Dec. 28, 1943. H. SCOTT-PAINE ET AL 2,337,840

AIR-COOLED GUN

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Fig. 1.

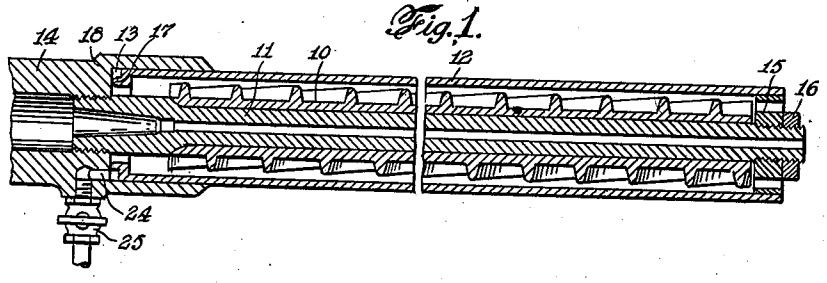


Fig. 2.

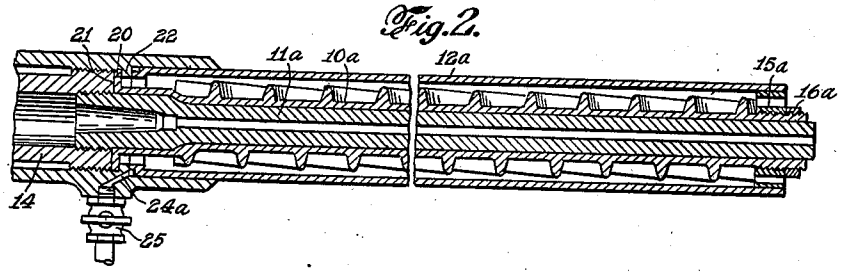
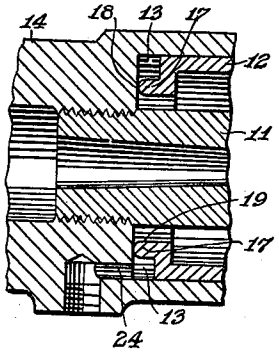


Fig. 3.



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AIR-COOLED GUN

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Application January 6, 1942, Serial No. 425,724
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4 Claims. (Cl. 89—14)

This invention relates to air-cooled guns and more particularly to that type of rapid firing gun having a jacket surrounding the barrel so as to provide a space through which air under pressure is passed to effect cooling of the barrel.

More particularly the invention relates to means for controlling the flow of air through said space which is automatically actuated in accordance with the temperature of a part of the gun which becomes heated when it is fired.

According to the invention there is provided, in a gun of the type set forth, an air inlet valve between a source of compressed air and the chamber between the barrel and the jacket, said valve being thermostatically controlled by the expansion and contraction of a gun part, to open the valve when cooling is required and to close the valve when adequate cooling has been effected.

An object of the invention is to provide a novel type of valve for controlling the flow of compressed air.

Another object is to utilize the expansion and contraction of the gun barrel for the operation of the valve.

A further object is to utilize the expansion and contraction of a member which is in close contact with the barrel, and is heated thereby, for the operation of the valve.

The following is a description of two alternative forms of construction according to this invention, reference being made to the accompanying drawing in which both Figures 1 and 2 are longitudinal sections through the gun barrel and cooling sleeve and a part of the breech casing and Figure 3 is an enlarged view of the valve shown in Figure 1.

In the construction shown in Fig. 1, a ribbed sleeve 10 of aluminium or other good heat-conducting metal is forced on to the barrel 11 to assist in conducting heat away therefrom. A cooling jacket 12 spaced away from it and surrounding it is located at one end in a recess 13 in a part of the breech casing 14, having a close sliding fit therein so as to make a substantially air-tight joint. At its forward end the jacket 12 is secured to the forward end of the barrel 11 by means of a spider 15 and lock-nut 16 so that the jacket partakes of the thermal expansion movements of the forward end of the barrel relative to its rear end.

At its rear end the jacket 12 is provided with an inwardly directed flange formed with a valve rim 17. The rim extends axially to engage a flat face 18 formed on the breech casing 14; with this arrangement the valve provides an annular space 13 around the barrel to which compressed air at a high pressure, say of the order of 300 pounds per square inch or more, can be admitted through a passage 24. A manual shut off cock 25 may be provided for closing the air line which connects with passage 24.

When the gun is operated, the temperature of the barrel 11 rises and it expands, but its temperature rises much more than that of the jacket 12 so that the differential expansion of the two parts, which are held together at the forward end of the barrel, results in the valve rim 17 being lifted off its seat and admitting the compressed air to the interior of the jacket. It is permitted to escape through suitable openings in the spider 15, as shown in Fig. 1.

As shown in Fig. 3, the rim 17 which engages the seating 18 on the breech casing 14 is rounded off at 19 thus providing a Venturi-form discharge passage imposing a low resistance to the passage of the compressed air. The sudden expansion of the highly compressed air results in a fall of temperature of the air which thereby is rendered more effective for cooling purposes.

It should also be noted that by forming the valve rim on a flange on the jacket, a slight resilience is obtained permitting accurate close seating of the valve when the gun is not in use.

In the construction shown in Fig. 2, the inner ribbed sleeve 10a which is mounted on the gun barrel 11a is fitted less tightly to the barrel than in the previous construction, so as to slide thereon, and is positively clamped between the gun barrel and breech casing at its rear end. For example a flange 20 on the sleeve is engaged between a shoulder 21 and a flange 22 in the breech part of the mechanism. The forward end of this sleeve carries a spider 15a, secured by a nut 16a, to which the forward end of the jacket 12a is rigidly secured. The inner sleeve 10a is of aluminium or other material having a high coefficient of expansion, and since it gets hotter, when the gun is in use, than the external jacket 12a, the rear end of the jacket has a movement relative to the rear end of the sleeve, or the flange 22 which it abuts, and this movement is used to effect a valving of the air similar to that described above in connection with Figs. 1 and 3. This construction provides a greater valve opening than that previously described, for a given temperature change, and therefore can be used with lower air-supply pressures.

A particular advantage of this invention is that the flow of cooling air continues so long as

the barrel or other part is at a higher temperature than the jacket, and thereby effective cooling between bursts of firing is ensured; in the known auto-ejection air cooling systems in which a flow of air was introduced by the exhaust gases from the gun, the flow ceased between the bursts of fire when the gun was not in use so that adequate cooling could not be obtained.

The present invention therefore renders it possible to avoid the use of thick and heavy barrels which have previously been used on account of their heat capacity or of making the barrels rapidly exchangeable when hot. The invention is readily applied in the case of marine and land installations where an adequate supply of compressed air is already available so that no additional complications are introduced.

The foregoing specific embodiments of the invention herein described are to be taken merely as illustrative and the invention is not to be construed as limited to their specific details, which are obviously subject to modification without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A thermostatic control for the flow of compressed air through a chamber surrounding a gun barrel to effect cooling thereof comprising, a gun having a longitudinally extending member which becomes heated on firing the gun, a breech casing secured to the rear end of said member and having a recess therein, a jacket surrounding said member and spaced therefrom and forming said chamber, the forward end of said jacket being secured to the forward part of said member, the rear end of said jacket being slidably mounted in said recess, means for directing compressed air to said recess, and valving means in said recess controlling the flow of said air to said chamber and actuated by the differential expansion of said member and said jacket.

2. A thermostatic control for the flow of compressed air through a chamber surrounding a gun barrel to effect cooling thereof comprising, a gun having a longitudinally extending member which becomes heated on firing of the gun, a breech casing secured to the rear end thereof and having an annular recess therein, a jacket surrounding said member and spaced therefrom to form said chamber, the forward end of said jacket being secured to the forward part of said member, the rear end of said jacket being slidably mounted in said recess, an annular valve part carried by the rear end of said jacket and coacting with a complementary valve part on said breech casing, said valve parts being adapted to open to admit air into said chamber upon differential expansion of said member and said jacket.

3. A thermostatic control for the flow of compressed air through a chamber surrounding a gun barrel to effect cooling thereof comprising, a barrel, a breech casing secured to one end thereof and having an annular recess adjacent the rear portion of the barrel, a jacket surrounding the barrel and having its forward end secured to the forward part of the barrel and forming said chamber, the rear end of said jacket being slidably mounted in said recess, an annular valve part carried by the rear end of said jacket and coacting with a complementary valve part on said breech casing, said valve parts being adapted to open to admit said compressed air inside the jacket upon differential expansion of the barrel and jacket.

4. A thermostatic control for the flow of compressed air through a chamber surrounding a gun barrel to effect cooling thereof comprising, a barrel, a breech casing secured to one end thereof and having an annular recess adjacent the rear end of the barrel, a sleeve coaxial with the barrel and capable of independent expansion relative thereto, a jacket surrounding the barrel and the sleeve and having its forward end secured to the forward part of said sleeve and forming said chamber, the rear end of said jacket being slidably mounted in said recess, means for securing the rear end of said sleeve to said breech casing, an annular valve part carried by the rear end of said jacket and coacting with a complementary valve part on said breech casing, said valve parts being adapted to open to admit said compressed air inside the jacket upon differential expansion of the sleeve and jacket.

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