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BIG GUNS.

How They Originated.

When a great part of the world is echoing with the roar of cannon, there was appropriateness in the selection of the title of "Big guns" by Professor Chapman for a series of three University extension lectures, the first of which was delivered in the Prince of Wales Theatre on Tuesday evening. Professor Chapman, M.A., B.C.E., is the occupant of the Elder Chair of Mathematics and Mechanics. He opened his discourse by stating that in these times of trial it was difficult for most people to settle down to the study of abstract science, and when it was proposed to him that he should deliver a course of extension lectures it seemed almost out of the question that he could attempt, under present conditions, to hold the attention of an audience upon any subject that had no connection with the war. So he chose the subject of "Big guns," because, while not too far removed from association with those events that occupied most of people's thoughts at the present time, it was of real interest in itself, in view of the tremendous events that were taking place. He did not wish to pose as an authority upon modern artillery, but every engineer could not but be interested in the study of the development of those machines for throwing death-dealing projectiles, from the formidable enough weapons of the ancients to the terrible weapons that had produced such havoc in human life in the present great war.

—Genius of Archimedes.—

The engines of Archimedes, which destroyed the Roman galleys and created consternation among the legions of Marcellus at the siege of Syracuse, threw stones weighing over 100 lb., and were very wonderful. But what would Archimedes have thought of the guns of the Queen Elizabeth, which threw a projectile weighing 1,250 lb. over 20 miles? Archimedes's engines remained probably unsurpassed for hundreds of years, and it was not until long after the introduction of gunpowder into Europe that the old projectile-throwing engines were finally superseded by cannon that were more effective, and the picturesque chivalry of the armoured knight gave place to the devilish efficiency of the chemical explosive.

—Biblical References.—

There were references in the Bible to ancient weapons of destruction. In Chronicles xxvi., 15, it was said "And he (Uzziah) made in Jerusalem engines invented by cunning men to be on the towers and upon the bulwarks, to shoot arrows and great stones withal." Classical writers also made many references to such weapons. The lecturer dealt with the discomfiture of Marcellus, the Roman admiral who attempted to capture Syracuse. The weapons of Archimedes dismayed the Roman, and he retired in the contention that Archimedes had "shamefully baffled his assaults." Marcellus drew off his ships, and adopted a new method. He blockaded the town, and finally took it by surprise. Unfortunately, although Archimedes had left full accounts of his many scientific investigations, he had left no descriptions of his wonderful engines, which he apparently regarded as mere mechanical appliances that were beneath his serious attention. The oldest detailed accounts of the construction of projectile-throwing engines were those given by Greek writers, about 250 B.C., and similar descriptions were given later by Roman writers, who copied their details from the Greeks.

—Catapults and the Like.—

Professor Chapman described the first projectile-thrower—the catapult. At the siege of Jerusalem catapults cast stones weighing 57½ lb. for 160 or 430 yards. Then the ballista came, which discharged heavy arrows or javelins. They were of various sizes, the largest of which was able to cast feathered javelins weighing 5 or 6 lb. to a range of 450 to 500 yards. The trebuchet was of much more recent invention than the catapult or ballista, and was said to have been introduced by the French into siege operations in the twelfth century. The projectile force was obtained from the gravitation of a heavy weight at the short end of a long arm, and the weapon was often of immense size. Trebuchets were used to cast the dead bodies of horses, and even men, and loads of manure into besieged towns with the idea of creating pestilence.

—Gunpowder.—

The bringing in of gunpowder soon changed the character of projectile engines. Gunpowder was introduced to Europe early in the Christian era. It, or some substance very closely akin to it, was used at the siege of Constantinople in A.D. 668, and by the Arabs at the siege of Mecca in A.D. 690. The early history of guns and cannon had yet to be written, but there was evidence that cannon were used in Europe during the thirteenth century. For a long time the primitive cannon made very little headway because they were outranged by projectile engines, which could also throw a heavier missile. Apparently one of the great advantages cannon possessed was the tremendous noise they made. Early in the fourteenth century the first guns were small, and were vase-shaped. Towards the end of that period they had become of huge dimensions, and fired heavy stone shot of from 200 lb. to 450 lb. weight. Bombards, on fixed and rolling carriages, were among the first varieties of firearms used in Europe. They were short, the barrel in most instances being only just long enough to hold the charge of powder and the missile.

—Early Breechloaders.—

The system of loading cannon at the breech was introduced very early, and cannon of the 14th century showed that method. The lecturer took his audience on, step by step, through the evolution of the big gun. Among other famous weapons he mentioned the enormous siege gun cast in Turkey in 1468, and which was presented to Queen Victoria by the Sultan Abdul Aziz in 1867. Another famous cannon was "Mons Meg," presented by the McLellans to James II. when he arrived with an army at Carlingwark to besiege the Castle of Threve. "Mons Meg" weighed nearly 4 tons, and shot a stone bullet weighing more than 350 lb. It had a calibre of 20 inches.

—Forcing the Dardanelles.—

The methods of cannon-making were described. Towards the latter half of the 14th century cast cannon were made in Italy and France, and large bronze guns were cast at Constantinople. Guns of the latter type throwing stones weighing from 600 to 700 lb. did considerable damage to Sir John Duckworth's squadron when he forced the Dardanelles in 1807. Six of his men-of-war were damaged, and 126 sailors killed or wounded. Considerable obscurity existed as regarded the means adopted of mounting the first cannon. The professor traced the gradual improvements in that direction. He showed a model cannon of the 17th century, in which the weapon was fired with a linstock and a lighted "match" applied to a touch-hole. Beyond that, he said, very little progress was made until 40 or 50 years ago. The standard guns of the American civil war and for 20 years afterwards were cast-iron muzzle-loaders with a smooth bore, and they fired a round shot. Bronze remained in some countries the standard material of construction for field guns until long after that. So late as March, 1904, the fact was remarked upon that the Austro-Hungarian Government was about to rearm its field and horse artillery with a new bronze field gun.

The next lecture of the series will be given on Tuesday evening next.

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TECHNICAL EDUCATION.

LOCAL ACTIVITIES DETAILED.

MR. F. W. REID TALKS OF SCHOOL OF MINES.

"What is being done in South Australia in regard to technical education?" is a question that naturally arises as the result of the recent visit of Mr. Donald Clark, Chief Inspector of Junior Technical Schools in Victoria. In order to obtain definite information on this subject a "Mail" representative saw Mr. F. W. Reid, B.Sc., the Registrar of the School of Mines.

"The scope of the institution," he remarked, "is much wider than is indicated by its popular title, 'School of Mines.' The full name, School of Mines and Industries, is more descriptive of its functions. It stands at the head of technical education in our State—the branch of education which is to-day of paramount importance. At the time of its establishment 27 years ago, and for a considerable period thereafter, the mining side of the school was undoubtedly the more prominent, but it is on the more general technical side that its chief development has taken place in recent years.

"We deal with technical education in all its grades, from the rudimentary training of the Junior Technical School to the scientific work of the applied science courses, qualifying for the School of Mines diploma or the University degree in engineering. Purely trade classes are also embraced.

"I am given to understand that Mr. Clark's recent mission was more directly concerned with a proposal to establish junior technical schools under the Director of Education. A junior technical school is conducted under the management of the Council of the School of Mines, and it is going ahead by leaps and bounds. Although it is only three years since it was founded on the basis of a free school—thus coming into line with the High Schools in the abolition of fees—over 250 students are in attendance. Last year the number was 150, which gives an idea of the rate at which it is increasing. It has, in fact, reached the stage when it should be housed in its own building, which, however, should be in proximity to the School of Mines, so that the present policy of making the equipment of the workshops and laboratories of the School of Mines available for the pupils of the junior technical school could be continued. That is a distinct advantage. It saves duplication, and not only provides the best possible apparatus, but also expert instructors in each department. It will not be necessary, at least for some time, to establish a number of schools. There is a vast difference between Adelaide and Melbourne, as Mr. Clark pointed out in a conversation with me. In the latter metropolis the suburbs are separated by long distances, and much time would be wasted in travelling if schools were not set up in different parts. Here all the trams converge to the city, and no suburb is a great distance from the centre.

"The importance of technical education as an adjunct to apprenticeship cannot be too strongly emphasised. Expert teachers give the instruction, and they have the time to devote to the specific purpose of demonstrating to the pupils what they should do, whereas that is not the case in a workshop, where the chief aim is to get through the work. The apprentice in a training school has an opportunity of gaining an insight into work which is more advanced than what he is doing in the factory. His employers are not slow to note his capacity for better work, and his advancement is more rapid than it would otherwise be.

"One aim of the institution is to get into touch with the employers to convince them of the importance and value of technical education, and to induce them to make it a necessary condition for apprenticeship. The Institute of Architects has made it a condition precedent to the recognition of an articled pupil that he shall have studied and reached a certain standard in the architectural course at the School of Mines. That principle

should be extended to trades. Already a number of employers are fully aware of the worth of technical training in the more valuable services of their employes, the best indication of which is that several firms pay the fees. The Government has set an example in this direction in allowing the apprentices of the Islington Workshops to attend the school on two afternoons a week for three years. The Railways Commissioner provides a scholarship for the best student of the third year, which enables him to devote his whole time to study for the next two years, while he receives £7 per month in lieu of wages.

"It is not only employers who recognise the value of technical instruction, but employes also. In some instances classes have been started at the request of employes—in one important case at the joint representation of employers and the union. The instructors are specialists in their own departments. Many trades classes are conducted exclusively in the evenings, and are in charge of men who during the day are engaged in the trades concerned.

"It is not often that direct evidence is obtainable of value returned for money spent in technical education. In connection with our wool-classing department, however, experts state that the enhanced value of the clip due to better classing since the inauguration of the School of Mines classes represents an amount greater than that expended on the School of Mines in all its departments since its inception.

"This school in its classrooms, laboratories, and workshops compares favourably with any similar institution in the Commonwealth. Finer laboratories will not be found than those of the Bonython building, set apart for metallurgy, assaying, and chemistry. In the electrical engineering department there is splendid equipment, which is constantly kept up to date by the addition of machines of the latest type. A feature of the mechanical engineering department is the experimental steam engine specially designed for instructional purposes. The most advanced work of the school is in the applied science courses for qualifying for the Associateship or Fellowship Diploma. Much of the higher work for the B.E. Degree of the University is carried out at the School of Mines. In that connection it is interesting to note that the Commonwealth Naval Department granted facilities to universities to nominate engineering students for commissions in the navy, and the privilege was afterwards extended to the School of Mines.

"The number of individual students enrolled last year was 2,726, and the figure this year is in advance of that for the corresponding period of 1915. That the attendance is the highest in the records of the school, in spite of war conditions and the absence of students on active service, is an indication that the value of technical education is becoming more generally recognised."

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University Proposals.

MELBOURNE, June 12.

The recommendations recently made by the Senate of the University of Queensland to the State and Commonwealth Governments that the electoral and naturalization laws should be reviewed were discussed by the council of the Melbourne University to-day. The matter had been previously brought to the notice of the council, and had been referred to the professorial board for a report. The board to-day submitted a report in which it was stated that the matter was one in which the university in its official and corporate capacity could take no action. Any representation which should be made on the subject belonged rather to an expression of public opinion, which was best left to the individual views of the members of the university as citizens. The board, however, had considered that the question of how far alien enemies should be admitted to university courses and degrees and other privileges might be taken into consideration by the Government, and suggested that a copy of the report should be forwarded to the Government. The report was approved.