their repeated warnings, but little attention has hitherto been given. We mean the composition of the charcoal. According to the manner of preparing this, the method adopted for charring and the material employed, so does the chemical composition of the charcoal differ. Some samples, for instance, prove on analysis to contain 85 per cent. of carbon, while others have 20 per cent. less; it is scarcely to be expected that gunpowder made from the two kinds will have the same burning qualities, and yet with gunpowder manufactures charcoal is charcoal, no matter how much its component parts of carbon, hydrogen, oxygen, and ash may differ. It is of little use, therefore, paying any particular attention to the physical qualities of gunpowder so long as its chemical composition is almost entirely ignored.

The manner in which the strain upon the gun and the velocity of the shot are measured at Woolwich are worthy of explanation. The means employed are of the simplest kind. The maximum pressure of the gases inside the gun as the shot is being expelled is recorded by what is termed a "crusher gauge." This is no more than a tiny pillar of copper. The pillar is placed loosely in a tube, the end of which, made of steel, stands firm and fast no matter what the pressure. So that the soft copper pillar, when subjected to the action of the gas, gets compressed, or crushed, and assumes something of a barrel shape. The pillar and its case, being affixed to the base of the shot, gets the full pressure of the gunpowder gases, and its length afterwards denotes how much this pressure has been. To secure more trustworthy pillars of the metal it is the practice to compress them first of all to a certain degree, to remove any honeycomb or imperfection, and, thus uniformly compressed, they may be relied upon to record the strain with accuracy. Comparison of the fired pillar, with other pillars which have been subjected to known pressures, at once reveals the degree of force to which the former has been subjected in the gun. The maximum pressure, or strain, to which the 80-ton gun should be subjected, is set down as 25 tons on the square inch, and it is with the aid of this "crusher-gauge" that the strain exerted in the various experiments has been ascertained.

The initial velocity of a shot, or, in other words, the rapidity with which a projectile flies at the outset of its career, is now measured by an electrical instrument, the invention of Major le Boulengé, a Belgian officer. As in the case of other instruments of a like nature, the shot is made to break through two wire screens, placed at some distance from one another. The interval is usually about 100 feet. The screen is simply a wooden framework with fine wires zigzagging across, and it is these fine wires which the shot cuts. One screen is near the muzzle of the gun, and the other at the distance we have mentioned. No. 1 screen is in connection with an electro-magnet in the instrument-house, and No. 2 screen with a second, the two magnets hanging close together. While the wires in front of the screen are perfect, an electric current passes without interruption, and the electro-magnets in connection with them are endowed with power, but this power ceases as soon as the shot cuts the wires of the screen. Before the gun is fired there is suspended to the magnets two rods of iron, which remain, however, only so long as the magnets are magnets. When the shot is fired, No. 1 screen is torn, and down falls the rod suspended to No. 1 magnet; an instant afterwards, when the shot has reached No. 2 screen, No. 2 magnet also loses it virtue, and down falls the second rod. The time between the falling of the two rods is so small, that ere the first has fallen half its length the second has dropped upon a trigger, which trigger darts out and strikes the side of No. 1 rod. When the latter is picked up, the first thing is to examine the surface for the mark of the trigger, for the position of this mark, whether high or low, tells the operator what he wants to know. The rod being of a given weight, always takes the same time to fall, and according whether it has fallen half or quarter its length, so the time taken by the shot to travel between the screens has been long or short. In a word, the rod has only to be compared with a prepared scale in order to read off the number of feet per second at which the shot has gone on its way.

THE REGISTRARSHIP OF LONDON UNIVERSITY

LAST week we referred to Dr. Carpenter's intended resignation of the Registrarship of the University of London. We have before us his letter intimating his desire to resign his post on May 31 next, and the resolution of the Senate in connection therewith. By the date mentioned Dr. Carpenter will have completed his twenty-third year as Registrar, and, including his previous nine years as Examiner, his connection with the University has extended over four-fifths of its term of existence, and over a corresponding proportion of his own professional life. There is no doubt that the success of this great institution is to a great extent owing to the energy and faithfulness with which Dr. Carpenter has discharged the duties of his post. It has been fortunate for the University as well as for science that a man of so eminent a scientific position has been so long and so intimately connected with it, and it will be extremely difficult to find one capable of taking up adequately Dr. Carpenter's work. We have pleasure in publishing the resolution of the Senate, to which we have referred.

"In accepting the Registrar's resignation of the important office he has held since 1856, the Senate desire to record their sense not only of the ability, judgment, and fidelity with which he has uniformly discharged its duties, but also of the zeal and efficiency with which he has on all occasions exerted himself both within and beyond the limits of his official obligation, for the promotion of the best interests of the University.

"The Senate would further record their conviction that it has been of special advantage to the University, during the twenty years of its most rapid development, to have had the services of a Registrar who, besides being an excellent administrator of its affairs, has attained, by his scientific labours, a position which has given him a just weight and influence over those with whom he has been brought officially into contact.

"The Senate strongly recommend the Registrar to the favourable consideration of the Lords of Her Majesty's Treasury as having acquired, by 'special services,' a claim to a larger superannuation allowance than that to which he is entitled by mere length of service."

ABOUT FISHES' HEADS

IN a former number (vol. xvii., p. 286), in a note "About Fishes' Tails," we called attention to some recent observations of Alexander Agassiz on the young stages of some fishes, in which he showed the wonderful changes that, as development went on, took place in their caudal fins; yet strange though these changes are, they seem as nothing to those that take place in some fishes' heads, and the facts first noticed by Steenstrup, and the theory which, by a marvellous power of intuition, he built up thereon, as to the eye in a flounder passing from the right side of its head to its left, have been in a great measure confirmed, and perhaps in a greater measure added to, by the painstaking observations quite recently published, of Alexander Agassiz,[1] from which it would now seem very certain that even the most shapeless adult fishes begin their life as quite symmetrical young creatures. No more

[1] *Proceedings* of the American Academy of Arts and Sciences, vol. xiv., July 1878.