

MODERN GERMAN ARTILLERY.

Our engraving represents a 10 inch 22 ton cast steel gun, manufactured by Krupp, the celebrated founder of Essen, Prussia, and now in use in the German artillery service for coast defence. The arm is made of two layers of rings or hoops over the barrel, and fires a shell of 423 pounds, with a charge of 66 pounds of powder, at 1,200 yards, through an 8 inch armor plate. The illustration shows the gun mounted in a sea fort, and resting on a thick bed of concrete so as to fire over an earth breastwork 40 feet thick, the muzzle of the

sufficient to fight a 10 inch gun, and for a long time can fire once every 1½ minutes, or about 40 rounds per hour.

NEW GEOLOGICAL DISCOVERY.

During the recent voyage of the Challenger, a discovery has been made, the significance of which must strike every one who gives the matter even a passing thought; but to those who possess a knowledge of chemistry or geology this discovery is of peculiar interest.

In sailing from Teneriffe, off the west coast of Africa, to

the depth and the character of the dredgings. When worked on the 1,500 fathom ridge, the dredge brought up *globigerina* ooze, multitudes of minute shells, and fragments of coral, the whole, with the exception of a few silicious sponges, being composed mainly of carbonate of lime. As the depth increased, the proportion of these shells regularly diminished, until in the deep water they had altogether disappeared, and the dredgings then consisted of a fine, red mud which did not effervesce with acid. This red colored deposit of the silicates of peroxide of iron and alumina was met with everywhere all over this vast submarine plain; everywhere it had the same unmistakable appearance; it could not, therefore, be the fine sediment brought down by rivers and carried out to sea, slowly settling in deep water, for then it must have differed in different localities; the absence of currents, too, as well as the great extent of the deposit, precluded this view of the origin. Another remarkable feature of this area was the absence of those pelagic shells which are littered in such numbers over all other parts of the bed of the Atlantic.

How, then, was this gradual disappearance of shell to be accounted for? Why was it that on this red mud area the shells of those animals that frequent surface waters were not found, since, when these creatures die, their shells must inevitably fall to the bottom? Whence came this enormous accumulation of impalpable clay?

Air dissolved by water is richer in oxygen and carbonic acid than the air of the atmosphere. The ratio of the carbonic acid to the total amount of dissolved gases is greater in water taken from a depth than in surface water.

If, to the depth of 3,000 fathoms, the amount of carbonic acid keeps on increasing, relatively to the other dissolved gases, in a ratio at all comparable with that indicated by the foregoing analyses, it is easy to see that the water at this depth, under such enormous pressure, must be capable of dissolving a large quantity of those solid substances which, like carbonate of lime, are soluble in water containing carbonic acid. It is clear, too, on account of both the pressure and the amount of carbonic acid being less, that water near the surface must possess a much feebler solvent power than water at a great depth. This being the case, we should expect to find more lime-secreting organisms in the shallower than in the deeper parts of the ocean; now, as has been seen, this is exactly what was found by the explorers in the Challenger.

Under these circumstances, Professor Thomson concludes that this vast deposit of fine red clay is neither more nor less than the insoluble portion of myriads of shells, the residue, in fact, of a chalk formation now dissolved.

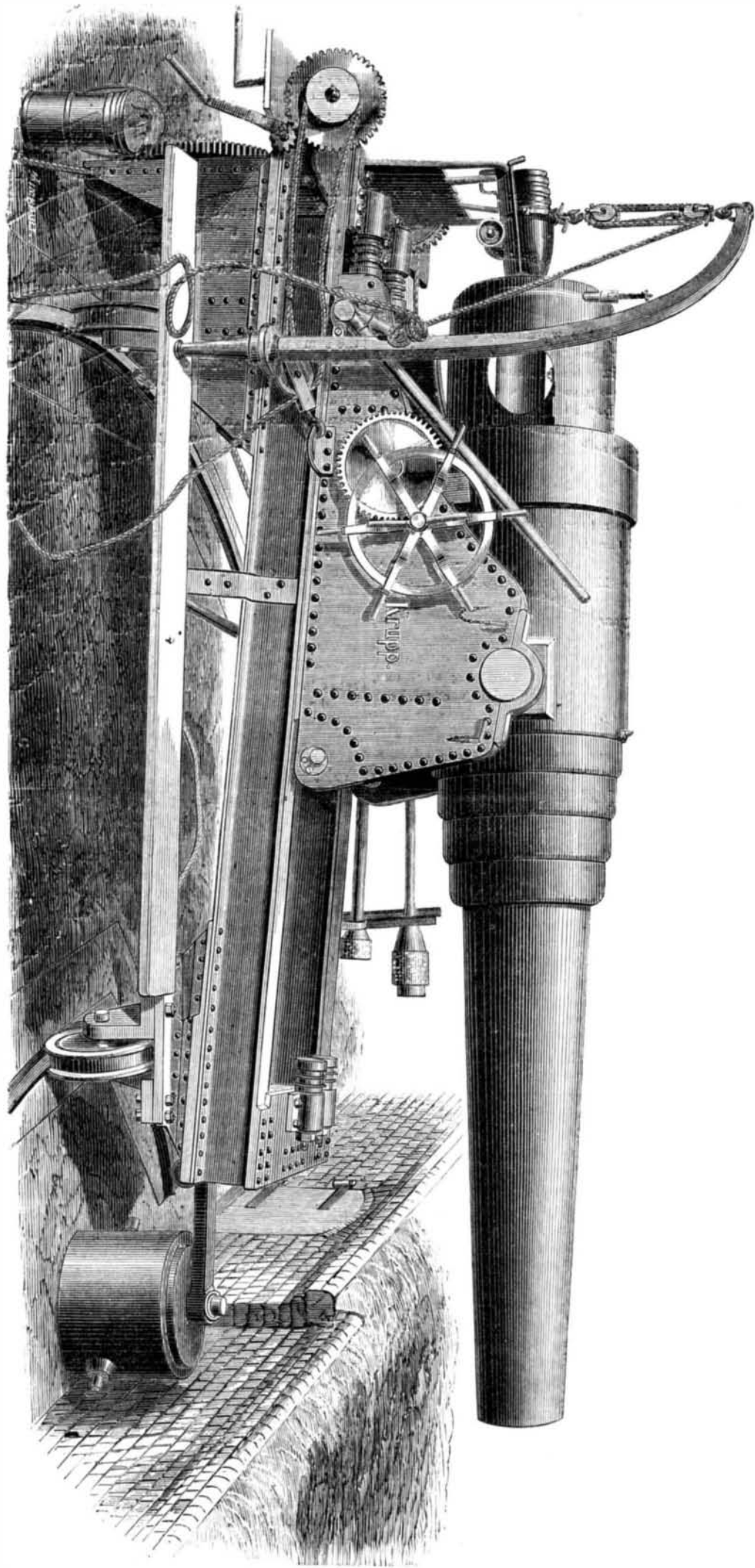
It appears then that, just as the higher regions of the Alps or the Andes are buried beneath a pall of eternal snow, so the higher regions of the sea bed are covered by a layer of grayish white ooze, prolific in organisms whose vacated shells will one day form chalk; and just as at the edge of the snow sheet the glacier melts away into a liquid, ocean-seeking stream, so, where the chalky covering of the sea bottom descends into submarine valleys, it descends into ocean, leaving behind it the red mud, like a terminal or bottom moraine.

Suppose, now, that a geologist should come across an ancient ocean bed, undisturbed by volcanic eruptions and undefaced by denudation: he would expect to find, on the higher levels, chalk or limestone of some sort, and, as he descended into the lower plains, that the rocks would gradually lose their calcareous character, passing from chalk to argillaceous limestone, from that to a calciferous slate, and finally into slate containing no lime whatever.

There is every reason to believe that the fine red clay accumulation is but incipient slate rock.

If, then, the great bulk of these rocks be removed from the category of mechanically formed, into that of chemically formed, or of organic, rocks, it will appear that geologists have been in the habit of underestimating the importance of organic processes as geological agents. We will no longer be able to affirm with confidence, of a single grain of the commonest materials found on the earth's surface, that it has not at one time or other been associated with the manifestation of those mysterious forces which we call living. Our globe therefore resolves itself into a great charnel house or mausoleum. Man has been called a plagiarist from oxen and sheep; but his house, whether it be of mud or of marble, is equally a plagiarist from the deserted dwellings of the invertebrata.

The tendency of modern geology has been to break down the well marked divisions into which the older geologists were wont to parcel out past time. The old notion, which in some measure still clings to the terms Devonian, carboniferous, cretaceous, etc., was that of a distinct period in the history of the earth. Each of these epochs was conceived to have begun and closed before the succeeding era began. In this way the world was believed to have passed through so many stages, in each of which only rocks belonging to that particular formation were deposited anywhere on the earth's surface. Thus, all the rocks of the gneiss were thought to have been formed before the lowest of the Cambrian began to be laid down; similarly with the succeeding silurian and Devonian systems. Now, however, these terms are used without reference to time, and we think of systems, widely separated according to the old method, being formed simultaneously. The chalk age was formerly supposed to have come to an end at a period long prior to man's appearance on the earth, but the researches of Carpenter, Thomson, Huxley, and others have established the "continuity of the chalk," and shown that a fauna, very similar to, if not identical with, that of the chalk, inhabits the Atlantic at the present day. The discovery of this red clay seems to point to the continuity of those ages when slate rocks were supposed to



THE KRUPP 10 INCH CANNON

piece being 7 feet above the platform. A tramway, not shown in the engraving, runs behind the guns upon the terreplain, upon which trucks loaded with projectiles, after being hoisted up from the casemate below the gun platforms by means of a hydraulic lift, carry the required ammunition to the battery. The trucks are so high that the projectiles can be rolled from them direct upon the platform, where two davits with tackles receive them and lift them up to the breech. In the engraving a shell is shown just entering. The arrangements are said to be so perfect that six men are

St. Thomas, one of the outlying West Indian islands, the soundings indicated that the bottom of the Atlantic rose into a ridge about 300 miles west of Teneriffe, and that from that, where the depth was 1,500 fathoms, it sloped gently down until, at 750 miles west of Teneriffe, it had sunk to a depth of 2,950 fathoms. From this point to within 300 miles of Sombrero, the depth was pretty constant, and for 1,800 miles the explorers seem to have been sailing over what geologists term a plain of marine denudation.

A remarkable relationship was found to subsist between