H. H. C. DUNWOODY.

AUTOMATIC GUN.

APPLICATION FILED APR. 14, 1917.

1,227,897.

Patented May 29, 1917.

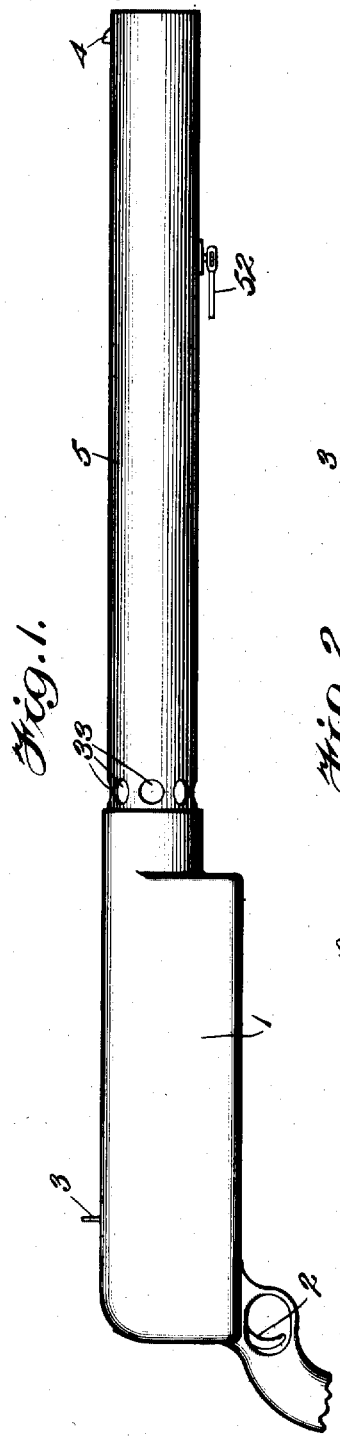

Fig. 1.

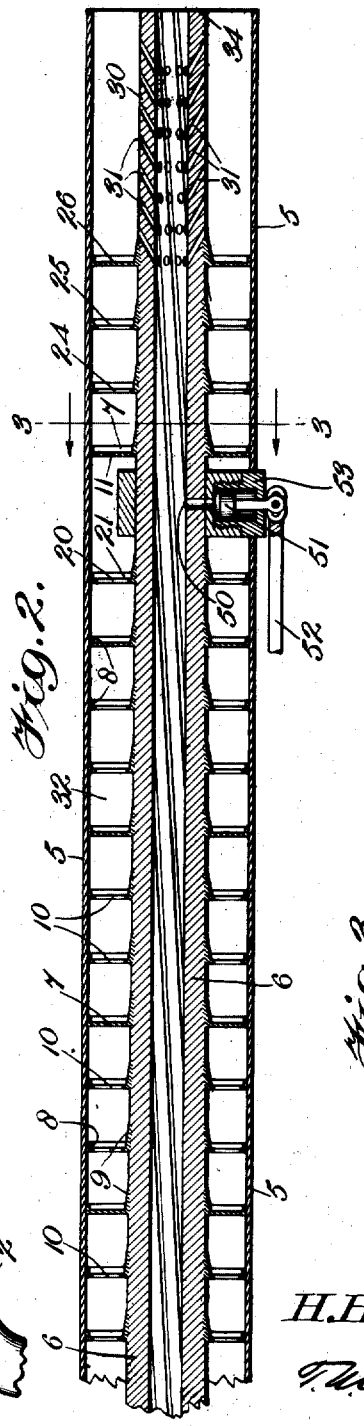

Fig. 2.

Fig. 4.

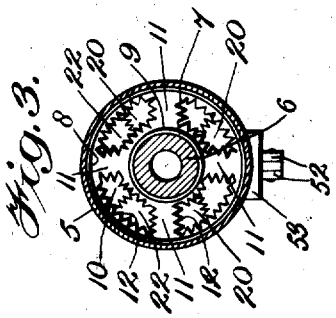

Fig. 3.

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AUTOMATIC GUN.

1,227,897. Specification of Letters Patent. Patented May 29, 1917.

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To all whom it may concern:

Be it known that I, HENRY H. C. DUNWOODY, brigadier general U. S. Army, retired, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Automatic Guns; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to means for cooling gun barrels especially adapted for the cooling of the barrels of rapid fire guns and has for its object to provide a means which will be simple in construction, efficient in action and comparatively inexpensive to manufacture.

With these and other objects in view the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals designate like parts in all the views:—

Figure 1 is a diagrammatic side elevational view of a gun of the rapid fire type provided with this invention;

Fig. 2 is a longitudinal sectional view of a portion of the barrel and its cooling means illustrated in Fig. 1;

Fig. 3 is a cross sectional view taken on the line 3—3 of Fig. 2, looking in the direction of the arrows; and

Fig. 4 is a diagrammatic enlarged plan view illustrating a portion of the serrated or roughened edges with which the cooling disks are provided.

1 indicates the breech portion of a gun of any desired type, 2 the trigger thereof, 3 any desired rear sight, 4 any desired front sight, and 5 a casing surrounding the barrel 6. Said casing 5 is larger in diameter than is the barrel 6 and is spaced from said barrel by a plurality of disk-shaped members 7. These said disk-shaped members are preferably of the shape shown being provided with an outer flange 8 fitting the interior of the casing 5, and with an inner flange 9 adapted to be tightly driven on or welded to the barrel 6 in order to provide a good heat conducting joint.

Each of the members 7 are provided with a plurality of openings 10, four being illustrated in Fig. 3, to provide four radially disposed spokes or connections 11. Each of the openings 10 are serrated or roughened around their edges as shown at 12 to provide a plurality of sharp projections 13, best illustrated in Fig. 4.

The disks 7 are so disposed between the barrel 6 and the casing 5 as to cause the spokes 11 of the one disk to be angularly displaced with reference to the spokes of a succeeding disk. For example, if four openings 10 are provided in each disk as shown, I prefer to displace the spokes of each succeeding disk through an angle of 30 degrees thus causing the longitudinal channels, formed by successive openings 10, to be obstructed or broken up by the succeeding spokes of succeeding disks. This disposition of the disks will be rendered clear if we consider Figs. 2 and 3. That is to say, supposing the spokes 11 of the disk 7 there shown to be disposed as indicated in Fig. 2, and that the eye is directed along the barrel in the direction of the arrows, the spokes of the next disk in this case would not appear because the disk that would ordinarily come next to the first disk 7 has been omitted so that the empty spaces 22 would appear in Fig. 3.

The eye, however, would catch the third disk 21 and its spokes 20 would appear to overlap the spokes 11 all as is illustrated in Fig. 3. However, it is clear that if the omitted disks were in place that the entire area of the spaces 10 would be taken up by angularly displaced spokes. In other words, should the eye be directed in a direction opposite to that of the arrows in Fig. 2, it would successively see the angularly displaced spokes 24 and 25, and would also see the spokes of the third disk 26 filling up what corresponds to the empty spaces 22 in Fig. 3.

The effect of thus angularly displacing the spokes of the various disks is, as above stated, to break up what would otherwise be a continuous passage of air through the holes 10 and to therefore cause the air traversing the interior of the casing 5 to follow a zig-zag course around the outer edges of the various spokes. The passage of the air is thus obstructed by each successive spoke along the barrel and the air is

forced to impinge with a greater or less force against the serrated or roughened edges of said spokes with the result that it more efficiently strips the said spokes of their heat as will appear more fully below.

The barrel 6 is made somewhat longer than is usual and its extreme outer portion 30 is provided with a plurality of inclined passages 31, as shown, through which the gases of the explosion pass, and thus suck out the air filling the space 32 between the casing 5 and the barrel 6. As said air is thus sucked out of the space 32, additional air enters through the openings 33 with which the casing is provided at or near the rear end of the barrel, and thus there is effected a sort of pumping action which causes the air to circulate freely through the openings 10 and around the edges of the individual spokes of the disks. As a matter of fact, as the bullet passes the first series of openings 31 the gases escape through said openings and set up a vacuum in the space 32 between the casing and the barrel. A very brief interval after this vacuum is formed another vacuum is formed by the bullet passing the second series of openings 31 and so on until the bullet has emerged at the muzzle 34. The effect of thus creating sufficient vacuums after very brief intervals of time in the space between the barrel and casing is to start the air flowing through the tortuous passages between the spokes and to cause the same to finally pass out around the muzzle 34, thus cooling the barrel.

Referring more particularly to Fig. 4, the serrations or very fine points 13 of the openings 10 in each disk accumulate heat thereon in the manner well known. That is to say, it is a well known principle of physics that heat accumulates on points to much higher densities than on flat surfaces and that therefore it may be removed from said points with greater facility than it is from flat surfaces. In other words, if the dotted lines 40 in Fig. 4 represent in a rough sort of way the densities of the heat accumulated on the various points 13, then it is evident that the air passing along the outside barrel 6 will strip or conduct off or deprive the spokes 11 of their heat much more readily when the said openings 10 are provided with the points 13 than would be the case if the edges of said openings were smooth. In addition to the above, it is further well known that when air passes along a smooth surface it sticks to the walls of the passage through the action of the phenomena known as adsorption so that the air in the middle of the passages does not accumulate as much heat as would be the case were the passages broken up and were the air in the middle of the passages thus forced to contact with the walls of said passages. It is for this reason that radiators in general often cause the cooling air to traverse sinuous passages instead of straight passages.

Another advantage of causing the air to traverse a zig-zag passage is the fact that such passage is longer than is a straight passage between the same points, and consequently, the air remains longer in contact with the metal than is the case with straight passages.

It will thus be observed that by angularly displacing the spokes of the various disks 7 in the manner disclosed I provide zig-zag or broken passages for the air, thus causing a more intimate contact between the metal and the air than would otherwise be the case, and I further provide a longer contact between the air and the metal than would be the case with a straight passage. Further, by roughening the surfaces of the openings between the spokes of the different disks, I enable the air to more effectually strip the heat from said disks than would otherwise be the case. In order that there may be as much heat as possible conducted from the barrel to the various disks, I preferably either braze or solder the said disks to the barrel or else I autogenously weld or electrically weld them thereto thus making them an integral part of the barrel. The outer casing may or may not be roughened as desired. If it is roughened as is usually done, of course, it will radiate heat to better advantage than if it is smooth. At 50 I have indicated the usual vent through which a portion of the gases may pass in order to operate the piston 51 located in the cylinder 53. The said piston 51 is returned by any suitable mechanism not shown and it operates any suitable or desired type of automatic loading mechanism a portion of which is indicated at 52.

It is obvious that those skilled in the art may vary the details of construction as well as the arrangement of parts without departing from the spirit of the invention and therefore I do not wish to be limited to the above description except as may be required by the claims.

What I claim is:—

1. In a rapid fire gun the combination of a gun barrel; a casing surrounding the same; means to admit air at one end of said casing; means to create a partial vacuum at the other end of said casing; and a plurality of disk like members provided with staggered openings for the passage of said air located between said casing and barrel, substantially as described.

2. In a rapid fire gun the combination of a gun barrel; a casing surrounding the same; means to admit air at one end of said casing; means to create a partial vacuum at the other end of said casing; and a plurality of disk like members provided with openings having edges provided with pro-

jections for the passage of said air located between said casing and barrel, substantially as described.

3. In a rapid fire gun the combination of a gun barrel; a casing surrounding the same provided with means to admit air at one end of said casing; means to create a partial vacuum at the other end of said casing; and a plurality of disk like members provided with angularly displaced openings having roughened edges for the passage of said air located between said casing and barrel, substantially as described.

4. In a rapid fire gun the combination of a gun barrel; provided with a port; a gas cylinder associated with and adapted to receive the gases escaping through said port; a casing surrounding the barrel; means to admit air at one end of said casing; means to create a partial vacuum at the other end of said casing; and a plurality of disk like members provided with openings having projections on their edges for the passage of said air located between said casing and barrel, substantially as described.

5. In a rapid fire gun the combination of a barrel provided with a muzzle portion, having a plurality of perforations through which the gases of explosion may pass; a casing surrounding said barrel and perforations; a plurality of disks integral with said barrel located between said barrel and casing each disk provided with a plurality of openings and each opening being angularly disposed with relation to an adjacent opening to form a tortuous passage for said air; substantially as described.

In testimony whereof I affix my signature.

HENRY H. C. DUNWOODY.