

## THE AGINCOURT AND THE STUDDED SHOT QUESTION.

*From the Broad Arrow 10th August.*

Those of our contemporaries who thought it worth their while to notice that we were mistaken about the identity of a gun on a recent occasion, have not been equally keen to observe the record in the *Western Daily Mercury* of the accident to the 12½ ton gun of the Agincourt, whilst slowly firing empty shells at a target with but little elevation. The shell was not observed to break up, and it was only next morning when cleaning the gun that the fracture—which extends through the steel tube to the coils, for a length of 24 inches—was discovered. On the Agincourt's return to Devonport, the disabled gun was forwarded to the Royal Arsenal, where it is to be cut in two transversely and rebuilt. Seven slow discharges from a gun nearly horizontal should give a very slight strain, and if the destruction had been caused by the direct action of the powder, it would have taken place in the chamber or inner end of the bore, and not as the *Pall Mall Gazette* would say, in the "chase." It is evident also from this accident that forbidding the use of time fuzes and even of bursting charges, would not prevent the destruction of our heavy guns. The only royal road to safety is to forbid their being fired at all.

We have said so much on the subject which has been answered by argument, and never can be answered by ridicule, that if it were not for the vast importance of the questions at issue we should be disposed to let the matter rest. We feel it a duty asolutely binding on us, however, as often as new facts tending to establish our position present themselves, to point out their bearing, and this is the more necessary since, as we had occasion to notice last week the Surveyor General of Ordnance is in danger of being misinformed on points of vital importance. We therefore reiterate all the statements we have hitherto made as to the cause of these accidents, and also as to the extent and importance of the damage they have caused. If Sir Henry Storks will pay the Royal United Service Institution a visit, he will be able to judge for himself as to the cause of the accumulation of gases in the powder chamber which caused the crusher gauges to vary their register from twenty-seven to sixty six tons, when firing only 120lbs. of mild pebble powder. He will find there a hardened gun metal stud on which a 700lb. projectile was supported and rotated, which is misshapen into the form of a wedge, by over riding its grooves about one inch, and which is shivered at an angle corresponding to that of the increasing spiral of the rifling. A ring of such wedges (nine in number, we believe) acting simultaneously, must naturally tend to jam the shot and rupture the gun; and on the other hand, in the case of common shell, by reacting on the projectile, at least assisting in causing that alteration of form which consists in the compression of their walls into the shape approximately, of a dumb-bell.

Artillerists are well aware of this fact, and the permanent set thus given to the shell amounts, in some instances according to the official work on *Ammunition*, (Part II), to .35 inch diameter in the case of nine-inch shell. This amount of compression would withdraw the studs from the grooves .176 inch, and as the grooves are only .2 inch deep, and each stud has a windage of .05 inch, it follows that the remaining grip of the rifling cannot exceed .02 inch, and that

there would be no grip at all in some of the grooves when the centre of the projectile does not exactly correspond with the centre of the bore. On account of the evil consequences resulting from this compression of the walls of the shell, experiments have been made to strengthen the 10 inch shell internally, the effect of which was to reduce its capacity from 261 to 173 lbs. of powder. The last quarterly extract of the proceedings of the departments of the Director General of Artillery states, "The result of the trial made on the 10th July 1871, of the six 10-inch strengthened common shell. . . . Five shells have been recovered; they are all lightly reduced in diameter, and marked in one place at the base with the rifling of the gun."

"Five more shells further strengthened" were demanded and fired in February last, four of which were found, on recovery, to have "groove marks on the base;" the maximum reduction in diameter was .13. Need we remark, in passing, that no portion of the shell except the studs can touch the bore at all if the axis of the projectile be steady, and that steadiness of the axis is one essential condition of accuracy of fire and hard hitting.

The Superintendent of the Royal Laboratory points out that the 10 inch common shell, of strengthened pattern, fired at Shoeburyness on the 14th November, 1871, have for the first time withstood the discharge without alteration of shape, and in his opinion, they are the first 10 inch common shell which have yet been fired sufficiently strong to withstand the battering charge of 60 lbs. R. L. G. powder." But the committee seem to have thought that a reduction of 4 lbs. in the bursting charge was rather a high price to pay for immunity for compression of the stud wedges, and weakening by stud holes. They therefore recommended that the 10-inch shell should continue to be made as before. "The Superintendent Royal Laboratory, however in his capacity of manufacturer, wishes to record his opinion that not withstanding the evidence obtained, the 10 inch common shell as at present designed, is not calculated to withstand, with absolute safety, the battering charges of R. L. G. powder.

It thus appears that all the efforts of Col. Milward and his staff cannot prevent the collapse of the walls of the common shell, partly, if not wholly, owing to the action of the studs, and partly to the pressure of the gases, if any chose to adopt such a theory. But this collapse of the shell must itself facilitate that "oblique movement of the axis of the projectile," to which all hard projectiles having studs are generally liable. When this obliquity is considerable, and an "increasing spiral" provides an increasing resistance near the muzzle, something must give way—either the unlucky shell, or as in the case of the Agincourt, which has suggested these remarks, the gun itself. Common sense and experience show that the only safety for our magnificent built artillery lies in abolishing the unmechanical system of studded shot, and this must certainly be the result of the inquiry which we still believe the facts we have recorded imperatively demand.

### THE DISABLED GUNS OF THE HLR-CULES.

Admiral Sir Henry Codrington, K. C. B. Commander-in-Chief, president at a meeting of the United Service Institution of Plymouth on Thursday evening last week,

when Commander William Dawson, R. N. read a paper on the 400lb shell, which disabled three out of eight 18 ton guns on board the *Hercules*, explaining in detail from official publications and artillery authorities the mechanical action of the French short bearing non centering stud rifling, and tracing its injuries found upon the guns and recovered projectiles in the course of ordinary training practices. After showing how the system involved a multiplication of grooves in the bore, and a less twist than the manufacturer should like to give any gun, bad rotation, a weak shell of small powder capacity, a diminished striking force and a high or trajectory, with increased strain upon both guns and projectile, the lecturer explained by the aid of diagrams and full sized models how "the oblique movement of the axis of the projectile" and the increasing spiral were connected with the occasional breaking up or bursting of both Palliser shell, which have no fuzes, and of common shell, which have time fuzes, at a particular point in the gun. He then went on to say, "In common with every other naval officer I have during my service afloat witnessed the movement of heavy guns only, the exercise of heavy guns weekly, and the firing of heavy guns at least once a quarter. During those eighteen years I witnessed the firing of many thousand smooth bores and of about four thousand rifled projectiles; yet I never knew an instance of a gun being injured or marked by its projectiles or other wise than in the vent. But since the introduction of French rifling, a regular "rate-book" has to be kept of every discharge from each gun, and inspectors of ordnance are appointed to register the injuries inflicted by every fifty heavy projectiles. Almost every damage so registered may be traced to the non-centering of the French rifled projectile, and to its consequent oblique movement. These accidents have led to permanent reductions in the powder charges as in the 35 ton gun; in the length and weight of the projectile as in the 25 and 35 ton guns, or in the bursting charge as in the 18, 25, and 35 ton guns, to limitation of the number and frequency of the discharge as in all guns of over 12½ tons weight or to forbidding the use of common shells with time fuzes as in all guns over 6½ tons; and in general to a great diminution in the striking force, and in the effective work done by every French rifled gun, and of the endurance, under quick, continuous discharges, of the heavier ordnance. In the face of such everyday facts, of what avail is it to say that the French rifling does not cause any heavy guns to burst explosively "on service" when no such guns have ever been employed "on service"; or that the French rifling answers very well for present purposes, when the present purposes of training men in profound peace are not what our magnificent guns are built for, but to endure the stern realities of a maritime war; or that so many technically said to be in "the service" but which are never loaded with anything stronger than oil and tow or white lead and tallow, remain undamaged; and that the cemetery of suicides at the naval arsenal is filled with French rifled guns fired at Shoeburyness and at Woolwich, which, in official language, are said not to have been in the Service, these being the only guns which are subject to frequent discharges. All this may be quite true, without effecting the question that the premature bursts of the 400 lb. shell of the *Hercules* and at Shoeburyness, which disabled their respective 18 ton guns, are only links in a whole chain of faults traceable to "the disposition to admit" of the