Jan. 9, 1945. J. D. S. DE GUERIN 2,367,012

CARTRIDGE FIRING APPARATUS FOR POWER GENERATION

Filed June 2, 1941

Fig 1.

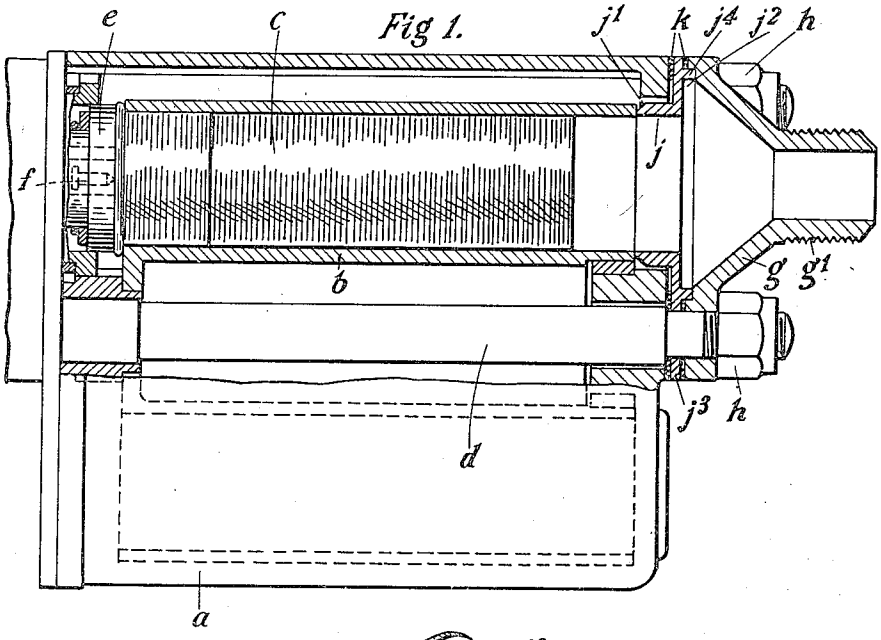


Fig. 2.

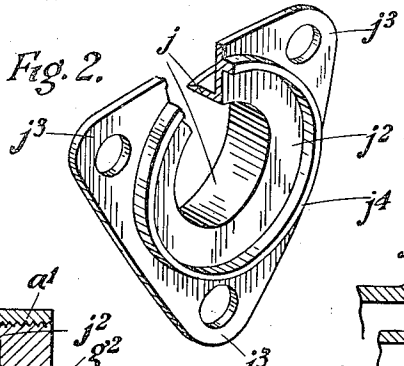


Fig. 3.

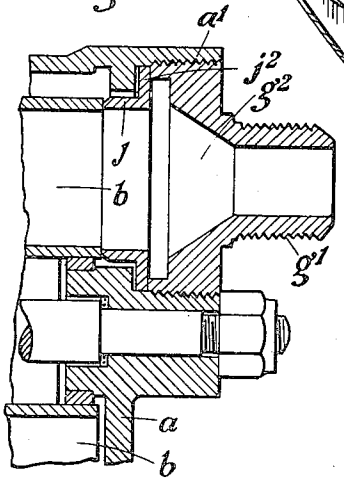
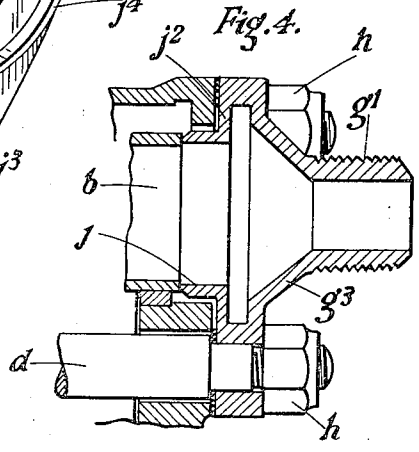


Fig. 4.



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Patented Jan. 9, 1945

2,367,012

UNITED STATES PATENT OFFICE

2,367,012

CARTRIDGE FIRING APPARATUS FOR POWER GENERATION

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Application June 2, 1941, Serial No. 396,359
In Great Britain July 24, 1940

4 Claims. (Cl. 89—1)

This invention comprises improvements relating to cartridge firing apparatus for power generation such apparatus being particularly applicable for the starting of aero engines.

In apparatus of the kind in question, a revoluble magazine comprising a number of cartridge tubes has been mounted between a combustion chamber and a breech block and pressure due to the combustion or explosion has been utilised for operating means for sealing the forward end of the cartridge tube in operation at the time against the combustion chamber, and for sealing the breech block against the rear end of the cartridge tube. In one case, the said operating means has comprised a piston in a cylinder open to the combustion chamber, the said piston being operatively connected with rods coupled with the breech block. In another case, the said operating means has comprised a sealing ring movable in the combustion chamber by the gas pressure which causes such ring to seat on the delivery end of the cartridge tube in operation at the moment.

The object of the present invention is to provide a simplification and improvement of the sealing means by dispensing with parts which move against one another and require piston rings or like sliding packing between them for preventing escape of the pressure gases.

According to this invention a sealing ring or sleeve is attached to the inner end of the combustion chamber by means of an annulus capable of flexing. The annulus may be made integral with the combustion chamber and sealing ring. Or it may be a flange formed on one end of the sealing ring and attached around the periphery in a pressure-tight manner to the inner enlarged end of the combustion chamber.

Thus, the sealing ring or sleeve is not movable against another part and therefore does not involve the employment of sliding packing. When pressure arises in the combustion chamber due to explosion or combustion of a cartridge, such pressure comes upon the annulus and the end of the sealing ring or tube and causes the latter to be pressed tightly against the end of that cartridge tube which is in operative position at the time. The amount of movement required for effecting a tight sealing is microscopic, so that little flexure of the annulus is involved.

In order to enable the invention to be readily understood, reference is made to the accompanying drawing, wherein:

Figure 1 is a longitudinal sectional elevation of a cartridge firing apparatus having one form of the sealing means in accordance with this invention applied to its combustion chamber.

Figure 2 is a perspective view of the sealing means of Figure 1 as seen when removed from the apparatus.

Figures 3 and 4 are fragmentary views similar to Figure 1 illustrating modifications.

Referring to Figure 1, *a* is a casing part enclosing a revoluble magazine *b*, one of the chambers of which is seen, in the upper part of Figure 1, to be in the firing position and loaded with a cartridge *c*. The magazine is revolubly mounted in the casing *a* as shown and turns about the axis of a pin or bolt *d*. As each chamber in turn is brought into the firing position, its rear end is closed by a breech block *e* containing a firing pin *f* for percussion cartridges, or a contact for electrically ignited cartridges. At the front end of the casing *a* there is mounted, coaxially with the breech block *e*, a so-called combustion chamber *g*. In the example illustrated, the combustion chamber *g* has the known form of a hollow conical body with a forwardly extending screw threaded spigot g^1 to which is screwed the duct or part receiving the delivery of pressure gases. The combustion chamber *g* is formed with three lugs at respective points of a triangle these lugs being perforated so as to pass on to three bolts, one of the latter being the bolt *d* aforesaid, and the chamber being secured in position by nuts *h* screwed on to the bolts.

There is a space between the end of the chamber in the firing position and the combustion chamber *g* and this space is occupied by a sealing ring *j* (see also Figure 2), which is a short length of tube. The inner end of the latter may be tapered or bevelled, as at j^1, in order to present an annular edge of reduced radial thickness for seating against the cartridge chamber in question. The opposite end of the tube *j* is formed with an out-turned radial annular flange j^2 of reduced thickness, this flange having perforated triangular enlargements or ears j^3 for enabling it to be mounted on the three bolts which support the combustion chamber *g*. The radial flange j^2 may be formed with a forwardly extending cylindrical flange j^4 to provide a short spigot for fitting into a socket recess in the inner end of the combustion chamber *g* as seen in Figure 1. This sealing ring fitting is applied to the bolts before the combustion chamber *g* is mounted thereon, packing rings *k* being provided between the said fitting and the casing *a* and also between the fitting and the combustion chamber *g*.

According to the modification shown in Figure

3, the combustion chamber g^2 is screwed threaded at the rim of its conical portion and screwed into a socket a^1 in the casing a. A sealing ring fitting f f^2 is introduced into such socket prior to the screwing in of the combustion chamber g^2 and the peripheral portion of its radial flange f^2 is held tightly between the rear wall of the socket a^1 and the rear end of the combustion chamber g^2 when the latter is screwed home.

In another form of construction shown in Figure 4, a sealing ring fitting f, f^2 is made integrally with a combustion chamber g^3.

When the loaded chamber has been brought into the firing position seen in the upper part of Figure 1, the breech block e is screwed up or advanced by means of a cam or other mechanism and this has the effect of pressing the cartridge chamber hard against the sealing ring f. Owing to the stiffness of the annulus f^2, the sealing ring f is held against the thrust of the cartridge chamber. The contact pressure due to this thrust provides an initial seal against which the gas pressure may build up. Owing to the manner in which the ring f is supported by the annulus f^2 it is possible for it to tilt a little under the said thrust, if necessary, in order to compensate for any small misalignment of the mechanism.

When the cartridge c is fired, the pressure arising in the combustion chamber g acts upon the area presented by the annulus or radial flange f^2 and the ring f and considerably increases the pressure of contact already existing between the sealing ring f and the cartridge chamber. As already mentioned, the amount of movement performed by the ring f in thus effecting sealing is microscopic. Therefore, the annulus or radial flange f^2 can be of a relatively stiff or robust nature so as to be capable of resisting rupture by the sudden rise of gas pressure, whilst at the same time permitting of sufficient flexure for the purpose described.

In order to reduce to a minimum the degree of the aforesiad tilting movement of the sealing ring due to want of axial alignment, the construction shown in Figure 1 may incorporate adjustable shims at one or more points of the three-point fixing of the combustion chamber to the casing a. Adjustment of the shims causes the axis of the combustion chamber g to be deflected with respect to the axis of the cartridge tube. Approximate alignment of the two axes is thus obtainable during assembly.

The inner end, f^1 of the sealing ring may have sharp edges and the mechanism may be assembled so that, during rotation of the cartridge magazine after firing, the ring will wipe the face of the magazine lightly thus keeping the seatings around the chambers clear of foreign matter and so assisting the perfect sealing of the ring against the chambers.

I claim:

1. A cartridge firing apparatus for generating power, comprising in combination, a support, a member mounted on said support and having a combustion chamber formed therein, said combustion chamber member having an outlet for pressure gas at one end, a breech block mounted on said support in axial alignment with the combustion chamber and spaced therefrom, means forming a cartridge chamber movable into alignment with and between said block and combustion chamber, and a sealing ring located adjacent the end of the cartridge chamber-forming means opposite the breech block for sealing against said end when a cartridge is fired, said ring having an outwardly extending annular flange fixedly secured to said support having a considerable area exposed to the pressure in the combustion chamber, said annular flange being of sufficient rigidity to support the ring against movement axially of the combustion chamber from mechanical pressure applied by the breech block through the cartridge chamber-forming means but having sufficient flexibility to flex under the gas pressure in the combustion chamber when a cartridge is fired so as to press the sealing ring gas-tightly against the adjacent end of the cartridge chamber-forming means.

2. A cartridge firing apparatus for generating power according to claim 1 and in which the annular flange of the sealing ring is integral with the combustion chamber-forming means and the ring and flange are also integral.

3. A cartridge firing apparatus for generating power according to claim 1 and in which the annular flange of the sealing ring is spigotted into the end of the combustion chamber-forming means opposite the outlet, jointing means securing together in gas-tight connection the outer portion of the annular flange and the combustion chamber-forming means, and in which the sealing ring and its annular flange are integral.

4. A cartridge firing apparatus for generating power according to claim 1, in which the combustion chamber-forming means is secured to the support by screws located approximately 120° apart about the axis of said combustion chamber, the annular flange of the sealing ring being jointed with the end of the combustion chamber-forming means at the end of the latter opposite its outlet, said flange having openings registering with said screws so as to be secured, and in which the sealing ring and its annular flange are integral.

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