

ditions!—*Hamilton won the prize.* In 1888 Hamilton made a good "inner" in the competition; that they did not strike the "bull" should be more fairly ascribed to the want of coaching of the competitors at the final practice, and not to the "varying conditions" that have heretofore necessarily existed every year; as far, at least, as four or five of the competing batteries are concerned.

From all accounts in 1889 Major Van Wagner can have absolutely no ground for complaint if, as expected, the efforts of the executive to secure shell practice for all competitors on the same ground are successful.

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Ottawa, 8th April, 1889.

### Changes in Armament.

(Lieut. Philip Reade, in Chicago Times.)

It is not a matter of general knowledge that when the civil war broke out the infantry of the United States army had just changed its rifle. In 1860 the Maynard primer rifle was changed to the percussion-cap, despite the protest of Gen. Winfield Scott, and the Springfield rifle, muzzle-loading, was adopted instead. March 4, 1861, the United States had on hand 336,788 smooth-bore flint and percussion muskets, 73,544 rifled muskets, and 32,855 rifles. In addition Uncle Sam owned nineteen different varieties of breech-loading carbines. The chief of ordnance purchased in open market and from contractors the enormous number of 1,055,862 foreign rifles; also, 670,617 rifled United States pattern muskets, and 113,034 old smooth-bores. There were fabricated that year in the United States armory 805,537 rifled muskets. The total of smooth-bores was 449,822, and of rifles 1,559,698. These were the small arms with which to arm the handful of United States regulars and the army of volunteers. By June 30, 1866, the total number of small arms had increased to 2,649,439. The losses by wear and tear during three years of active warfare were for infantry about 13 per cent. per annum. In January, 1866, Gen. W. S. Hancock was directed to report what form and calibre should be adopted for breech-loading muskets and carbines, and what form of conversion for muskets from muzzle-loading to breech-loading should be adopted. After testing twenty-two varieties of breech-loading muskets and seventeen varieties of breech-loading carbines, Gen. Hancock reported in favour of 45 calibre for muskets, and the best charge of powder from sixty-five to seventy grains, weight of ball from 480 to 500 grains. These dimensions exist now. During 1869 Gen. J. M. Schofield was ordered to select the six best patterns of muskets for infantry. After examining thirty-four varieties of breech-loading muskets and eight each of carbines and of pistols, he recommended the Remington, Springfield, and Sharp's system of breech-loading as superior to others in the order named and alone superior for adoption by the government without further trial in the hands of the troops. In 1870 the chief of ordnance placed in the hands of companies of infantry and cavalry for twelve months' trial muskets and carbines of each of the above named system and also of the Ward Burton system.

Two years later congress passed an act under the provisions of which Gen. Alfred H. Terry was ordered to recommend a breech-loading system for muskets and carbines to be adopted for our military service, which system, when adopted, it was directed by congress should be the only one to be used by the ordnance department in the manufacture of muskets and carbines for the military service. After the trial and examination of ninety-nine varieties, besides nine varieties of breech-loaders in use by foreign nations, Gen. Terry (in May, 1873) recommended that the Springfield breech-loading system be adopted for the military service of the United States. We still adhere to that system. Some of the foreign systems examined by Gen. Terry were the Martini-Henry (England), Chassepot (French), Dreyse Needle (Germany), Mauser (Prussia), Werndl (Austrian), Berdan (Russian), Vetterlin (Swiss), and Werder (Bavarian), also, the Spanish Remington. Four of these nine varieties named were American in their origin. The weight of the Springfield rifle decided on was 8.38 pounds and the trigger was adjusted to pull off at from six to eight pounds.

In February, 1881, Congress appropriated for the manufacture of small arms at national armories \$300,000. Of this amount \$50,000 was directed to be expended in the manufacture or purchase of magazine guns, to be selected by a board of officers to be appointed by the Secretary of War. Col. Brooke was detailed as president of the board. Forty guns were submitted. Of these the principal ones were the James P. Lee, Chaffee-Reece, Hotchkiss, Spencer-Lee, Marlin, Remington-Keene, Burton, Springfield-Jones, Elliott, Dean, Russell-Livermore, Trabue, and Boch. Two foreign guns were presented by Joseph Schulhof, of Austria, and F. Vetterli, of Schaffhausen, Switzerland. The board reported that the Lee, the Chaffee-Reece and the Hotchkiss possessed efficiency as single loaders, and, considering safety, ease of loading, rapidity of fire, endurance, moderate weight and simplicity of construction, it recommended them in the order named. The Spencer-Lee was especially

mentioned as possessing some novel and meritorious features. The board recommended 9¼ pounds weight for the Springfield rifle; calibre .45 inch. This recommendation of weight was not concurred in. At that time the weights of the muskets of the other nations were as follows: United States, 8.38 pounds; France (Gras), 9.26 pounds; England (Martini-Henry), 8.75 pounds; Holland (Beaumont), 9.76 pounds; Italy (Vetterli), 9.26 pounds; Prussia (Mauser), 9.66 pounds; Russia (Berdan), 9.47 pounds; Switzerland (Vetterli, magazine gun), 10.14 pounds. It is notable that ten years ago Switzerland was the only country whose forces were armed with a repeating rifle. It may be also mentioned that the lapse of ten years finds six of the nations mentioned feverishly engaged in changing their small-arms system. When one calculates the expenditure involved in buying or making a quarter of a million or so of rifles, the immense cost of rearming a nation with small-arms becomes appreciable. The Springfield rifle costs \$13.12, the Lee \$14.12, Hotchkiss \$16.58, Chaffee-Reece \$33.35.

The Lee, Chaffee-Reece and Hotchkiss magazine guns recommended by the board in September, 1882, to be issued to the United States army for trial were issued to selected companies of our army for trial by troops. After a careful consideration of the reports rendered, Gen. Benet, Chief of Ordnance, stated to the Secretary of War, December, 1885, that he was satisfied that neither of these magazine guns should be adopted and substituted for the Springfield rifle as the arm of the service. He has since reported that an effective and simple magazine gun has become a necessity, but that from the little that can be learned of the magazine systems abroad he is persuaded that nothing is to be gained by haste at this juncture, as the Springfield will continue to admirably serve the purpose and the best interests of the army long enough to enable the determination finally on a magazine gun that will do credit to the inventive genius of the people.

The list of articles procured by fabrication at American armories annually is too extended for publication. The yearly average of manufacture is about 41,000 rifles and carbines, 5,000,000 ball metallic cartridges for same and 1,000,000 blank cartridges for small-arms. There is purchased each year more than 100,000 pounds of small-arms or musket powder, and about 300,000 metallic cartridges. These amounts are not for the use of the regular army exclusively. Under sections 1661-1667, Revised Statutes of the United States, there is annually distributed to the militia arms and equipments to the value of \$400,000. For more than 25 years Americans have been engaged in improving the Springfield rifle and its ammunition. Its parts are interchangeable, and it has been tested by extensive, accurate and well designed experiments. To ascertain its tensile strength the barrel of the Springfield rifle has been filled with lead so tightly secured that the service charge—70 grains of gunpowder—was unable to move the mass of metal in front of it, and yet no rupture of any kind was produced. This proves that the barrel is able to stand at least 43,000 pounds per square inch. It has been experimented with charges of compressed powder, smokeless propellants, perforated cartridges, Hebler cartridges and every conceivable variety, model and calibered projectile. Every Government is on the look out for a perfect missile weapon. The Germans, in particular, have been experimenting for years with other rifles than the Mauser, but have not yet decided on the pattern to succeed that rifle. So rapid is the progress that is made in the development of this problem of small-arms that the new rifle of last year may require modification this and become obsolete next year. The perfect gun of 1889 may not be, probably will not be, the best rifle pattern in 1890; but in Europe the desire for or the dread of conquest compels unceasing expenditures in the matter of military rifles. We watch the progress of experiments and tests by foreign experts, and meantime adhere to the single-loading Springfield. Eventually we will reap the benefits of the satisfactory solution of the problem. To European nations these incessant changes of rifle, of ammunition, and so forth are almost synonymous with bankruptcy. France, Italy, Portugal, Prussia, Germany and England have either adopted or are about to adopt new or converted rifles with calibres varying but little from .31 inch.

When the United States ordnance department experimented to find out the effect of increasing the length of barrel of the Springfield rifle it was found that with a barrel 112 inches long, using seventy grains of powder and regulation bullet, there was scarcely any smoke and a very little noise accompanying the explosion, while with a barrel only five inches in length there was a perfect cloud of smoke and a deafening noise. These phenomena are natural results of the complete combustion of the charge in the bore. In the near future the common black gunpowder will be entirely superseded as a motive force in guns. It is time that the mechanical mixture known as gunpowder, and which was used in battle by the Chinese in the year 1232, and which composition has practically been used in all portable fire-arms ever since, should be superseded by a chemical mixture, smokeless, noiseless, without recoil, and a more powerful pusher than gunpowder. The term "pusher" is used