

I. N. LEWIS.
FIREARM.

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1,004,665.

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Fig. 1

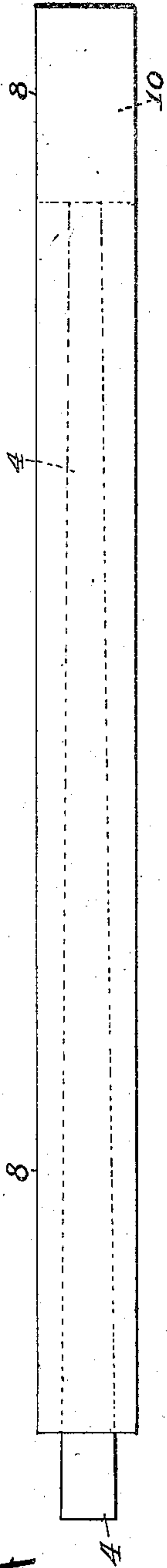


Fig. 2

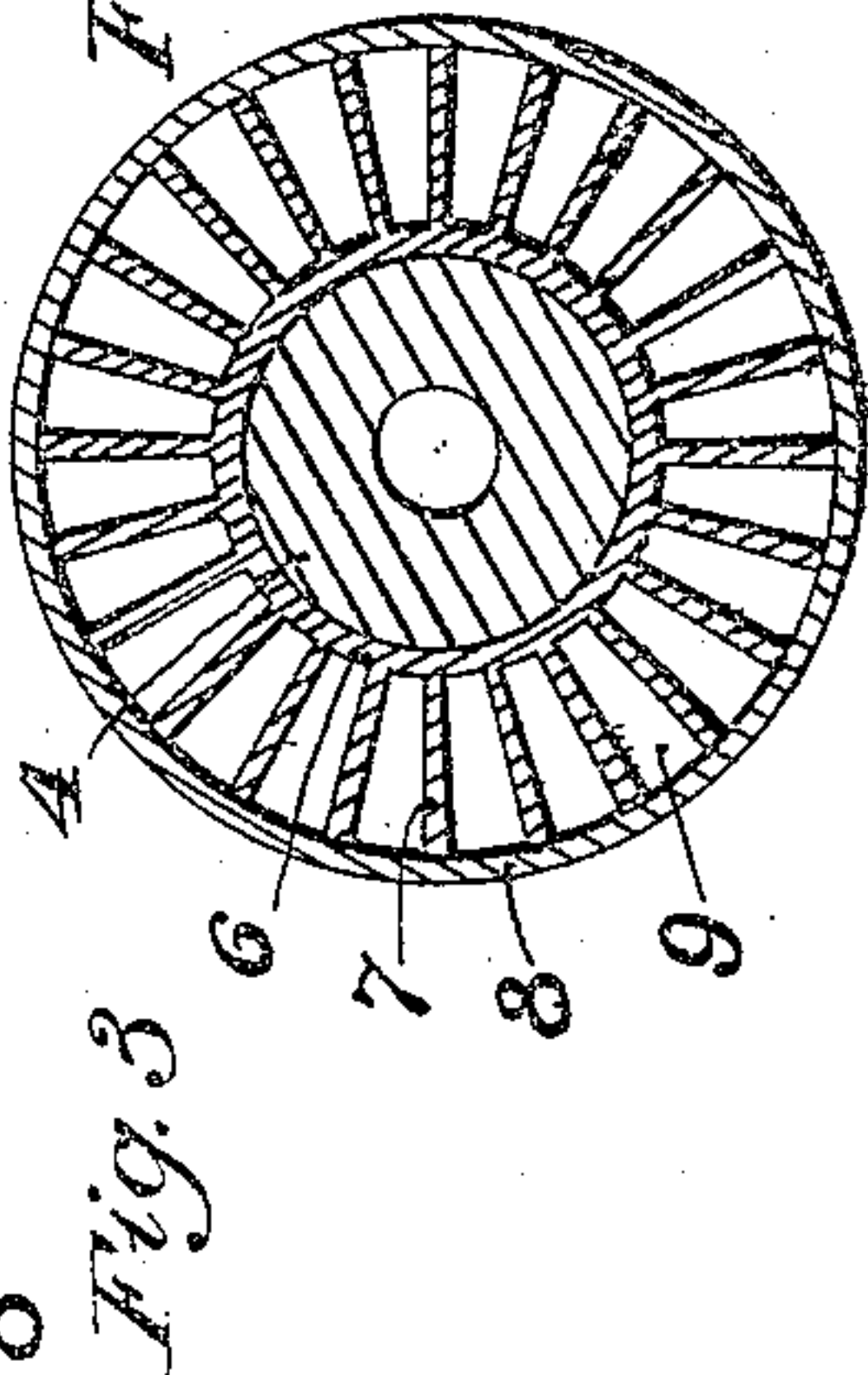
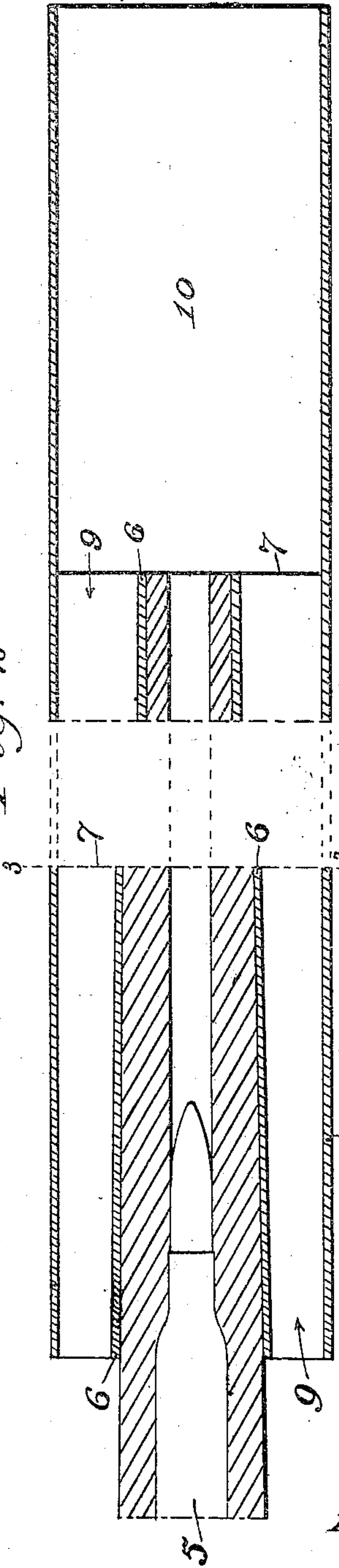


Fig. 4

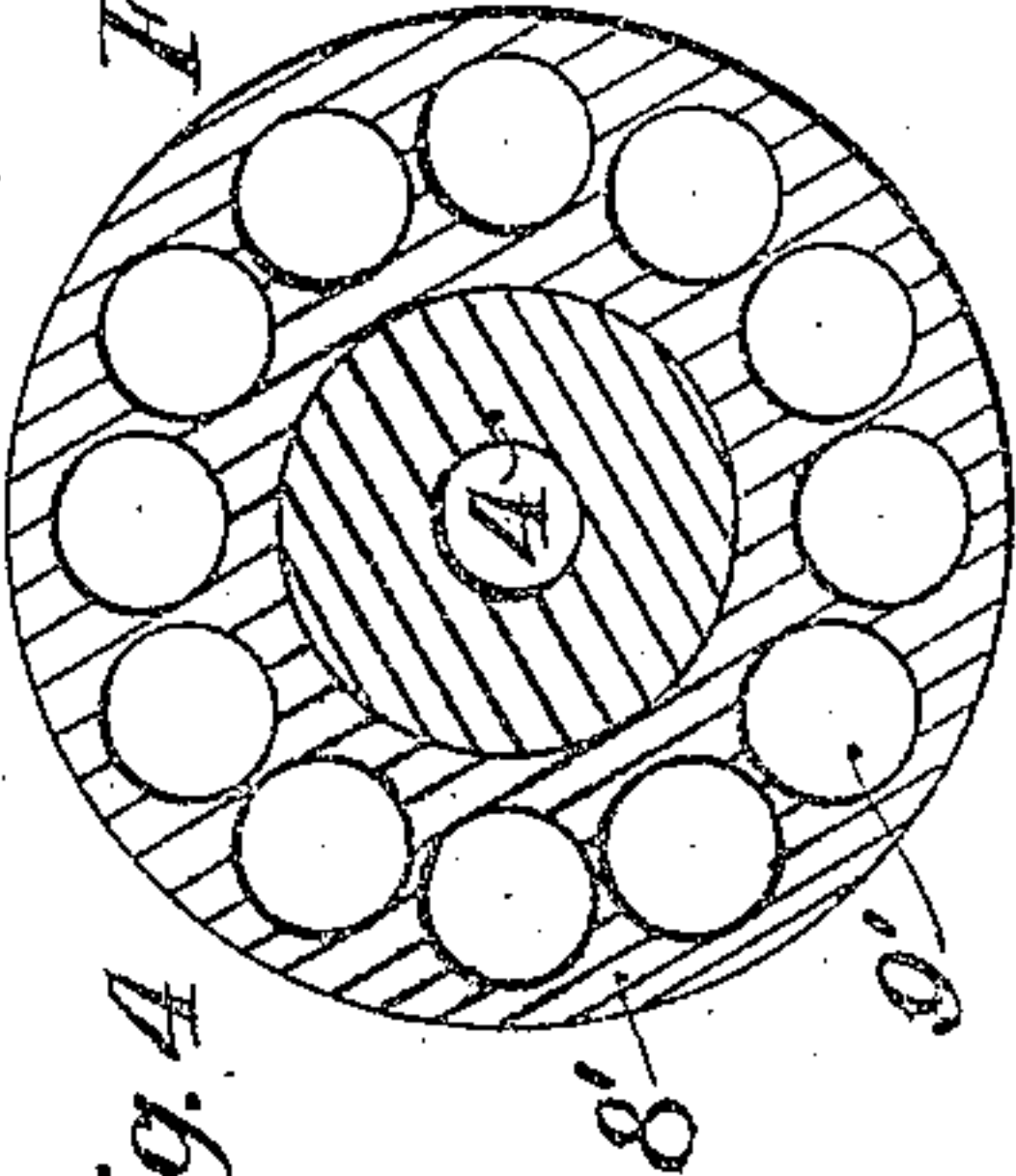
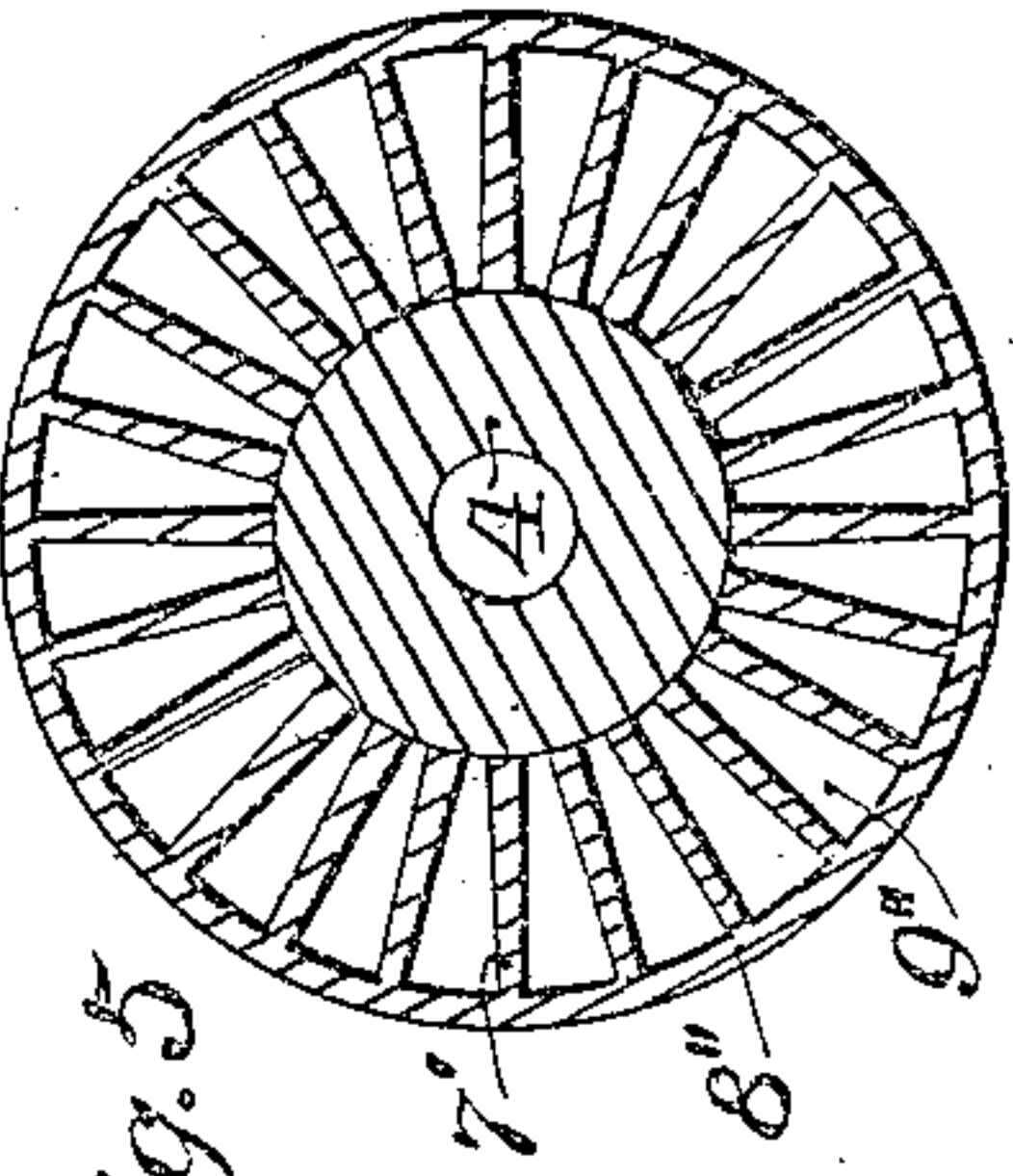


Fig. 5



Witnesses
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UNITED STATES PATENT OFFICE.

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FIREARM.

1,004,665.

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To all whom it may concern:

Be it known that I, ISAAC N. LEWIS, a citizen of the United States, residing at Fortress Monroe, in the county of Elizabeth City and State of Virginia, have invented new and useful Improvements in Firearms, of which the following is a specification.

My invention relates more especially to discharge-operated fire-arms of the automatic or semi-automatic variety wherein rapidity of fire is a prime consideration, although it may be advantageously applied to any small arm or cannon in which the rate of fire is sufficiently high to unduly heat the barrel and contiguous metal parts.

It is well known that in all magazine guns and rapid-fire cannon heretofore constructed the metal parts become intensely hot under a rapid, sustained fire unless effective means of cooling are provided. It has been customary to cool such arms in one of two ways, namely—1, to surround the barrel wholly or in part by a water jacket, the contained water of which receives the heat transmitted through the metal parts, or, 2, by so increasing the thickness of metal in the gun barrel and adding radially projecting rings or ribs of metal, as to greatly increase the outer radiating surface of the barrel, thus partially carrying off the transmitted heat by radiation into and by direct contact with the cooler atmospheric air. In the case of the water-cooled gun, continued rapid firing will convert the water into steam and the steam so formed must be either condensed or allowed to escape into the air. The use of water for cooling must therefore necessarily involve additional cost and weight of the constructed parts, the inconvenience and expense of securing and transporting an extra supply of water, and the annoyance and danger to the personnel and to the mechanism of the gun due to the presence of boiling water and steam during action. In the case of the air-cooled guns heretofore used, there has been no successful attempt made to obtain a proper circulation of the cooling air through or over the heated surfaces of the metal. Nor has it been possible thus to carry away the transmitted heat with sufficient rapidity to prevent a very rapid rise of temperature in the barrel of the gun in action. One or more extra detached barrels are supplied with such air-cooled guns, and it is necessary either to provide a number of such

barrels or to have a supply of water at hand to quickly cool the used barrel as soon as it is detached. It is not practicable under the severe conditions of service to maintain a high rate of fire continuously with any water-cooled or air-cooled gun heretofore constructed.

It is the purpose of my invention to provide a simple and practically effective plan of cooling a fire-arm by means of currents of air induced by the ejector action of the powder gases as they issue at high temperature, pressure, and velocity, from the muzzle. By the ejector action of the gases, cool atmospheric air is sucked in from in rear through numerous inclosed air passages which surround the barrel throughout the greater part of its length. The partial vacuum maintained at the muzzle also draws in cool air from in rear through the barrel at the instant the breech is opened to withdraw and eject the empty cartridge case, thus quickly clearing the bore of the spent gases and partially cooling the highly heated interior walls.

The currents of cool air drawn, by ejector action, through, around, and over the barrel or tube of the gun serve to carry away the heat from the metal parts, and thus prevent an excessive rise in temperature no matter how rapid the firing nor how long continued it may be at any one time. The higher the rate of fire the more perfect the ejector action of the powder gases in producing the effective forced draft of air for cooling purposes.

It will be especially noted that the mechanical embodiment of my invention requires no moving part, and that the construction is such that the addition of the cooling device to the gun involves but little extra expense and weight. The exact dimensions, form, and number of the inclosed air passages for any given length and caliber of gun may be determined when the rate and conditions of service fire are known. Where minimum weight and a moderate degree of heat are prime considerations, I prefer to surround the steel barrel of the gun by a tightly fitted, fluted aluminum sleeve (or its equivalent) inclosed in a tube of aluminum; the advantages of such construction being due to the lightness and high conductivity and specific heat of the metal aluminum as compared with gun steel. The use of my plan of cooling in a fire arm does not

affect injuriously, either the range or the accuracy of the weapon.

The details of construction and form set forth in the accompanying drawings and specification will be sufficiently clear to explain the scope and practical value of my invention.

In said drawings, Figure 1 represents, in side elevation, at one-third scale, a gun barrel equipped with any air cooling device; Fig. 2 shows, in full size, longitudinal medial sections of the muzzle and butt ends of the device seen in Fig. 1; and in Fig. 3 is seen a transverse section through the barrel and cooling device, taken in the plane indicated by the line 3—3 in Fig. 2; while Figs. 4 and 5 are modifications.

The gun barrel is represented at 4 and is typical of any gun barrel. The location of a cartridge is indicated at 5, Fig. 2. The cooling device preferably consists of two parts; first, a sleeve 6 fitted snugly to the barrel and provided with longitudinal, radiating fins or ribs 7; and, second, a tube 8 fitted snugly to the said fins or ribs. By this arrangement a series of narrow passages or ducts 9 are formed extending from over the cartridge chamber of the muzzle of the barrel and radially disposed with respect to the barrel. The tube 8 extends beyond the barrel and beyond said ducts for a sufficient distance to create what may be termed a suction chamber 10. The bullets and powder gases as they issue through this chamber create sufficient suction to draw air rapidly from in rear forward through said ducts 9. Thus at the firing of each round there is created a flow of cool air all around the barrel which provides for rapid dissipation of the heat from the barrel, because the currents of air so induced carry along the heat transmitted to them. The suction created in the chamber 10 will also draw air through the bore of the barrel as soon as the breech is opened in the ejection of the cartridge case. By making the cooling device, particularly the sleeve 6 and its integral fins, from a metal of high conductivity such as aluminum, and fitting said sleeve snugly to the barrel, rapid conveyance of heat from the heated barrel is well provided for. Then, because of the narrow passages or ducts between the fins 7 a rapid change of the contacting air is produced, resulting in an effective cooling of the barrel. Aluminum is especially well adapted for my purpose, because it combines lightness with high conductivity and therefore enables me to provide a cooling device of high efficiency and of light weight.

The sleeve 6 with its fins 7 may be produced in any convenient way, but I have found it practicable to form it from a rod of aluminum bored to closely fit the barrel and then longitudinally milled to provide

the channels between the fins. In this way the surface of the channels may be made smooth so as not to retard the passage of air through them. The tube 8 may then be fitted to the sleeve, so channeled or fluted, and secured thereto as by shrinking or otherwise. Other ways of making the cooling device will readily suggest themselves to a mechanic and it matters not what plan is followed, as long as there is produced a cooling jacket that fits snugly to the surface of the barrel and is provided with a series of narrow open-ended ducts extending lengthwise of the device and the whole so formed and located upon the barrel that the issuing bullets and powder gases will draw air through said ducts as they leave the muzzle of the gun. The fins might be made integral with the tube 8 as in Fig. 4 where the ducts 9' are formed by boring or the fins might be made integral with the tube 8 and the sleeve 6 omitted as shown in Fig. 5.

This invention is particularly well adapted to gas operated guns, such as pistols, shoulder arms and machine guns, wherein the barrel, as a rule, has no movement; since in such guns the cooling device herein set forth can be rigidly fixed to the barrel, without interfering with the mechanism or the manipulation of the gun in any way. It is this intimate contact of the extended radiating surfaces with the surface of the barrel that makes the device especially efficient, particularly when such extended radiating surfaces are of a metal of high conductivity, and particularly also when the cooling device is so constructed that the discharges from the barrel automatically create a rapid change of the air contacting with said extended surfaces.

The extension of the jacket or tube 8 beyond the muzzle of the barrel, thereby forming chamber 10, and the opening of ducts from the rear into said chamber produce a device which serves also as an effective silencer.

I claim as my invention:—

1. The combination with a tube, from which highly heated gases are forcibly expelled, of a surrounding cooling device composed of a material of high heat conductivity and low specific gravity and provided with a plurality of open-ended non-communicating ducts within its outer surface extending longitudinally of said device and terminating at the forward end of said tube, while the outer surface of said device extends beyond the forward end of the tube so that the issuing gases shall act to draw air through said ducts and thereby dissipate the heat given off from said tube.

2. The combination with a gun barrel, of a cooling device of aluminum fitted about it and having radially disposed longitudinal partitions between which are ducts extend-

ing lengthwise of the barrel, said device having a prolongation extending beyond the ducts and beyond the forward end of the barrel and concentric with the barrel, whereby the issuing gases will draw air through said ducts.

3. In an air cooling device for guns, the combination with the gun barrel of two surrounding concentric tubes, partitions extending between the tubes from one to the other whereby distinct non-communicating ducts are formed longitudinally of the barrel, said tubes and partitions consisting of material of higher heat conductivity than the barrel and so constructed that the discharging gases as they issue from the barrel will coact with the outer tube and draw air through said ducts and thereby rapidly carry away the heat given off from the barrel.

4. In an air cooling device for guns, the combination with the gun barrel of a sleeve attached to the barrel and having heat conductors of higher conductivity and lower specific gravity than the barrel extending from the sleeve, and a tube surrounding and engaging said conductors and forming air ducts extending from in rear to the muzzle of the barrel, said tube extending beyond the muzzle of the barrel and providing a suction chamber for the purpose set forth.

5. In a device for cooling guns by air, the combination with the gun barrel, of an aluminum sleeve fitted snugly to the surface of the barrel and provided with integral, longitudinal fins radially disposed, and a tube fitted to the outer edges of said fins, thereby forming the channels between said fins into open-ended ducts, said tube being extended beyond the muzzle of the barrel whereby to form a suction chamber such that, as the bullets and powder gases speed through it, air will be drawn forward through the said ducts and through the bore of the barrel thus effecting rapid cooling thereof.

6. A silencer for guns consisting in the combination with the gun barrel, of a tube surrounding the barrel and extending beyond the muzzle thereof, and radially disposed longitudinal partitions within said tube between which are formed separate and distinct non-communicating open-ended ducts whose forward ends are in proximity to the muzzle of the barrel.

In testimony whereof I have affixed hereto my signature, in presence of two subscribing witnesses.

ISAAC N. LEWIS.

Witnesses:

A. GIBSON,
WM. M. CLINE.