

the initial tensions of the wire coils be duly calculated and applied. We insist specially on this, because not only has the Woolwich practice hitherto been to treat the shrinkage question in a hap-hazard rule of thumb method, but also Sir William Armstrong, in his late address as President of the Institution of Civil Engineers, made light of the precise degree of initial tension, and spoke of the tendency of the explosive force to effect an adjustment of the strains.

We cannot too strongly protest against such a view, as crude and unscientific, and any results which may be obtained from guns so constructed must be inconclusive as regards the principle of wire construction.

In concluding this article we bring before our readers sketches of three types of wire guns showing the application of the principle. The first is a heavy muzzle-loading gun, designed by the writer for land defences (Figs. 1 and 2). The gun is furnished with rollers on the trunnions at G, and recoils up a curved inclined plane, 111, which is mounted on a turnable, so as to be capable of training in any direction in azimuth. The elevation is given by a hydraulic lift at K. The construction of the gun is shown in Fig. 1, in section. AA is the inner tube; BB the wire coiled on it; C the breech plug; EE is a heavy casting of cast iron, against which the breech plug rests, and which also forms the trunnions, GG; KK is a cast-iron casing covering the chase of the gun, and attached to the casting EE by strong iron bolts, FF. In this gun there is no longitudinal strain on the chase; the recoil being taken up by the insertion of the heavy mass behind the breech plug and by the force of gravity on the ascending planes of the carriage, aided by compressors.

The second type, Fig. 3, is a muzzle-loading gun mounted on an ordinary carriage. The main trunnions are behind the breech and are connected to the carriage trunnions B by side links C, so that the longitudinal strain is transmitted direct from the breech to the carriage without the intervention of the chase of the gun.

Figs. 4 and 5 represent the type for heavy breech-loading guns. In this case the breech plug is fixed in a massive block, AA, which slides backwards and forwards along the side rods, BB. Through this block passes an eccentric shaft, C, which terminates on each side in the side rods BB. When the eccentric is in its forward position the sliding block closes the breech. In the backward position the breech is open and the gun tops up on the forward trunnions E, so as to allow of the introduction of the charge as shown in Fig. 5. When the charge is introduced the preponderance is restored to the breech end, the gun falls back to its normal position, the eccentric is removed, the breech closed, and the gun is ready for firing.

In all these cases it is obvious that there is no longitudinal strain on the chase of the gun, and it is obvious that so far as construction is concerned there is no limit to the possible size of the gun.

JAMES A. LONGRIDGE

BEN NEVIS OBSERVATORY

THE conditions of weather on Ben Nevis are now such as to render it impracticable and hazardous to continue the daily observations satisfactorily. I have therefore judged it best to discontinue them, after a very successful season, under the auspices of the Scottish Meteorological Society, of five months from June 1, without the break of a single day. The work at the six intermediate fixed stations has, I am very pleased to say, been well and generally punctually kept up throughout, and I trust that much good will result. Simultaneous observations were of course made at the observatory at Achintore, Fort William. The Stevenson's screens at these stations have now been made firm by wire stays to withstand the storms of winter. Yesterday

Colin Cameron, the guide, accompanied me. The track was snowed up, and it was necessary to force a way through great banks and drifts of snow. The average depth was two feet; once we got off our course in the blankness of thick cloud-fog and trackless snow. To-day the weather was very bad on the summit, the hut was partly filled by drift, and the south-east gale was so violent at times that I could hardly make way. Possibly I shall attempt weekly or periodical ascents during the winter to keep up the registrations of the rain-gauges and self-recording thermometers.

I have to-day commenced provisionally a three-hourly system of observation at Fort William (including 3 a.m.). The special features are sea temperature, ozone, and the reading and setting of the self-registering instruments on each occasion. Of course all the other usual elements are three-hourly observed also. Further particulars are reserved for a future number. CLEMENT R. WRAGGE

Fort William, November 1

THE OYSTER INDUSTRY OF THE UNITED STATES

A VERY complete account of the history and present condition of the oyster industry of the United States has been recently prepared by Ernest Ingersoll, under the direction of Prof. Baird, United States Commissioner of Fisheries. The importance of this industry it is not easy to over-estimate, and the United States Government deserve every credit for their efforts to preserve and extend it.

As having an important bearing on the question, the oyster-beds of the maritime provinces of Canada are briefly referred to. The eastern coast of the province of New Brunswick is washed by the Gulf of St. Lawrence; down in the bottom of the Gulf lies the long, irregularly shaped Prince Edward's Island, between which and the mainland flow the shallow but troublesome currents of Northumberland Strait. The shores on either side of this Strait are for the most part low bluffs of reddish soil and sloping meadows; there is little solid rock, few prominent headlands, but a continuous line of shore, shelving very gradually into water, nowhere deep; many rivers come down along the coast of the Gulf, and at the mouth of each there is an estuary proportionate to the size of the stream, from the mighty channel of the St. Lawrence to the miniature bay of Bedeque. Most of these estuaries are shallow, and most of them are protected from gales. This condition of affairs seems well suited for oyster growth, since nearly all of these estuaries either contain or contained large colonies of these mollusks. Except at its western end, Prince Edward Island is engirdled with oysters. That most beautiful salt-water lake in the world, the Bras d'Or, which occupies the whole interior of Cape Breton Island, fattens multitudes of oysters. These Canadian oysters are of large size, and have thick, strong shells; oysters with shells from eight to ten inches in length are not extraordinary. The best are not the longest, but those with straight and narrow, or evenly-rounded shells. All the oysters on the eastern shores of North America, belong to the species known as *Ostrea virginiana*, which embraces many varieties, of which *O. borealis* is perhaps the best marked. Except at wholly unsuitable places, it is to be found almost without interruption from the northern shores of the Gulf of Mexico and the coast of Florida to the Canadian districts just referred to. It is, however, said not to be found along the eastern shores of Maine, nor in the Bay of Fundy, though the shells, in a semi-fossil state, are dug up in quantities from the deep mud in the harbour of Portland, Maine.

Mr. Ingersoll gives a very interesting account of the former extent and condition of the native beds in the Gulf of Maine, and of the evidence of the immense con-