THE GLATTON.

From the *Engineer* of July 12 we condense the account of the experiments with the *Glatton* which follows:

The turret, then, was to be tested by three blows—(1) It was to be near the top, where the shot would act with a certain amount of leverage, and, if it were possible to do so, contort the base and prevent free movement: (2) a blow was to be struck lower down, nearer the middle of the turret; (3) the junction of the turret with the "glacis" plate was to be fired at, in order to learn the probability of motion being prevented by actual distortion or wedging of the shot between the moving and fixed parts, namely, the turret and glacis plate. For this purpose it was supposed that a quantity of ballast carried in the *Glatton* might have to be placed so as to give her sufficient "list" to expose the part in question to the full blow of the *Hotspur's* gun.

Against the strongest portion of the turret, 14 inches of iron backed by 15 inches of wood, the 12in gun of 25 tons weight, was brought to bear at a range of 200 yards, firing "Palliser large-cored shot," or, speaking loosely, "Palliser shell without bursting charges."

At 200 yards we have shown the shot as just able to perforate this thickness of armor but it must be remembered that the circular form of the turret tends to give a slight increase of strength, especially in the case of shot not striking it exactly in a radiating or normal direction. The 12in., of all the Woolwich guns, fires its projectiles most unsteadily, from its having so slow a twist. All things considered, then, it was hardly to be expected that the projectile would go right through the turret, but it was likely that it would do so.

In order to insure the turret being struck on the desired spot in each case, the firing of the *Hotspur's* gun was tested against a canvas screen erected on the deck of the *Glatton*. Those who witnessed the experiment may perhaps call eo mind the evidence to their senses of slow twist and slight unsteadiness shown by the shot passing over the breakwater and ricocheting out to sea.

A high velocity of rotation tends to make the shot ricochet to one side, a right-hand spin to the right, a left-hand spin to the left The shots in question after graze continued their path in a more direct line than might be expected, and the steamengine-like noise was then heard which indicates unsteady flight.

For the first round a mark was made at a spot near the turret top. The gun was to be laid to strike a spot just beneath this but (owing, it was thought by some officers, to the firing being delayed and the gun getting cold) the shot passed close over the turret top cutting through the rail-post and causing the rending and contortion. On giving rather less elevation the next shot struck some two feet below the mark at which it was directed. The shot stood well up to its work, the front portion, as far as the front ring of studs, remaining apparently intact and buried deep in the turret side.

We have presumed to show in the place occupied by the shot's head and the depth to which the point has penetrated; we believe this cannot be far wrong on the following ground. The rear edge of the front stud was about 6¼in. past the face of the plate, and the projectile, if a Palliser 12in. shell, would measure from this to the point nearly 14in. As it appears, however, that it was not the service Palliser shell of 1870, but a pattern known as large cored shot, not then sealed and proved, this measurement may be slightly incorrect. Still, it hardly seems probable that the actual position of the projectile when taken out can be found to differ from what is given in the figure by so much as half an inch.

Supposing our estimate to be correct, the following are the effects produced, shown by the numbring and arrows in:—(1) The entire upper plate forced back to a distance at point of junction with lower plate 5¼in.; (2) shots penetrated to a depth of nearly 20½ in., (3) horizontal joint between upper and lower plate opened to a width of 2in., the same effect being manifest in the corner of the top plate being lifted 2in. higher than that of the adjacant plate; (4) the lower plate cracked in a vertical and laminating direction, if such a word may be allowed, and otherwise contorted at the edge; (5) a bolt driven some inches backwards, the head flying into the interior of the turret; (6) the double skin being bent back and forced open to a width of about 3in, the wood protruding; (7) the ¼in. or inner skin torn open and hanging down to the extent of about 4ft. by 18in., a number of revent-hands (as well as the bolt-heads) being thrown into the interior of the turret.

Although a little below the spot intended, it was quite clear that this round gave a heavy contorting blow to the turret, the top of which had been so far forced back, it was nevertheless, found that the turret revolved without the slightesi difficulty, and for the object of the experiment the next round might be proceeded with.

Considering the spot struck by the first blow, it seemed advisable to pass on at once to the trial of a blow at the line of junction between turret and glacis plate, which perhaps might be struck without the delay necessary for altering the ballast, in order to give the vessel a "list" towards the *Hotspur*. This was done. By means of a mark painted on the turret, a shot was delivered grazing the glacis plate at a point 3ft. from the turret and glancing into the turret, which it penetrated to a depth of about 15in., the shot, as before, standing well up to its work and coming easily out of the hole, uninjured as for as the front row of studs.

The effects produced by this round are—(1) Penetration about 15¼in.; (2) glacis plate grooved to a depth of about ¼in., and cracked; (3) flange ring covering joint of turret and glacis, cut through and bent; (4) lower side of glacis plate bent back, and split open to a width of about ¾in.; (5) a sort of binding plate fixed on the lower edge of the armour-side beneath the deck, broken off for a length of some feet, and the edge bulged downwards.

This round again severely tested the working of the turret, not perhaps quite so severely as might be conceived were a similar blow to fall in a more downward direction, but quite the kind of blow intended. On trial the turret was again found to work freely and easily. The ports, which up to this time had been covered and plugged up with beams of wood, were cleared, opened, and two rounds were fired from each gun; one a full blank charge of 70 lb. of pebble powder, and one a battering charge of 85 lb. of pebble powder with shot. The turret revolved easily in about a minute, and we are not aware that any effort was used to obtain speed. In short, the *Glatton* was in good lighting trim at the conclusion of the experiment. Considering how great are the chances against the second shot falling exactly on a spot already struck, it would hardly be going too far to say that the *Glatton* was in nearly as good condition to go into action as before the trial. Yet, it would be difficult to put her through a more severe ordeal except by bringing the 35 ton gun to bear on her, and as far as the object of the experiment, namely, injured to the working of the turret, it may be doubted whether much more effect would, even then, have been produced. A plunging fire we are inclined to believe the most likely to jam the turret. Suppose, for example, that the ship has much list over towards the *Glatton*, there can be little doubt the second shot would have caused much greater damage to the glacis plate, which at the thickest end (that is, next the turret), is only 3½in. thick. As it was, this plate received a more severe blow than was at first apparent. Suppose the shot, instead of merely opening it through along one crack, had broken it into fragments, it is easy to conceive that detached portions either of shot or plate might have temporarily jammed up the space between turret side and glacis plate edge, a space we should say, from observation, of perhaps 6in. Still, even in this case, it seems likely that such jamming fragments might be removed; and, as this might be done from below, by men and under cover, it is improbable that any breaking of glacis plate, or any wedging of shot, could cause more than temporary interruption to the action of the turret. In the plunging fire we have assumed a rather extreme case: such a vessel as the *Glatton* would never be called upon to fight in a sea which would expose her to a plunging fire from a hostile *ship*, nor is it to be expected that she would be very likely to come under the plunging fire of works of great command. At all events in supposing such a case, we must remember that we have only to go to such an extreme as may be found in Gibraltar batteries; to come to a fire indeed that no conceivable form of armor-plated ships capable of floating could resist.

We suppose the case of the 35 ton gun firing at the *Glatton* turret. Let us see what might be expected to happen. It is probable that the turret would be penetrated at any range up to at all events 1,000 yards, if struck fair. The men and guns in the interior might no doubt suffer, but no more shock would fall on the *turret structure* than in the present instance. The experiment was not made with a view to penetration. In selecting the 14 in. plates to fire at rather than the 12 in., the trial of the turret in its working powers was probably the most severe that could be given to it by any shot of 12-in. diameter, It will be seen that the shot which first struck the turret very nearly penetrated. The point of the shot we have estimated as being at a depth of nearly 20½ in., having in front of it only 8½ in. of oak, and a skin which it had opened already to the extent of 3In, When it is remembered how little more would have been required to take the projectile through and, that once through it ceases to strain the structure of the turret, is will be seen that ao 12 inch shot could much more severely try a turret with this thickness of plate—the same we believe in total amount in the 14in. plate parts as that of the *Devastation* and *Thunderer*.

We are tempted to speculate as to what would have been the effect of the slow, heavy blow of the Radman shot, but it may be profitable to conclude by summing up a few minor facts connected with the experiment.

First, as to moral effect. The officer and men, (about thirty in number) who remained on board the *Glatton* during the firing, occupied the captain's cabin where the shock