To all whom it may concern:

I, Isaac N. Lewis, a citizen of the United States, residing at Fortress Monroe, in the county of Elizabeth, and the State of Virginia, have invented an improved or semi-automatic firearm, the said firearm being capable of being discharged in a rapid or rapid-fire manner, wherein the said firearm is provided with a barrel or barrel assembly having a chamber, a barrel or barrel assembly, and a breech mechanism, the said breech mechanism being operable to open and close the said chamber, and the said firearm being capable of being discharged in a rapid or rapid-fire manner, wherein the said firearm is provided with a barrel or barrel assembly having a chamber, a barrel or barrel assembly, and a breech mechanism, the said breech mechanism being operable to open and close the said chamber.

My invention relates more especially to the discharge of the firearm, the said firearm being capable of being discharged in a rapid or rapid-fire manner, wherein the said firearm is provided with a barrel or barrel assembly having a chamber, a barrel or barrel assembly, and a breech mechanism, the said breech mechanism being operable to open and close the said chamber.

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 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 a 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 each air-cooled gun, 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 action of the powder gases as they issue at high temperature, pressure, and velocity, from the muzzle. By the use of a jet of air, the gases, the air coming in from rear through numerous inlets passing which surround the barrel throughout most of its length, the partial vacuum maintained at the muzzle also draws in cool air to cool the barrel. The instant the breech opens to withdraw the ejected empty cartridge cases, thus quickly drawing the body of the spent gases and partially cooling the highly heated interior walls.

The currents of cool air drawn, by the ejector action, through, around, and over the barrel, serve to carry away the heat from the metal parts, and thus prevent an excessive rise in temperature. No matter how rapid the firing or 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 inlets and the conditions of service 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 slightly fluted sleeve, which sleeve serves to reduce the weight and to cool the barrel. 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 1 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 current 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 breach 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 provided a cooling jacket that fits snugly to the surface of the barrel and is provided with a series of narrow open-ended ducts extending longitudinally 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 the fins 75 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 effective, 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 produces 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-
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 coat with the outer tube and draw air through said ducts and thereby rapidly carry away the heat given off from the barrel.

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