THE ARMAMENT OF THE ATLANTA.

The new cruiser Atlanta proved a stanch though slow sea boat on her trial trips in blue water, but some recent tests with her battery show her in imminent danger from the recoil of her own guns. While lying lately in Gardiner's Bay, Long Island, one round was fired with reduced charges and shell and one round with full charges and shell from each gun of her battery, which consists of two eight inch and two six inch breech loading rifles and four rapid firing three pounders.

As a result, both eight inch gun carriages were disabled, and the six inch carriages, as well as the three pounder rapid fire gun mounts, were proved failures, being unable to withstand the strain put upon them. Indeed, the ship herself was fairly rattled by the firing; doors were sprung from their fastenings, several deck knees were started, and while firing was in progress with one gun, the neighboring guns had to be abandoned by their crews. News of this reaching the Secretary of the Navy, the Atlanta was ordered to sea for a thorough trial, at the risk, be it said, of losing both ship and crew, which, when only begun, showed the ship wholly unable to bear the shock of recoil, and her commander put into Newport, where the Atlanta now swings to a buoy off the torpedo station.

We illustrate herewith a gun crew aboard the Atlanta working one of the eight inch rifles that have caused the havoc; the sketches having been made by our artist, who visited the Atlanta before she set out for Gardiner's Bay.

Fig. 3 represents three pounder quickfiring gun, Fig. 2 the same type being pointed and fired, and Fig. 1 a six inch gun stopped in its embrasure in order to secure and steady it while at sea. During fire, the stop is cast off and the embrasure thrown wide open to allow of sighting.

The big gun shown in the engraving rests upon a carriage, or to speak more accurately a "top carriage," because this kind of gun support is composed of two distinct parts; the upper one, after firing, sliding a short distance over the under one or chassis as the liquid escapes out of the hydraulic buffers by the pressure exerted against them by the gun in recoiling. In land works, where the base on which the gun rests may be made of masonry, the rails on which the chassis rests are made to run up a sharp incline, and the recoil of the piece is nicely checked by its backward movement up hill. But on shipboard, with space limited, and the base unsteady, because of the movement of the ship in the seaway, it is immediately obvious that such a system is impracticable, first, because the sudden movement of heavy guns across the deck would threaten the stability of the ship, and again, because the guns running thus free, the lurching of the vessel might unship them and cause serious disaster. To suit the requirements of mounting and firing heavy guns aboard ship, the device portrayed in the engraving was hit upon long since by an English ordnance officer.

The top carriage, on which the gun will be seen to stand, is of wrought iron, and so is the chassis on which the top carriage moves. This top carriage is made of two cheeks joined by a like number of plates made of boiler iron, and called front and rear transoms. The cheeks are triangular in shape, separated by interposing at the edges the vertical portion of a T-shaped bar; the horizontal branches projecting, the one over the other, to form a double flange, which gives stiffness to the cheeks. The hydraulic buffer which checks the recoil is laid parallel to and between the sides of the traversing platform, and the carriage, in recoiling, forces a piston into a cylinder filled with alcohol and water, which escapes by means of perforations in the piston head.

The cylinders are, in the case of the Atlanta's guns, attached to the front end of the chassis, this position being generally supposed to be best because the more rigid, though there are said to be advantages attaching to the other position at the rear, in which case the rod is forced out of the cylinder. Besides checking the recoil in firing, the hydraulic buffers serve to force the gun in or out of the battery, and also to traverse the carriage to the right or left.

As is usual in mounting guns afloat, the engraving shows that the rails on which the chassis rests, instead of running up an incline in the rear of the piece, are laid at right angles to its alignment, only permitting the carriage to move to the right or left—an operation necessitated in lateral sighting.

As may readily be conjectured, the force exerted by the recoil of such a gun as this is enormous. Powerful apparatus is required to check it, and the base upon which this apparatus is affixed—in this case, the deck and framework of the ship—must needs be specially reenforced in order to withstand the shock of checking. When we analyze the disposition of the forces exerted and their mean direction, we find that the foundation upon which the carriage rests—to wit, the deck and its bracings—must be able to resist the shock of recoil minus the amount of tempering and easing afforded by the hydraulic apparatus. It is not necessary to the present purpose to enumerate the various formulæ by which this may be accurately determined, nor to go into a mathematical discussion, since we are not informed as to the exact amount of charge fired, resisting power of hydraulic buffers, and strength of deck structure.

It is sufficient to say that these formulæ are easily had, and it is hard to understand how the Ordnance Board of the navy, which must have studied them, could have made what seems to be so fatal an error. The reports of the effects of the firing aboard the Atlanta furnish circumstantial evidence not only that the gun carriages are too frail for the service expected of them, but that the structure of the ship herself is inadequate to the demands of the battery she is expected to carry.

Let us look for a moment at the theory of construction of a sea-going ship, fitted with a steel spur on her forefoot, and intended for ramming. It is evident that the ordinary ship, running full tilt at an enemy, and striking him with or without such a weapon, would, in all probability, carry away her own bows, and be wrecked by the force of her own blow. The projectors of this system of warfare provided against this form of structural suicide by putting all parts together end on, as one might say; that is, every timber, bolt, knee, plate, and even the engines and boilers were set with the single purpose of withstanding the shock when the ship should fetch up, all standing, against an opposing obstacle. These ships could strike an enemy while running full speed, and not start a bolt! Now, in building ships to carry modern guns, a special construction is likewise necessary. The fact must be continually kept in mind that, at various points, great shocks are to be received, and all the timbers, plates, and frames should be arranged to successfully resist them.

Eminent ordnance authorities have laid down the rule, based upon experience, that injury to the carriage resulting from the recoil of the piece increases with the square of the velocity of the recoil, which is dependent on the relation between the weight of the carriage and the weight of the piece. In every case, they say, the carriage must be so constructed as to effectually meet the forces that act upon it, as the axis of the bore intersects the axis of the trunnions. The entire force of the charge acting on the bottom of the bore is communicated to the carriage at the trunnion beds.

Looking at the Atlanta as she is, and remembering that, though a warship, she cannot fight, and though a steamer has no speed, one is reminded of those merchantmen, up to a recent period quite numerous on the ocean, having gun ports painted on their sides, and targets therein as though the broadsides were ready to run out. At a distance these dummy guns seemed to sweep the horizon with their frown, and in the old days we are told that the pirate and the corsair bore up and squared away when they sighted one of these harmless craft, fearing to draw near for a nearer view, lest they might get a broadside between wind and water to moderate their curiosity.

It seems only fair to the memory of the contractor who built the Atlanta to say that he had not anything to do with the fact, if it is a fact, that the ship is not structurally strong enough to withstand the recoil of her guns. If he put in the material agreed upon and fashioned it according to his contract, as the advisory board of naval officers testified he did, his responsibility ended there. The advisory board, and none other, is accountable for the ship, just as the ordnance board is responsible for her defective gun carriages.

New Professor of Physics at Cornell.

Professor E. L. Nichols, of the University of Kansas, has been appointed to the chair of Physics, Cornell University, in place of Prof. Anthony, resigned. The *Ithaca Journal* says:

"Professor Nichols was graduated at Cornell University with high honors in 1875. He had already acquired an especial taste for physics, and, accordingly, immediately after receiving his degree, he went to Germany, where, during four years, he prosecuted his studies mainly in the laboratories of Helmholtz and Kirchhoff in the University of Berlin. After taking the degree of Ph.D., he returned to America, and for one year held a fellowship in Johns Hopkins University. He then had a year of experience in the further study of electrical physics in the laboratory of Edison at Menlo Park. In 1882 he entered the practical work of a professor of physics, and has been so successful in building up the department at the University of Kansas that the university, during the past winter, made a special appropriation of five thousand dollars for an electrical equipment.

"The testimony is unanimous that Professor Nichols is a brilliant experimenter and an excellent lecturer. While he is a very industrious worker in the laboratory, he has good social qualities, as well as the invaluable characteristic of ambition and good health. During the past five years he has published numerous papers read before the American Association, and may confidently be relied upon to keep the work of the laboratory here prominently before the scientific world."

Correspondence.

How Snakes Climb Trees—Remarkable Growth of a Girdled Tree.

To the Editor of the Scientific American:

In your issue of May 14, in an article on "Boys and Trades," you say, "How many know how a snake can climb a tree?" I am one of those that do not, and yet I have seen it done once, very similar to the one your correspondent saw, as given in the article, "How snakes climb trees," July 2, and yet it does not tell how it is done, by what process the snake holds and yet climbs, so that you could not fairly answer the question.

Some years since, I saw a black snake, about 5 ft. long, lying under a large cherry tree. The limbs of the tree projected nearly horizontal, and the nearest was 12 ft. or more from the ground. Between me and the body of the tree, but not quite in a direct line with the snake, was a slender cedar tree, whose top was about 4 ft. below the nearest branch, and about 10 ft. from the body of the tree. The snake lay on the opposite side of the tree. As there were plenty of stones there, I thought I could easily kill the snake, and threw one at it, but did not hit it. In an instant it came, as I thought, directly for me, but it was for the cedar tree. It went straight up it, until it stood in a straight line above the top (and the top of a young cedar is very slender, about like a whip), with only a few inches of its tail resting against the slender top of the cedar (it was a sight I never shall forget), then its head was just up to the first limb of the cherry tree. It gave a slight curve motion and immediately it continued to ascend, with only about two inches of its body in contact with the limb, so it passed up several limbs, nearly standing on the tip of its tail to reach the next limb, until about 25 ft. from the ground, when it lay along the limb, and put its head over and looked at me, as though it would say, "What are you going to do about it?" I did not throw any more stones. I was surprised. I thought that a snake had to coil around a tree to climb it, and as the snake looked as though it might spring upon me, I left, wondering by what power a snake could climb a tree like that, and how it could calculate that he could reach the tree, when the top of the cedar was so far below.

In the SCIENTIFIC AMERICAN for October 16, 1886, is an article entitled "Remarkable Tree Growth after Girdling." It is singular that, in the August previous, I had a large whitewood or tulip tree, which I suppose is the same as "poplar" in the article referred to, and as it was very tall and shaded the ground, and could not be cut down on account of the crops, I girdled it about 3 ft. above the ground, by cutting away all the bark for about 4 in., and also cutting out the wood all around, that no sap wood might remain, expecting to see it soon wither and die, as the weather was hot and dry at the time. But it continued green and the leaves did not turn or fall off in the fall sooner than other trees. I then saw your article in the October number, and left the tree to see what it would do. It put out leaves, was full of blossoms, and made as much growth as though the bark had not been taken off. The wood now is black and rotten for the depth of three-fourths of an inch, and the bark is dead about 8 in. below the cut, but above the bark is alive to within one-half an inch of the cut. The wood has decayed so much that a growth of fungus is around it in places, like toadstools. The tree is 68 in. in circumference at the cut, and between 80 and 100 ft. high, and is now as thrifty as any of its kind, therefore it is not fed by the sap going between the bark and the wood.

J. E. PARKER.

Morristown, N. J.

Progress in Florida.

A correspondent writing from De Land, Florida, says: Our city council have contracted for water supply for fire protection, and an artesian well for the purpose is down 325 ft., and will go about 200 more to get a good flow. Arrangements are about completed for lighting the streets and stores by electricity, and work will begin in September.

We have good railroad connection; four daily mails; telegraph and express companies, thirty-one; four large hotels, fine schools, college, public, private, and kindergarten, churches of all denominations. No malaria, high and dry, good breeze day and night, thermometer averaging 90° in the shade at noon, cool nights.

An ice factory furnishes good ice at your door for one cent per pound, seventy-five cents per hundred pounds, and makes five tons a day.

JAS. H. STACKHOUSE.

De Land, Fla.

Gas Liquor for Grass.

It has been employed at Brackley, in Northamptonshire, on grass and other lands for the last two years, with very good results. There is now on the land where the liquor was applied about the heaviest crop of grass to be seen in the neighborhood.