NOTES ON THE HISTORY OF THE BREECH-LOADING GUN.

Let a Jules Verne or a Bellamy don the cap of prophecy and describe the probable state of affairs in A. D. 2000, and he has at once a host of readers. These idle vagaries are really surpassed in interest by the study of the manners, customs and inventions of a past time. The middle ages and the dawn of the modern period furnish abundance of material for the investigation of the curious. We have from time to time attempted to rescue some of the singular inventions of past time from oblivion, and we now present illustrations of breech-loading cannon in all ages, and shall endeavor to trace the history of the weapon from its inception to the present time.

It is indeed an extraordinary fact that the first guns of which we have any authentic record were breech-loaders. The breech-loading gun has passed through a period of desuetude, but to-day it stands without a rival and is truly the survival of the fittest. There is hardly a single principle of the modern breech-loading or machine gun which was not in use before 1700, and many of these principles are two hundred years older.

Tradition has named the battle of Crécy (1346) as the first occasion on which the weapon that was to revolutionize the art of war was used; but it is very probable that the use of cannon antedates the battle of Crécy by several years. Many historical works have stated that the battle of Crécy was won chiefly through the agency of a few small cannon; but this is very improbable, as a battle of that period was practically a succession of duels in which the individual was everything, and upon his valor in the hand-to-hand conflict the fate of the battle depended much more than in the modern long range battles. The English cannon used at the battle of Crécy, which we illustrate in Fig. 1, were made of forged iron and were open at both ends. The breech was probably closed with an iron block wedged in. The cannon was bound and re-enforced by bands. The mounting of the gun was very crude and could hardly have permitted of much accuracy of aim. The early cannon were called *bombardes* and *pierriers*, the latter name being used because stones were frequently used in place of other missiles. A little later the nomenclature became involved in inextricable confusion and the same kind of cannon are often described in different localities as *serpentines*, *coulverines*, *faucons*, *passe volants*, *basilics*, *spirales* and *bombardes*. Fig. 2 shows a blind or mantlet to a breech-loading cannon known at the time as a *schirmdach*. The gun and its mantlet belong to the second half of the fourteenth century. The swinging contrivance was by no means new, as it was used in siege work from Roman times to protect the *balista*. The figures are accoutered in the armor of the period.

The next gun, Fig. 3, is a Flemish breech-loading cannon. This curious engine, whose fire chamber screws into the barrel, is of forged iron, and was made at Ghent between 1404 and 1419. Holes will be noticed on the end to allow of its being screwed up tight with a spanner. Thus we have the principle which is used to-day in many systems of ordnance.

In Fig. 18, for example, is shown a piece of modern ordnance using a screw breech block almost exactly similar to this early piece. Fig. 12 shows a marked advance in mounting; the two pairs of uprights with holes to receive supporting pins allow of considerable adjustment.

This bombard is illustrated from a MSS. in *Bibliotheque National*, of Paris. In loading it movable cylinders (*manchons*) or movable chambers were used, in which the charge was previously laid; and these fitted by means of a wedge into the body of the piece. The removable chamber feature, which is, of course, the precursor of the modern cartridge, is also shown in Figs. 13 and 16. The gun shown in Fig. 13 dates from 1370 and is remarkable on several accounts, but chiefly because of its trunnions, which refutes Demmin, who says that trunnions made their first appearance in the middle of the fifteenth century. This interesting gun was raised from the Goodwin Sands. Fig. 16 shows a gun of similar character and is of great interest, as it was dredged up at Albany in 1879. It is an iron four pounder, ribbed, with short trunnions and a long handle. The breech block or case is missing, but is restored in our drawing from a similar gun in England. The slot in the side is where the wedge is inserted. This gun is at present at Governor's Island, New York Harbor. The Corean gun at Annapolis is almost exactly like Fig. 16, and has proved a source of controversy.

Fig. 15 shows a Dutch cannon made in 1650. The bore is continued through the cascabel, being closed at the breech after loading by a wedge moving horizontally, being on the same general principle as that of Krupp. Figs. 5 and 6 show modifications of the same principle. Fig. 5 is a cannon of the eighteenth century, in which the breech block is elevated by a rack and pinion. Fig. 6 represents a cannon which is in the museum of Woolwich Arsenal. In this gun we have the principle of the Armstrong gun. The bore is continued through the breech end and the breech piece works in a vertical slot, and is attached to a lever beneath. The vent runs first vertical and then horizontal to the axis of the bore. The date is 1619, and in this gun the principle of the modern rapid fire cannon may be said to have originated. Fig. 4 is a breech-loading cannon of the sixteenth century. The breech block is entirely removed while loading, and is secured with a pin before firing. The carriages were at this time much improved. Before proceeding to an examination of the double cannon, machine guns and other curious arms which we illustrate, it may prove interesting to glance for a moment at a modern breech mechanism, and we select the regular United States pattern for an example. Fig. 18 represents the regular arrangement of a rifled gun. The breech mechanism is regarded as being highly satisfactory. The breech block is provided with an interrupted screw for locking in the breech. One-sixth of a turn of the upper handle will lock or unlock the breech. A translating roller withdraws the block with great rapidity, as the screw thread is double. The block slides along the guide rails of the tray till the ends of these rails strike against the shoulders of the grooves. The shock due to this striking disengages a latch, the tray and block are then swung back to allow of the gun being loaded.

We now come to some curiosities in the way of guns. Fig. 11 shows a mortar or cannon, elbow-shaped. It is figured in Marescalchi's *Institutionum reipublicæ militaris*, published in 1515. The mortar was breech-loading and was provided with a movable chamber. The advantage of the elbow is very doubtful. Fig. 10 shows a glorious example of art metal work. This curious *dragonneau*, which is still in the Royal Armory of Madrid, was cast at Liège, France, in 1503, and figured in the siege of Santander in 1511. The carriage consists of a single piece of carved oak, and by its delicacy and finish worthily sustains this masterpiece of the bronze founder's art. The gun is particularly interesting from the fact that not only was it loaded at the breech, but has a double barrel. The costumes and armor of the men-at-arms are taken from manuscripts of the period. They are armed with crossbows, bills or war scythes and *gisarmes*, a kind of halbert.

The old manufacturers of ordnance at an early period saw the advantages of light rapid-fire guns and they produced some remarkable pieces. Fig. 7 shows a small iron breech-loading cannon on revolving gun carriage. This piece was left at Munich in 1632, by Gustavus Adolphus. All the usual adjustments in modern machine guns were provided for. Fig. 8 shows a small Swiss copper cannon adapted for firing ten successive charges. The length of the barrel is 27 inches, and it bears the signature of Welten, inventor, 1742. Fig. 14 is an interesting machine gun of 1718. Letters patent were granted to Mr. James Puckle for this gun. The light gun with its folding legs, the universal adjustments and the "Sett of Chambers ready charged to be Slip'd on when the first Sett are pull'd off to be recharg'd," is an extraordinary manifestation of the ability of our forefathers unassisted by Messrs. Nordenfelt, Maxim, Gardner *et al.* In the quaint language of Mr. Puckle the gun is intended for "bridges, breaches, lines, passes, ships' boats, houses and other places." The claim of the inventor to universality of application would horrify a United States Patent Office examiner of the present day. The method of manipulation will be readily understood by reference to the illustration, the successive charges being forced into the breech of the gun by a translating screw. The folding tripod and the facilities for adjustment have been only very slightly improved upon in the nineteenth century. A set of the chambers is shown at the side.

One more arm remains to be considered, the *mitrailleuse*. The serpentine organ of the seventeenth century illustrated in Fig. 17 was provided with forty-two cannon, to be fired six at once. This fine example is in the Arsenal of Solure. The large beam in the center may have possibly been an auxiliary cannon or simply a shaft for aiming the mitrailleuse, the original illustration, unfortunately, showing little detail. The circular mitrailleuse illustrated in Fig. 9 is of the time of Peter the Great, and is probably of the period of Mr. Puckle's machine gun. The small mortars were loaded at the rear of the gun and were fired in quick succession from the front. It is very possible that five or six were fired at once.

Perhaps the time will come when our descendants will look back with pitying glances at the ordnance of A. D. 1894, as we now regard the archaic pieces which belched forth water-worn stones on the field of Crécy.

A Remarkable Gas Well.

A phenomenal gas well was recently drilled by the Chicago Oil Co. near Fostoria, O. The *Chicago Record* says the well is on the James Wallace farm in Hancock County. The drill had only reached the depth of 350 feet and the well had just been cased. The drillers heard the roar of gas as the drill tapped the reservoir, and ran for their lives from the derrick, but none too soon, as the ponderous drill was hurled like a shot from a gun to a height of nearly 100 feet above the tree tops. The casing followed in quick succession and was scattered and bent in a tangled mass. No sooner had the ponderous volume of gas given vent to its strength than it ignited from the fires of the boiler near by and a steady volume of fire shot up over 150 feet high.

Enough oil is thrown out with the gas to make a lake of fire surrounding the well and it is impossible to get closer than 100 feet to the burning well. The entire plant of the drillers, including the engine and boiler, is encircled by the flames, and everything is a total loss. The surrounding land is boggy, and for a quarter of a mile surrounding the well in many places the gas is coming up through the earth with such force that ground and water are thrown to a height of ten feet or more, and these patches resemble boiling springs. The water gurgles and dances from the escape of the gas fully a quarter of a mile away from the well. The entire woods is filled with the gas coming through the ground, and people have left the place, fearing at any time that the entire vicinity may spring into a mass of seething flames. The roar of the gas can be heard for nearly ten miles and people are coming from miles around to see the gusher.

Oil men old in experience declare that nothing like it has ever been known. It is in entirely new territory, and is supposed to be a crevice or pocket which will soon blow itself out. At its present rate of speed it can never be brought under control.

The American Fisheries Association.

The first meeting was held in Philadelphia, May 15. Mr. Fred. Mather, superintendent of the Cold Spring Harbor Hatchery, N. Y., read a paper, the subject being "Improved Method of Hatching Smelts." The little smelt carries a great many eggs, from 30,000 to 60,000, and from 100 ripe females probably 5,000,000 could be obtained. Until last year the fish were stripped and the eggs impregnated by hand, but this year all the eggs were gathered from the troughs, passed through wire screens to separate them, and put in the jars. At intervals of two or three days, or whenever the eggs seemed inclined to gather in bunches, the operation was repeated, gently forcing the eggs through the screens with the fingers, and after a few such screenings the foot of the egg, an adhesive projection, shaped like the stem of a wine glass, seemed to be destroyed, and the eggs were left free and clean as those of the whitefish or shad.

United States Commissioner McDonald read a paper "On the Relation of the Community to the Fisheries." He said:

The commercial fisheries of the country give employment to 182,407 persons, represent an investment in vessels, boats, fishing gear, buildings, wharves and other property of $58,355,000, and yield products of the annual value of $45,000,000 in first hands. The cost to the consumer is probably about $130,000,000, and it is thought that the fisheries of the whole United States furnish support to over 1,000,000. Individual ownership of the open waters is not practicable, even if it were desirable. It is vested in the State, and they should be farmed for the general use and benefit, and equal privileges before the law should characterize the policy of the State in enacting such regulations as may be found necessary for the conservation of the fisheries. The community is concerned only as to the abundance, quality and price of the products drawn from the waters. When conditions are impaired, then it is incumbent on the State to adopt measures to arrest the decline. This done, we may attempt the regeneration by artificial propagation on a sufficiently extensive scale to repair the waste by natural casualties and man's operations. Where this can be shown to be adequate, there should be no further interference with the fisheries by legal restrictions than is necessary to insure equal privileges in fishing.

Whether we can rely entirely on artificial propagation I am inclined to doubt, and this is illustrated by the history of the shad fisheries of the Atlantic coast since 1880. This fish does not spawn in brackish or salt waters. Under the present conditions but a small proportion of the shad entering the river reach the spawning ground. Fully 80 per cent are taken in the brackish water. Thus we must depend entirely on artificial propagation to repair the loss. Its permanence and marked improvement since 1880 is unquestionably the result of this. Since 1885 there has been a steady increase in the value of the shad taken on the Atlantic seaboard, and at present it is nearly double what it was in 1880. Yet I cannot disguise the fact that every year we have more reason to apprehend that exhaustive fishing will reduce the number running in the river till we shall no longer be able to rely on artificial propagation. The same condition exists in the Columbia River. What is true in regard to our river species is true in regard to all coast species. Since 1880 the number of persons employed in all branches and related industries has increased 38·77 per cent, as compared with the number employed in 1880. The capital involved has increased 53·43 per cent, while the total value of the products has increased but 17·14 per cent.

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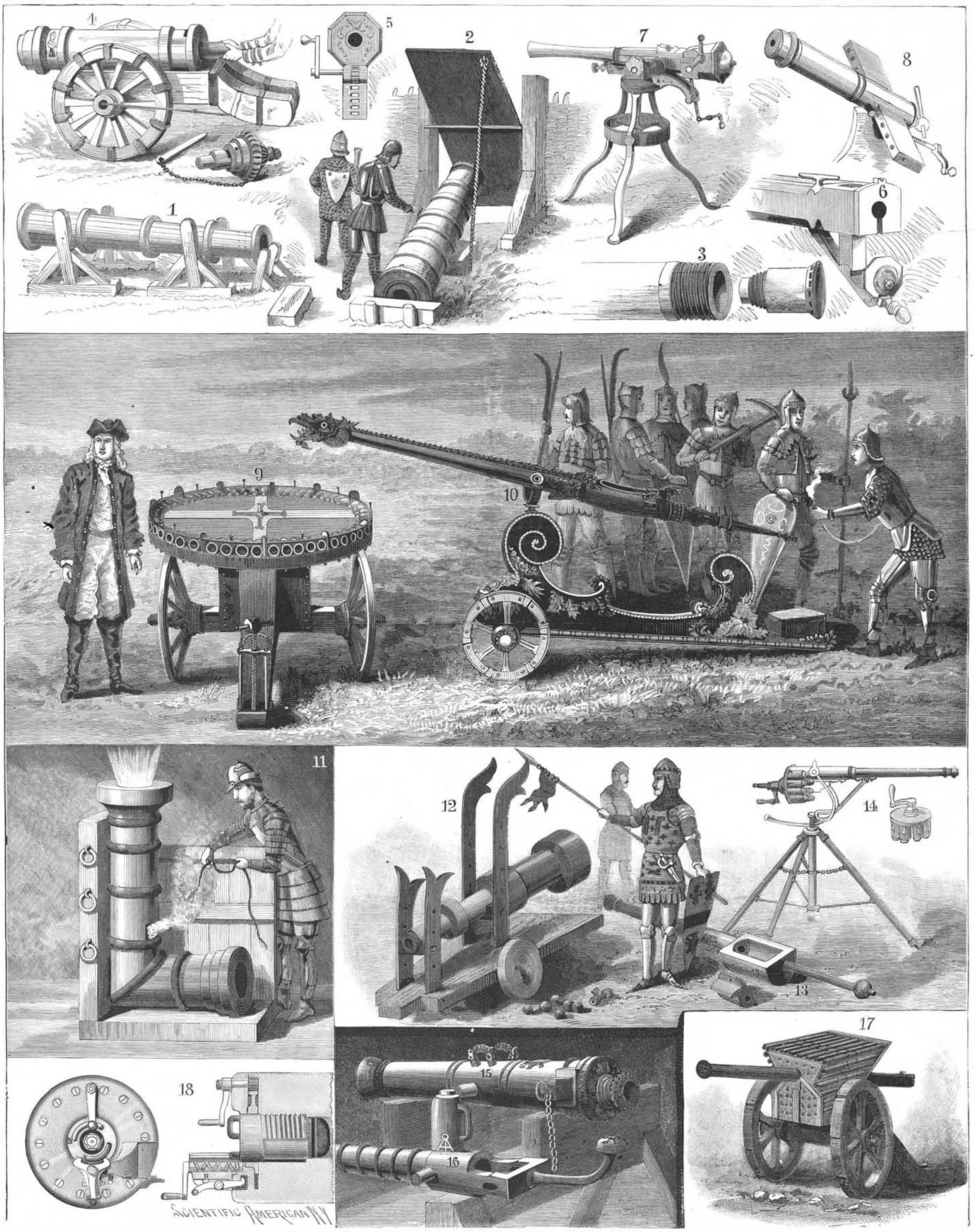

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