

THE FOURFOLD ASPECT.

The lovers stood in the deep recess

Of the old ancestral hall,
Where the storied panes their gold and red
Flung o'er the grace of her bending head,
As he whispered "Nothing on earth is bliss
Like a silent hour, such as this,
With the soft hush over all."

The children played on the flowery lawn,
Darting from glade to walk;
"And see," they said, as they glanced above,
"To the two, in their glorious trance of love,
"How Maud and Charlie waste the day,
Though night is coming to stop our play,
And they do not even talk!"

With her weary eyes and her sable robes,
The lonely lady passed;
A sudden cloud her pale face crossed,
The anguish of one who had loved and lost;
Then, from laughing babes and dreaming pair,
She turned, with the tearful gentle prayer,
"God, long may their sunshine last!"

The old men glanced from the lighted hearth,
Where they sat over cards and wine,
To the two, unconscious of aught the while,
But love and each other—then shrug and smile,
As one, draining his glass, said—"As they choose,
But you blaze is better than chill night dews:
Your trick, and the deal is mine."

The twilight deepened into night,
The stars through the dusk air shone,
Aged and infants calmly slept,
O'er a bright-eyed portrait the mourner wept,
And the lovers still murmured, "Not yet, not yet,
And why should such hours in parting set?"
And so the world rolls on.

—All the Year Round.

A FEW THOUGHTS ON THE ARTILLERY

ITS CONDITIONS AND REQUIREMENTS

BY AN ARTILLERY OFFICER.

WHAT WE HAVE TO LEARN.

Powder.—It is not so widely appreciated as it ought to be, that the improvements inaugurated in the manufacture of powder promise more good to the artillery than those even for the manufacture of cannon. We say *inaugurated*, for the prismatic powder invented by General Rodman has received less attention here than abroad. We believe that in the future General Rodman's name will be spoken of more in connection with his improvements in powder, than for anything else he has done. All the experiments of the Ordnance Department on cannon powder, so far as we are aware, of late have been confined to getting a suitable powder for the 15-inch gun. The manufacturers, the Messrs. Du Pont, have obtained some remarkable results; but with this exception, the subject of the proper powder for our heavy guns seems to have been utterly ignored. It is not proposed to go into details here; we content ourselves by saying that the kinds of powder and charges prescribed for our heavy guns, from the 10-inch Rodman down to the $\frac{1}{4}$ -inch Rifle, are entirely inappropriate; they rest on no system of experiments and comparisons, the whole thing being a piece of patchwork.

Chronoscopes are known to our artillery officers, except through the imperfect and unsatisfactory knowledge gained by the yearly detail at the Artillery School, where they may witness the occasional operation of the Schultz instrument by the Ordnance Department. This machine is perhaps too costly for general use, but neither Le Boulanger's nor Benton's is open to this objection. Now that Colonel Benton seems to have succeeded in still further simplifying his machine by holding the pendulum in suspension by threads, the cost must be materially reduced. Indeed, it is difficult to see why one might not be constructed at almost any post by an intelligent mechanic. At all our larger posts, as Forts Adams, Mc Henry, Hamilton, Jefferson, and at San

Francisco, artillery officers should become practically familiar with some of these machines.

Instruments for taking times of flight of projectiles with accuracy are unknown in our service, if we except the one stop watch at the Artillery School. When "guessing" is introduced into scientific artillery practice, either as to charges, elevations, times of flight, or in any other particular, the results are useless.

Range-finders.—Devices, under this name for determining distances with accuracy and rapidity, have attracted much attention among artillerists abroad. The importance of being able to tell at any instant the exact distance of an object at which our fire is to be directed, cannot be over-estimated. While ships under steam move much faster than of old, guns fire much slower, owing to the labor required in loading and training. The defence is secured by a small number of well directed shots, and not by rapidity of fire. Still with us the old system of "guessing" satisfies all our desires.

As long ago as in 1864, a plan was in use by which the exact distance of a ship, entering the harbor of Copenhagen, from each of the works constituting the defences, could be announced as often as once in thirty seconds. The works were connected by the electric telegraph, but a very good substitute for telegraphic communication exists in our system of signals. The method in use in Copenhagen was simply that of triangulating the position of the vessel by means of theodolites, the details being ingeniously arranged.

Numerous, and some apparently successful, attempts have been made to construct portable instruments for nearly instantaneous measurements. Among these may be mentioned the telemetric telescope, invented by Captain Gautier, of the French Imperial Artillery; and the range finder, invented by Captain Nolan, of the English service. The former is a telescope of only five inches in length, yet for distances of from three to six kilometres, with a base of thirty metres, has a maximum error of only one-fourth of one per cent., and with hardly an appreciable error for distances under one kilometre. A full description of this instrument is given by Prof. Barnard in his report of the Paris Exposition of 1867.

The range-finder consists of a pair of telescopes, one for either flank of the battery. The front of the battery being taken as a base line, the angles subtended at either flank by the object to be fired at and the opposite telescope are measured, and the distance read off from a calculating roller accompanying the machine. Though perhaps not possessing all the advantages claimed for it, extensive experiments show that its use greatly increases the accuracy of fire, and that the telescopes are little liable to get out of order by long and rapid movements of the battery. We have by no means exhausted the list of improvements agitated or accomplished, but have said enough perhaps to show that there is a wide field for experiment and investigation not yet even entered upon by us.

IMPERFECT USE OF OUR PRESENT MATERIALS.

But, dropping this subject, how through and complete a use do we make of the materials put in our hands. Take for illustration the semi-annual practice firing at our permanent works. An order is given to the ordnance sergeant to make up a certain number of cartridges; the projectiles are taken at random from the nearest shot pile; the elevation given with a tangent scale, possibly made for a gun of some other cali-

bre; the distance of the target guessed at; the time of flight not taken or incorrectly observed; the deviation entered as "almost a hundred yards to the right," "short," "over," etc.; and no description of the powder entered upon the record. We do not charge that all our experimental firing is thus loosely conducted; but there is no hazard in the assertion that the whole batch of firing records at the different posts, including the different artillery schools, are worthless for reference. These imperfect, and so far as we can see useless reports are finally sent to the Chief of Ordnance, by whom they are consigned to the oblivion they justly merit.

What are the records of experimental firing at the artillery schools of France, for it is from these we draw our illustrations chiefly in discussing the theory of fire?

First, we have a complete description of the powder; its density, size of grain, and general condition; and the initial velocity imparted by it to the projectile when fired from the gun in question.

The angle of departure, or angle at which the projectile leaves the muzzle, as distinguished from the angle of elevation, is accurately determined by experiment if not already known. [In the French guns, model of 1864-'66 this angle has a value of 13 min., due to the pressure of the breech on the carriage at the moment of discharge. With our own guns, without preponderance, Benton admits a variation of 4 or 5 minutes due to balloting. Easy as it is to determine this angle practically for each class of guns, it is doubtful if it has ever been attempted in our service.]

The charges are weighed with the nicest accuracy, and the several dimensions of the cartridge taken.

The projectiles are weighed, and brought to a uniform standard when practicable.

The exact calibre is recorded, and the eccentricity noted. [Given a powder of uniform quality, and the accuracy of fire, particularly of mortar fire depends upon these three points chiefly, viz: weight, windage, and eccentricity. The variations from the standard are scores of error that can be readily eliminated by greater care in the manufacture. Spherical projectiles are here referred to.]

The state of the barometer, thermometer, and hygrometer, and the force and direction of the wind are registered.

The elevation is given by the spirit level, a method not always exact, however.

The times of flight are observed by a stop-watch especially constructed for the purpose and arranged to time even the ricochets.

The ranges are measured by plane-tables. Three should be used for this purpose, one serving as a check on the other two. [How widely is this simple and indispensable instrument used in our service? at how many of our artillery stations it is supplied and used? The answer is not flattering to our intelligence.]

When firing at a target the deviation is taken from the centre of impact.

It is true that in the experimental firing conducted by the Ordnance Department, most of the points referred to are taken into account, but not in a way to materially assist the artillerist. Their experiments are directed generally to special points alone. A long series will be found recorded to test the pressure and initial velocity due to a certain grade of powder; another to determine the extent of recoil; another to show the comparative accuracy of certain projectiles but seldom if ever will be found grouped together the facts essential for solving any of the problems in scientific gunnery.