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THE SUPREMACY OF THE MODERN MAGAZINE RIFLE.

When the military attachés who are following the operations of the South African war return from the scene of hostilities, they will bring with them a mass of information which, in its intrinsic value, in the profound effect which it will have upon future military operations, will be without a parallel. Not even the great battles of the Franco-German war, or the heroic defence of Plevna against the battalions of Russia, taught so many lessons as have been spelled out in that great school of instruction upon the broad veldt and amid the kopjes and precipitous mountains of South Africa.

No period in the world's history has witnessed such rapid improvement in the implements of war as has marked the last quarter of a century; and it is due to the initiative of the Boer military advisers, native and European, that there is represented in the present struggle not merely every type of weapon of attack and defence, but the most modern of each type that could be procured in the markets of the world.

The important facts established thus far by the war are the supreme value of the magazine small-bore rifle, especially when used with the spade in defence; the necessity of keeping the artillery thoroughly up to date in respect to its range and mobility; and the increased importance of cavalry in the strategy and especially in the tactics of modern warfare. Although we are dealing just now with the magazine rifle, we would mention, in passing, that though the British artillery in the Natal campaign (with the exception of the more modern naval guns) was of a type brought out only a few years ago, it was so far outranged by the French and German guns of the Boers that the attacking forces were placed at an enormous disadvantage. So, too, the earlier operations of the British were rendered inconclusive for the lack of mounted troops, turning movements being out of the question, and any temporary advantage gained through well-considered maneuvering being more than offset by the remarkable mobility and rapidity of concentration of the burgher mounted troops. It was not until the call for cavalry had been answered that the deadlock was broken, General French and his army of eight thousand cavalry completely turning the tide of war in less than thirty days.

But most significant of all was the revelation of the terrible power of the modern magazine rifle in the hands of a skilled marksman who has a spade and a bandolier of cartridges ready to hand. Its great range, its accuracy, and rapidity of fire, and the invisibility resulting from the use of smokeless powder, enable an entrenched body of men to surround themselves with a murderous zone of fire within which, unless there is ample cover, it is simple suicide for an attacking force to enter. This zone, whose outer fringe extends in open and level country fully two miles toward the enemy, is so wide that the attacking force is sprayed with bullets long before it is close enough to see the entrenchments, to say nothing of the troops that man them. On the other hand the various ranges over which the attack is advancing are staked and measured, enabling the defence to adjust its sights with mathematical precision, the attacking force, during the first mile or more of its advance is, to all intents and purposes, fighting in the dark.

The situation was graphically drawn by Julian Ralph in his now celebrated description of the Modder River battle, where for ten long hours a whole army lay prone upon the earth to escape annihilation from the storm of Mauser bullets that swept the plain. "In engagement after engagement," he writes, "our men have thrown themselves upon the veldt, moved to do so by a hail of bullets around them, and then have fired away for hours at a time at the noise or the flame of the enemy's fire, in trenches which they cannot see." The day of the direct frontal attack, except in cases of absolute necessity, as at San Juan Hill or in the recent storming of Pieter's Hill, is over; and where cavalry or a preponderance of numbers are not present to favor a flanking movement, the attack must henceforth obey the mandate of the magazine rifle, and halt.

The Mauser rifle, which has found such an able exponent of its powers in the Boer soldier, is of a later pattern than that used in the Spanish-American war. It has a caliber of a little over a quarter of an inch (0·276) and fires a bullet which is 1·18 inches long and weighs 11·2 grains, with a muzzle velocity of 2,388 feet per second. At 40 feet from the muzzle the bullet will penetrate 4½ feet of deal. It has an extreme range of 2½ miles, and its trajectory, or curve of flight, is so flat that the space completely swept for infantry is 1,969 feet, and for cavalry 2,297 feet.

Nevertheless, despite its deadly nature, the magazine rifle is a merciful weapon, and paradoxical as it may seem stands second only to the Red Cross as an alleviating agency of the horrors of war. For in the first place the wounds inflicted, unless it hit a vital point, are mere pinpricks compared with the effects of the old large-bore rifles, and in the second place the impossibility of fighting with any hope of success in the open has driven the soldier to cover, with the result that desperate as has been the bravery on both sides in this end-of-the-century struggle, the percentage of losses has been the lightest in the history of warfare.

NEW YORK'S WATER SUPPLY—PRESENT AND FUTURE CAPACITY.

At the present juncture, when the notorious attempt of a private corporation to obtain absolute control of all possible sources of New York's future water supply is under discussion, a review of the present condition and future possibilities of the existing water supply systems of Greater New York will be of special interest. This, the greatest of all important questions of municipal administration, should receive the early and undivided attention of the three millions of inhabitants whose health and comfort it so vitally affects, and it is the duty of every citizen in the presence of such a momentous problem as has been raised by the proposed Ramapo scheme to acquaint himself, at least in a general way, both with the present condition and the future possibilities of the city's water supply.

In making the present necessarily brief review of the question, we cannot do better than consider separately the water supply of each of the five boroughs which compose the consolidated New York city of to-day. Of these, by far the most important are the Boroughs of Manhattan and the Bronx, whose sources of water supply are topographically closely related. The two million inhabitants of these boroughs depend for their supply upon three watersheds, those of the Croton, the Bronx, and the Byram Rivers. The drainage area of the Croton River and its tributaries above the Croton Dam is 338 square miles. The records of the past thirty-three years show an average annual rainfall of 48 inches with a maximum of 63·5 inches in 1888, and a minimum of 38·6 inches in 1895. The average total annual supply from the Croton watershed, supposing the whole amount to be utilized, is about 147,000,000,000 gallons. Prior to 1870 there was no reserve supply of this great total held in storage except in the small lake formed by the Croton Dam, from which the Old Aqueduct drew its water. Subsequently to that date various storage reservoirs have been formed across the different streams in the watershed, until at present there are eight in active use, with the total capacity of 40,500,000,000 gallons. Below these, two or three miles from the mouth of the river, is the great Croton Dam, to be completed in 1902, which will provide an additional storage capacity of 25,000,000,000 gallons. In the operation of the reservoirs the policy is to keep them full to the lips of the dams, only drawing upon the water thus stored on such days as the demands of the city exceed the flow of the Croton River. As the minimum average daily flow of the Croton River, in the driest of the last thirty-three years, was 250,000,000 gallons, and the daily consumption of water by the city is 98,000,000 gallons, it will be seen that there is an ample margin of supply over the demand. In the last report of the Department of Water Supply of the City of New York, it was stated that the department is prepared, in case of necessity, to deliver a daily water supply of 200,000,000 gallons for two hundred consecutive days, irrespective of the natural flow of the Croton River.

The supply of water for the Borough of the Bronx is derived from the Bronx River with a drainage area of 13⅔ square miles, and the Byram River with a drainage area of 8⅓ square miles, and the daily supply at present amounts to 14,000,000,000 per day from the former and 19,000,000 gallons per day from the Byram River. The water is conveyed to the city from the Croton watersheds by means of two aqueducts—the Old Aqueduct, with a capacity of 80,000,000 gallons per day, and the New Aqueduct, with a capacity of 300,000,000 gallons per day. The Bronx and the Byram Rivers conduits deliver 20,000,000 gallons per day, bringing up the total daily conduit capacity to 400,000,000 gallons.

The Borough of Brooklyn is supplied with water on an entirely different system from that in use for Manhattan and the Bronx, the difference being due to the topography of the watersheds and the intervening territory through which the supply is conveyed to the distributing systems. The New York supply flows by gravity from the source to the distributing mains, while only a portion of the Brooklyn system consists of a gravity supply, a large percentage being pumped into the conduits from wells and from bodies of water which lie below the level of the conduits. With a few exceptions the Borough of Brooklyn derives its entire water supply from a watershed within the boundaries of the county in the present Borough of Queens, which embraces the southerly slope of the central ridge of Long Island and the plains which extend south of it to the shores of Jamaica and Hempstead Bays. Its total area is 150 square miles. Within this area are located seventeen separate ponds or reservoirs for the storage of water, which have a total area of 491 acres and a total storage capacity of 1,283,000,000 gallons. During the last twelve years it has been necessary to supplement this water supply by means of wells and pumping plants, and these have grown so rapidly that at present there are sixteen stations which draw water from 963 wells of from 2 to 8 inches diameter. The total daily capacity of these wells is 57,500,000 gallons.

The avarage daily Brooklyn supply for the year 1898 was 93,573,500 gallons, while 10,500,000 gallons were received from private water companies of which the Long Island Water Company and the Flatbush Water Company are the most important. This makes a total supply of 104,073,500 gallons for a population of 1,179,100 souls, at the per capita consumption of 88·3 gallons.

Comparing now the water supply of Brooklyn with that of Manhattan and the Bronx, we find that in the latter borough the daily use of water rose to 243,000,000 gallons for a population of slightly over 2,000,000, or a consumption per capita per day of 121 gallons. To quote the words of the Department of Water Supply in their Annual Report, the Brooklyn rate of 88·3 gallons per capita "is very liberal and ample for all purpose of comfort, health and safety" the per capita consumption of 121 gallons of Manhattan and the Bronx being considered as "altogether extravagant and unnecessary," the department being of the opinion that "enormous quantities are carelessly and wantonly wasted without any possible benefit in any direction."

Manhattan and the Bronx, however, as we have seen, have a liberal margin to go upon, the average annual supply being 147,000,000.000 gallons, as against a consumption for the year 1899 of 92,000,000,000. In the Borough of Brooklyn, on the contrary, the per capita rate of consumption must necessarily be diminished, since the population will continue to grow whether extensions of the water system are made or not. The needs of the immediate future can be met by sinking additional wells at the existing pumping stations, by an increase in the capacity of pumping machinery, and by an enlargement of the conduits. The time, however, is not far distant when it will be necessary to acquire additional watershed area to meet the future growth of the borough.

The Borough of Queens is supplied from four public water plants with a combined daily capacity of 3,347,000 gallons, and about 1,500,000 gallons are supplied under a contract with the Citizens' Water Supply Company. The department is of the opinion that the anticipated growth of this borough will demand large additions to the present capacity of the water supply, proportionate and incident to the necessities for increasing the Brooklyn supply. As any additional supply for the Borough of Brooklyn will have to pass through the Borough of Queens, it will be advantageous to treat the two systems as one in any scheme of enlargement.

The problem in the Borough of Richmond, like that in the Borough of Queens, is, of course, relatively insignificant compared with that of the Bronx, Manhattan, and Brooklyn. There is one small public water plant at Tottenville with 1,000,000 gallons daily capacity. There are also two private water companies which, combined, are pumping a daily supply of 6,500,000 gallons. The problem of the future supply as regards this borough is not to be considered as pressing.

In summing up then, we find that Manhattan and the Bronx, with a daily per capita consumption greater probably than that of any city in the world, have still at command an annual surplus of supply over consumption of 67,000,000 gallons; while the Boroughs of Brooklyn and Queens are practically without reserve at the present consumption per capita of 88·3 gallons. No immediate anxiety need be felt for the future water supply of the Borough of Richmond. In a future issue we shall consider the notorious Ramapo scheme and its bearing upon the interests of the second greatest city in the world.

AMERICAN EXPERIMENT STATIONS AT THE PARIS EXPOSITION.

Among the many economic exhibitions that our government will make at Paris especial interest attaches to that of the United States Experiment Stations, from the fact that it will show the great progress made by them since the Paris Exposition of 1889, when the stations made only a small showing, as they were just beginning active operations under the Hatch Act. The ar-