July 1, 1947. G. MONNET 2,423,109

MEANS FOR IMPROVING THE EJECTION OF MASSES

Filed July 1, 1944 2 Sheets-Sheet 1

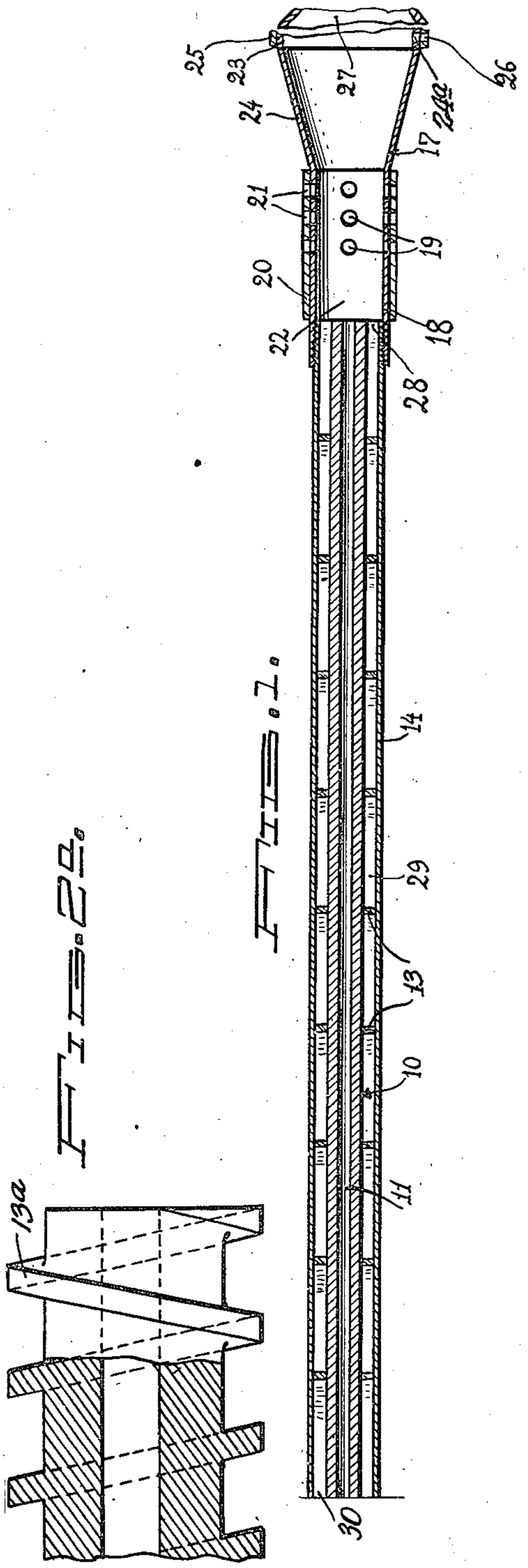

FIG. 1.

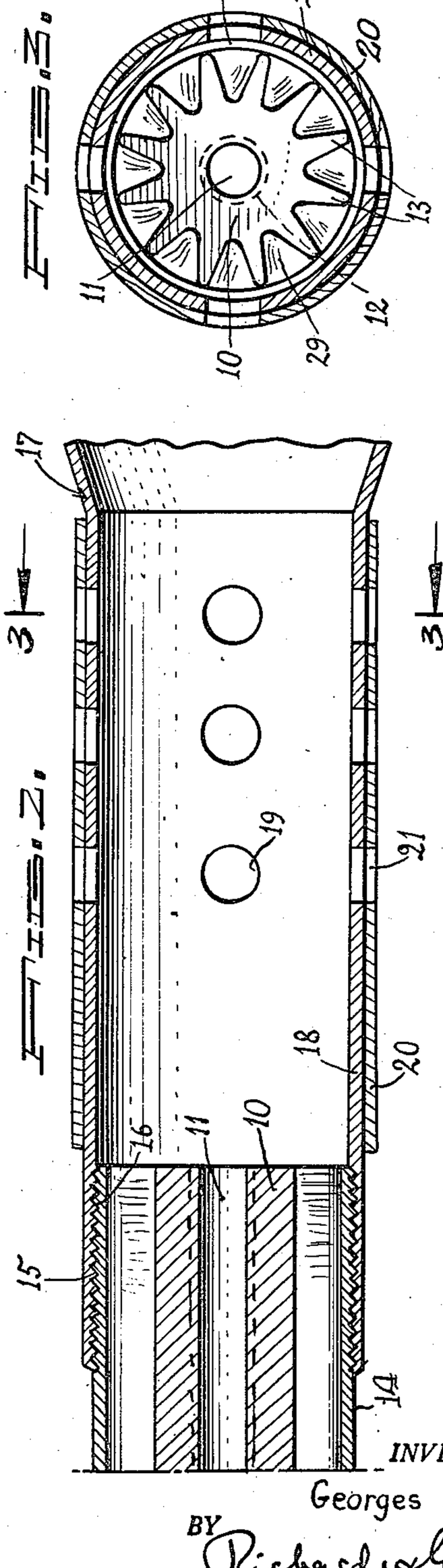

FIG. 2.

FIG. 3.

FIG. 2a.

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MEANS FOR IMPROVING THE EJECTION OF MASSES

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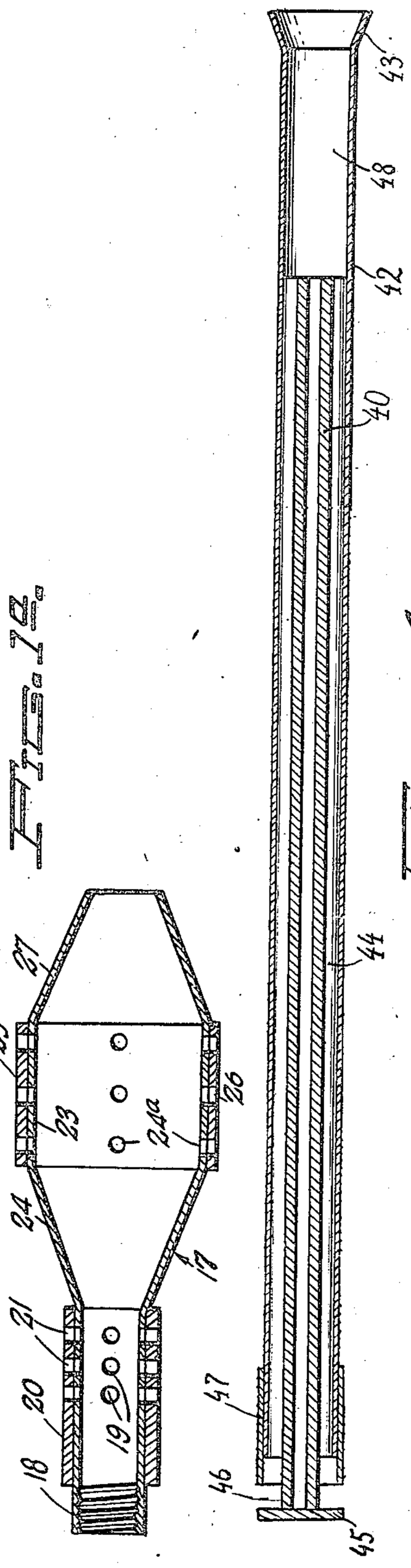

FIG. 1.

FIG. 4.

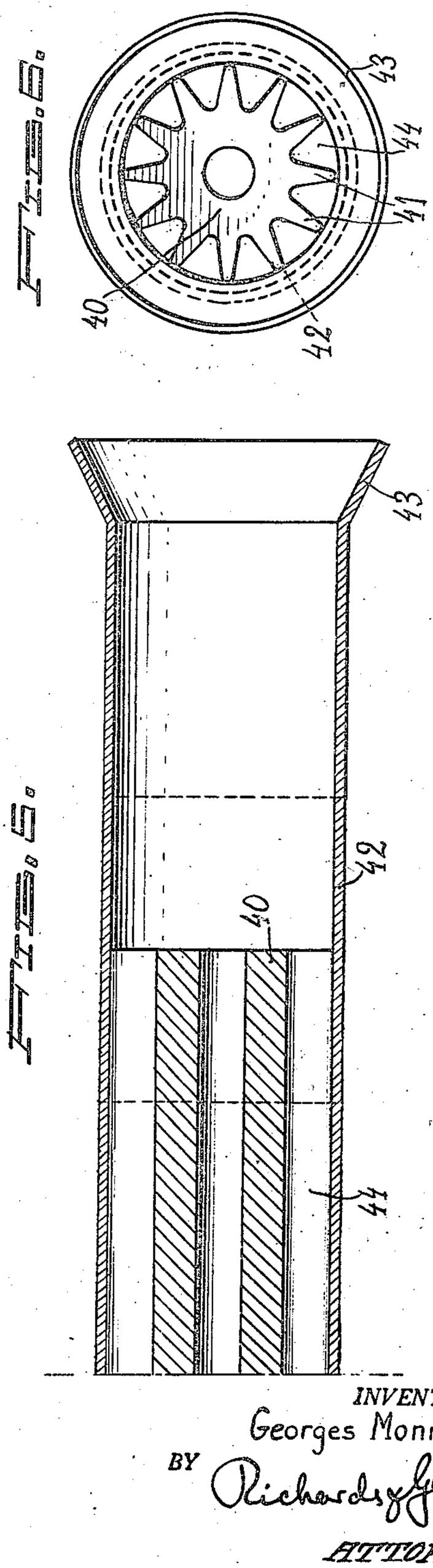

FIG. 3.

FIG. 5.

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MEANS FOR IMPROVING THE EJECTION OF MASSES

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1 Claim. (Cl. 89—14.1)

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This invention relates to a method and means for improving the ejection of solid, liquid and gaseous masses. The invention is particularly concerned with rifles, guns, flame throwers, and apparatus for jet propulsion.

All of the above mentioned machines have in common an elongated barrel or tube out of which a mass is ejected. In the case of rifles, guns and machine guns, it is the bullet or the shell which is being ejected, while the flame thrower ejects a burning liquid, and a jet propulsion apparatus ejects combustion gases.

One of the most serious drawbacks of barrels or tubes in the above described machines is the rapid heating thereof to a temperature at which firing becomes impossible.

It is, therefore, an object of the present invention to provide automatically operable cooling means which will adequately cool the outer surfaces of the barrel or tube and thereby considerably increase the efficiency of the machine.

The present invention is based in part on the realization that the ejection of a mass through a muzzle creates sub-atmospheric pressure or even a vacuum around this muzzle which may be utilized for the purpose of creating a flow of air or other gases thereto.

It is, therefore, another and equally important object of the present invention to utilize the sub-atmospheric pressure existing at the muzzle for the purpose of creating a gaseous flow which will improve the operation of the machine.

Another object is to facilitate the cooling of barrels and tubes by the provision of a gaseous flow around them.

A further object of the present invention is to increase the range or distance to which a mass may be ejected by providing a gaseous flow traveling in substantially the same direction as the ejected mass.

Yet another object is to eliminate or diminish the yaw of projectiles and the flash which accompanies the firing.

Yet another object is to improve the accuracy of firing of guns and machine guns, to increase their range, to diminish the recoil, and to reduce the report.

Other objects will become apparent in the course of the following specification.

In accomplishing the objects of the present

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invention, the suction created at the muzzle of a barrel or tube during firing is utilized to provide a flow of air along the barrel and toward the muzzle. For that purpose the barrel is enclosed in a tube which extends preferably along the entire length of the barrel and is supported by ribs. The ribs may be straight or helical to conform to the rifling of the barrel. A silencer or similar member is connected with the sleeve and is located in front of the muzzle. The sleeve is movable lengthwise upon the barrel, and various means may be provided to vary the amount and extent of the gaseous flow.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings showing, by way of example, preferred embodiments of the inventive idea.

In the drawing:

Figure 1 is a section through a barrel provided with a device constructed in accordance with the principles of the present invention. Figure 1*a* illustrates the silencer.

Figure 2 is a detailed sectional view of the muzzle portion of the barrel. Figure 2*a* is a fragmental side view partly in section of a barrel with helical ribs.

Figure 3 is a section along the line 3—3 of Figure 2.

Figure 4 is a sectional view through a differently constructed device.

Figure 5 is a detailed sectional view of the outer end of the device.

Figure 6 is an end view of the device.

Figures 1, 2 and 3 illustrate a barrel 10. This barrel may constitute a part of a gun or machine gun. On the other hand, the barrel or tube 10 may form the ejecting means of a flame thrower, a jet propelled projectile, or the like. The interior 11 of the muzzle is provided with the usual rifling 12.

In accordance with the present invention the barrel 10 is provided with radially extending ribs 13. These ribs may constitute an integral part of the barrel, as shown, or they may be mounted upon it by any suitable means.

The ribs 13 may extend parallel to the longitudinal axis of the barrel, or they may have the form of helical windings 13*a* as shown in Figure 2*a*. Preferably the pitch of these windings

should be the same as that of the rifling, and the ribs should extend parallel to the rifling.

A pipe or tube 14 is mounted upon the ribs 13 and is carried thereby. Preferably the pipe 14 extends the entire length of the barrel.

As shown in Figure 1, the outer end of the pipe 14 may coincide with the muzzle of the barrel 10 and may be provided with screw threads 15 which receive the screw thread 16 of a silencer or chamber-forming element 17.

The silencer 17 has a cylindrical portion 18 which is located close to the muzzle and which is provided with openings 19. These openings may be closed by a sleeve 20 which is rotatably mounted upon the portion 18 of the silencer. The sleeve 20 has openings 21 which may coincide with openings 19 of the silencer, thereby providing a communication of the interior 22 of the silencer with the outside atmosphere.

The silencer 17 has another larger cylindrical portion 23 and a conical outwardly flaring portion 24 which extends between the portions 18 and 23. The portion 23 has openings 24*a*, the operative area of which may be varied by sleeve 25 having openings 26 which are adapted to coincide with the openings 24*a*. The sleeve 25 is rotatably mounted upon the cylindrical portion 24.

The outer end of the silencer 17 has the form of a converging conical portion 27 which is connected to the cylindrical portion 23.

When a bullet or shell is fired through barrel 10 the air in the barrel ahead of the bullet is compressed and upon leaving the barrel forms circular shock waves outside the muzzle. These waves of gases create a vacuum, or at least a sub-atmospheric pressure in the annular opening 28 located around the muzzle of the barrel and connecting the channels 29 extending between the ribs 13 with the chamber 22 within the silencer 17. This sub-atmospheric pressure within the space 28 will create a flow of air through the channels 29, particularly if there is a passage or opening 30 connecting the inner end of the pipe 14 with the atmosphere.

This flow of air around the barrel 10 and toward its muzzle is furthered by the projectile as it emerges from the muzzle, and by the gases following the projectile, and forming the secondary shock waves.

It is apparent that the extent of the sub-atmospheric pressure around the muzzle can be regulated not only by the form of the silencer 17, but also by varying the operative area of the openings 19 and 24*a* connecting the space 28 with outside atmosphere.

The described arrangement has considerable advantages over existing constructions.

The amount of additional metal required for the rib 13 and the sleeve 14 is comparatively small and yet the cooling area of the barrel, which can lose its heat through radiation, is increased to a very substantial extent. Thus this arrangement can replace existing hydraulic cooling systems and will make it possible for an operator to touch the outer tube 14 for the purpose of manipulating the machine without danger of being injured. The heat of the barrel 10 is communicated only very slowly to the tube 14 since contact areas are small and since there is a layer of insulating air in the passages 29.

A further advantage of this construction is that the required strength of the barrel may be maintained even though the thickness of the metal around the bore is diminished since such

diminution is compensated by the provision of the ribs 13.

Thus the present construction provides an excellent cooling for a fast firing gun due to the provision of a greater cooling surface, a substantial air space between the parts 10 and 14, and the provision of means for regulating the flow of air.

On the other hand, this cooling of the barrel will provide a greater length of firing, greater accuracy, and a greater range.

It is apparent that in accordance with described construction, currents of air are established which flow substantially in the same direction as the projectile and which may be rotated in synchronism with the projectile. This arrangement has the further advantage that the usual wobbling or yaw in the first stages of trajectory will be eliminated. The undesirable flash at the muzzle of the gun will be also considerably reduced.

A further advantage is the diminution of the force of recoil and of the loudness of the report due to the elimination of many sound waves.

The device shown in Figures 4, 5 and 6 includes different means for varying the amount of flow of the air current along the barrel 40. The barrel is provided with ribs 41 carrying an elongated tube or pipe 42 which is loosely mounted upon the ribs.

The outer end of the tube 42 has the form of an outwardly flaring frustro-conical portion 43, which terminates in front of the muzzle and at a distance therefrom.

Passages 44 formed between the ribs 41 are closed by a rear end member 45, which is illustrated diagrammatically in the drawing, and the actual shape of which depends upon the use to which the barrel 40 is put.

The passages 44 communicate with the atmosphere through an opening 46 which can be varied in size, or closed by a sleeve 47. The sleeve 47 can be moved longitudinally upon the tube 42 for the purpose of varying the operative area of the opening 46.

Furthermore, the entire tube 42 may be shifted longitudinally upon the barrel 40, thus varying the operative size of the opening 46, and also varying the distance of the end piece 43 from the muzzle of the barrel and, consequently, the size of the chamber 48.

This possibility of varying the operative size of the opening 46 and of the chamber 48 located in front of the muzzle makes it possible to adapt the extent of the gaseous flow along the barrel to the speed of firing and the mode of operating the gun in general. The shifting of the sleeve 42 will increase or decrease this gaseous flow so that the operator, for instance, can increase the flow when the speed of firing is increased, when the barrel becomes unduly hot, or for a variety of other reasons.

It is apparent that the invention shown above has been given solely by way of illustration and not by way of limitation, and that the illustrated examples are capable of wide variation and modification without departing from the scope or intent of the present invention. This device may be used in conjunction with the usual barrel which may receive fins of the same or other metal of higher heat conductivity which in turn will support a properly insulated outer tube. The fins allow free circulation of cooling air flow. All of such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

A device for improving the ejection of solid, liquid and gaseous masses out of an elongated barrel, said device comprising in combination with an elongated barrel having a rear end, an elongated sleeve enclosing said barrel, and movable longitudinally thereon, said sleeve having a passage communicating with the atmosphere at the rear end thereof, means carried by said sleeve for varying the size of said passage, and ribs carried by said barrel and carrying said sleeve.

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