

A Pocket Machine Gun

By Capt. E. C. Crossman,
U. S. A.

THE marksmanship of the average policeman with the average policeman's revolver is something to make honest men turn pale, and the women and children duck for the subway. Here and there are exceptions, but as a general rule policemen seem far inferior to yeggs when it comes to hitting things they intend hitting with the pocket gun. I do not know whether the yegg spends some portion of his ill-gotten gains in target practice or whether his ability to hit, where the officer misses, is due merely to the cussedness of inanimate nature. The fact remains. Wherefore the announcement in the public prints of the adoption by the New York police of the wicked little Submachine Gun is of course interesting to those persons who wish to see the customary New York brand of gunplay made a little less one-sided.

Without doubt the early future will see a happy coincidence of a policeman skilled in the pointing of the new weapon, and an automobile full of yeggs willing to engage in the customary running gun flight. The result will be the worst-shot-up assortment of crooks that has come to the attention of the coroner.

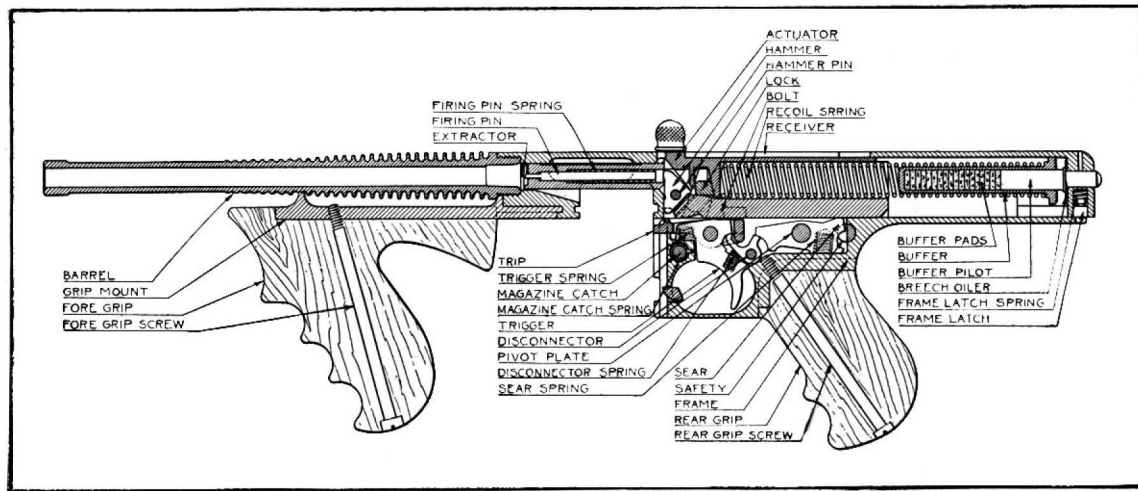
The new gun as adopted by New York consists of a 7-lb. weapon, 22 inches over all, and capable of being carried in concealment. It is sort of a compromise between a pistol and a rifle, with the speed of fire of the highest speed aircraft machine guns. It is turned out by a new and strong organization headed by the former Assistant Chief of Ordnance of the Army, the officer who gave to the Army the M 1917 rifle during the war.

As designed for American use it is chambered for the caliber .45 automatic pistol cartridge, with its powerful and knock-down blow inflicted by the 230-grain bullet. The barrel is less than a foot long. A grip for the left hand lies below the center of the barrel, while another for the right hand lies near the rear end of

the gun, below the breech casing. The magazine is between the two grips.

So arranged, the gun is intended to be fired from the waist line, the fire being directed by the sense of feel, as one throws a stone, and as used in the "marching fire" of attacking infantry during the war. The arm is truly automatic, not the semi-automatic self-loading type so often mis-called automatic. Such arms require a pull of the trigger for each shot, the mechanism merely ejecting and reloading the gun. The Submachine Gun is a true machine gun in that it fires as long as the trigger is held back and the cartridge supply kept up. This particular arm, however, has a theoretical speed of fire of 1,500 shots per minute, higher than any other weapon on earth, and three times as high as the average of machine guns used for land use among various armies.

If the trigger is held back, the result is a verberating roar of shots coming so fast that the ear cannot distinguish them apart. This of course empties a twenty shot magazine in less than a second; but the fire is easily controlled by the trigger pressure, and I found no trouble in firing single shots merely by a quick pressure of the trigger and instant release. Any number of shots between the single shot, and the entire capacity of the magazine is thus at the disposal of the firer.



Cross-section of the pocket machine gun, showing its components and the general assembly

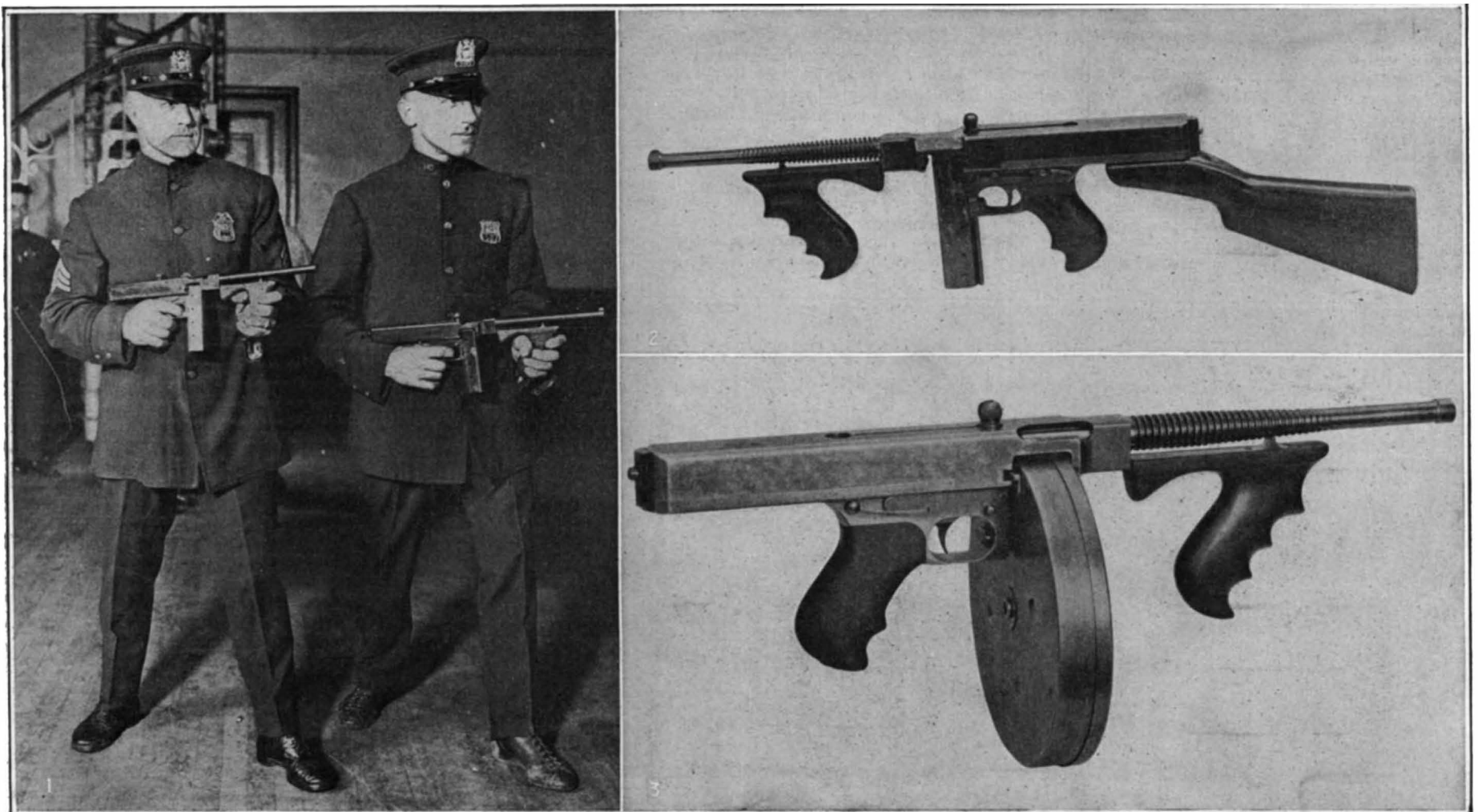
Were the gun designed for a military cartridge and of this weight and proportions, it would of course be absolutely unmanageable in automatic fire. Those who have used the 16-lb. Light Browning automatic rifle can testify to the difficulty of keeping the gun from whirling the firer around and twisting the gun toward the sky. The recoil of the .45 pistol cartridge, however, is very light, and the writer, accustomed to handling the Light Browning rifle, found it easier to control the fire of the Submachine Gun than the Browning automatic rifle. The gun is fed by magazines of varying capacity from the flat, box-type,

20-shot affair, to the drum-shaped carrying 50 or 100. A feature of the arm is its absolute simplicity and fewness of parts. When resolved into its components for cleaning one can discover only fourteen or fifteen parts, and the gun is taken down without a tool and in a few seconds.

The arm is novel in that its designers arranged it to be oiled—as they say like any other gas engine, which is of course the correct classification of the automatic rifle or machine gun. Felt pads lying within the receiver walls and so out of the way of dust and grip, are impregnated with oil, which the bolt picks up in its reciprocating motion. The advisability of oil in a machine gun for military use is open to question, but the certainty of function of this little gun, and its terrific rate of fire evidently owe much to the oiling of the parts and lead to thought as to whether or not this is not desirable with any other weapon of this high speed, heating and hitherto rather unreliable type. Nothing more elaborate is required in this oiling than a squirt of an oil can into the pads every 500 shots or so, nor will the gun cease to function if it is not oiled.

The writer, as fire control officer of the Small Arms Ballistic Station at Miami and Daytona, Fla., conducted by the Ordnance Department of the Army, was

(Continued on page 413)




1—New York policemen using the new pocket machine gun which fires .45-caliber automatic pistol cartridges at the theoretical rate of 1500 shots per minute—higher than that of any machine gun. 2—The pocket machine gun fitted with the 20-shot box-type magazine, and gun butt. 3—The pocket machine gun fitted with the drum-shaped magazine carrying 50 or 100 rounds.

Two types of pocket machine gun magazines and how the gun is used by the New York Police Department

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25 to 75 per cent efficiency, but were adopted because the repair costs on iron and steel were prohibitive. Calorizing can be applied to metal furnace lining, baffle plates, etc., the cost of these calorized plates per unit of service being in a great many cases much less than that of refractory materials. There is an unlimited field for calorizing as applied to equipment of this nature.

There are many possible applications of calorized metal which have not been considered, for the reason that only within the last six months has calorizing been available to the commercial world. It is impossible to enumerate or describe in detail the great number of applications. Every plant presents its individual problem and it is the object of the writer to illustrate several applications with the idea of suggesting to the engineer, metallurgist, and plant manager, possible applications to special equipment used in his particular process of manufacture.

A Pocket Machine Gun

(Continued from page 405)

obliged in his work to sit behind various machine guns in erosion, function, and ballistic tests for a matter of six months or more, and he was not impressed at the end of this time with the reliability of function of any machine gun at present used by civilized armies, examples of which we tested. Used under the most favorable conditions, in the hands of skilled mechanics, they all were made to look simply childish in certainty of function and endurance when compared to that other gas engine—the motor of the small car. A stoppage, a broken part, a jam—one of the three would occur with the most reliable machine gun of them all, the Browning, about every 1,000 rounds fired.

One thousand impulses of any given cylinder in the auto motor will, in high gear, run the little car something like a mile, and a hundred-mile run means that each cylinder has fired a hundred times as many "shots" as the machine gun averages between bits of trouble. Not even the most pessimistic of car owners will deny that the motor will run the car a hundred miles without stop, jam, or break.

I cheerfully admit the difference in conditions, such as the far greater pressure of the machine gun and the higher speed of the parts; but still I believe that there is not enough difference in conditions to justify the wide difference in reliability between the two types of gas engines. Possibly, therefore, the decision of the latest entrants into the machine gun market to use lubrication is based on sound judgment. There is also the possibility that they are making a virtue out of a necessity.

The new gun is arranged to fire any pistol cartridge, the change necessary being merely in barrel, magazine and bolt-head. Special cartridges containing buckshot will also function the gun, and make for close-up work a tremendously effective weapon.

The writer, after firing the gun several hundred rounds, would class it as the equal of a score of average policemen firing as the average policeman fires, provided of course the gun were fired by a man accustomed to it. And of course it is far easier to train one man to become expert with the gun than it is to raise the shooting of twenty policemen to the expert stage with their pistols.

There would be no trouble whatever for one man firing the gun to sweep a street clear from curb to curb, but after all, its greatest strength lies in its moral effect. Killing many of the common American sort of mob is unfortunate unless the right ones can be selected for the slaughter. Mobs as a rule are composed of ten per cent vicious (the leaders), and ninety per cent fools. Wherefore the dispersing of the crowds without bloodshed is usually desirable. It would be a most vicious and determined



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3. Each essay must be typewritten, and identified with a pseudonym. The essay shall bear a title and the author's pseudonym *only*, and must be enclosed in a plain sealed envelope likewise bearing this pseudonym. In the same package with the essay must be sent a second plain sealed envelope, also labelled with the pseudonym, and containing a statement of the name and address of the contestant, the pseudonym used, and the title of the essay. It is necessary to follow these instructions implicitly, in order to guard against confusion in opening the envelopes and assigning the pseudonyms to their proprietors, especially in view of the possibility that two of the contestants may employ the same pseudonym. The envelopes should be sent in a single package to the Einstein Prize Essay Editor, SCIENTIFIC AMERICAN, 233 Broadway, New York.
4. All essays must be in the office of the SCIENTIFIC AMERICAN by November 1st, 1920.
5. The Editor of the SCIENTIFIC AMERICAN will retain the small sealed envelopes containing the competitors' names and addresses, which will not be opened until the competitive essays have been passed upon and the winning essay selected.
6. As soon as the judges have selected the winning essay, they will notify the Editor, who will open the envelope bearing the proper pseudonym and revealing the competitor's true name. The competitor will at once be notified that he has won, and his essay will be published in an early issue of the SCIENTIFIC AMERICAN.
7. There shall be but one prize, of FIVE THOUSAND DOLLARS, to go to the author of the best essay submitted.
8. The SCIENTIFIC AMERICAN reserves the right to publish in its columns, or in those of the SCIENTIFIC AMERICAN MONTHLY, or in book form, any of the essays which may be deemed worthy of this. Aside from such rights, the essays shall remain the properties of their authors; but no manuscripts can be returned.
9. The Committee of Judges will consist of Professors Leigh Page of Yale and E. P. Adams of Princeton. In the event that they are unable to agree on the best essay, the Einstein Prize Essay Editor will cast the deciding vote.

aggregation that would stand up to the fire of one of these guns, after a couple of bursts had been fired over their heads or into the street in front of them. Moreover, one of the guns, mounted on a patrol wagon or automobile would riddle a car attempting to run by or to escape via the stern-chase route.

The cartridge selected for this gun is a most formidable one. Its bullet of 220 grains is 80 grains heavier than the bullet of our service rifles and machine guns, and its caliber, .45, as compared to .30 ensures that when it hits, it will strike a knock-down blow. The low initial velocity, less than a third that of the service rifle, and the stubby form of the bullet prevents it from having much range; which lack of carrying power is a most desirable thing in settled communities. The Ballistic Station found the extreme range of the cartridge to be 1,400 yards, with 500 yards as probably its effective range.

The locking bolt of the arm is worthy of notice as embodying a new principle in machine gun and self-loading arm mechanism. It consists of a wedge, sliding nearly vertical, and locking the barrel extension and receiver together. Its slots are cut at an angle of about 80° with the axis of the barrel and its extension. It was found years ago by Commander Blish of the United States Navy, the inventor of the device, that a wedge so arranged would hold while the breech pressure of the exploding cartridge remained high, but the instant or as soon as the bullet left the muzzle, the adhesion between wedge and its slots ceased, and the remaining backward pressure would compel the wedge to slide downward and unlock the breech mechanism. The principle applies to other forms of breech mechanisms, where the locking is done by cams without a final bearing at right angles to the line of backward thrust.

Thus, some years ago, a coast defense gun, firing blank cartridges, giving of course low pressure, insisted upon unlocking itself and coming open each shot.

This was very alarming because it was apparent that if the breech would cam itself open during the firing of low pressure blanks, then fireworks and trouble could surely be expected when firing high pressure service charges.

On trial, however, it didn't work out, the gun stayed locked beautifully with the service and high pressure charges. Here evidently the adhesion of the locking surface set up by the high pressure charge did not free in time to permit the subsequent falling pressure to unlock the gun and open it.

The writer found the same phenomenon when testing a well-known sporting rifle with greased cases. This rifle has a locking bolt which works in slots cut at nearly right angles to the horizontal bolt. The finger lever operating the mechanism normally has a catch to hold it closed, but here the catch was broken, the parts were worn and free and the case itself was greased.

The result was that the horizontal bolt would open during the firing, drawing the fired case with it. It did not "blow" open, that is it did not open during the height of the pressure and permit the escape of gas; it came open when the pressure had evidently fallen enough to free the locking surfaces of the vertical bolt, and permit the little remaining pressure to drive the breech bolt backward. The Ross sporting rifle was another weapon which would at times perform this trick if the rocker arm on the sear, which normally holds the sleeve closed, were removed, or was too short to reach up on the pulling of the trigger and hold the sleeve from backward movement. In this case, particularly with the cartridge case greased, the sleeve would slide open, taking the case with it. This was not a violent action, and there was no evidence of high pressure or gas. It was

evident that when the gas pressure in the chamber fell, the bolt would cam open, just as did the interrupted-screw block of the coast defense gun referred to.

In the Submachine Gun, the joint invention of General John T. Thompson, retired, former Chief of the Small Arms Division during the war, and Commander Blish of the Navy, this same principle is used, the wedge locking bolt holding firmly while high pressure persists within the chamber, unlocking when the pressure falls, and permitting the bolt to slide back and the various parts of the mechanism to function.

It is question how much friction enters into this sort of locking arrangement, and therefore how much of the oiling system adopted is a matter of necessity.

The fact remains that the gun functions at extraordinary speed and with more than normal machine gun reliability. With its small size, its light weight, its tremendous rate of fire, and its ease of control, the recent New York acquisition is probably the most efficient man killer of any firearm yet produced. A well-known American factory is producing 15,000 of them—destination and purpose not announced.

What Science Did for Cheese

(Continued from page 406)

record although much of this native product was of low grade. With the perfection of new commercial system of cheese manufacture, not only is dairying promoted in sections of the country far from city markets and adequate railroad transportation, but the standardization of Swiss-cheese-making also promises that we will produce our potential supplies at home and also may devote considerable of our surplus to export trade. At present one plant in California is manufacturing Swiss cheese on a large scale according to the new system of production. This factory will produce over \$2,000,000 worth of Swiss cheeses this year while it has already exported two carloads of the product to Switzerland where the cheese was sold on the open market and was complimented as being better than the best of the domestic offerings.

Another notable accomplishment of the National Dairy Division has been the perfection of modern methods of Roquefort cheese production so that this delectable delicacy can be made from cow's milk and cured under artificial conditions, the finished product being as good as, if not better than, the expensive, imported Roquefort which comes from France and is made from sheep's milk. For twenty centuries, Roquefort has ranked as the king of all cheese. It has been made by the peasants of southern France who live near Roquefort and maintain approximately 500,000 sheep especially for the production of milk from which to make the cheese. During their six months' lactation period some of the ewes produce enough milk individually to make 50 pounds of cheese. The cheese, for the most part, is made on the farms and small factories of that neighborhood and subsequently sent to Roquefort where it is cured in the famous caves of that region—formed by the slipping of rock at the base of the Cambrian Mountains.

Currents of cool moist air circulate freely through the caverns and galleries and are aided in their natural refrigeration and curing of the cheese by the numerous streams of mountain water which wind hither and thither among the grottoes. When the moist air currents strike the rocks, rapid evaporation occurs which is invaluable in lowering the temperature to about 40 degrees Fahrenheit. During recent years some of these natural subterranean ice-boxes have been enlarged and equipped with artificial means of refrigeration so that even lower temperatures than naturally obtain can be produced. The fact that cheese is produced at country points and concentrated at Roquefort