Modern Ordnance.

GUNS OF THE FLEETS.

By an English Artillery Officer.

The present epoch in the manufacture of ordnance may be said to have begun in 1854, when rifled guns and elongated projectiles came into use. Since then the tendency has been rapidly upwards. Every demand of the fighting services for weapons of greater shell power and longer range has been successfully met by the gunmakers, and we have not yet nearly reached the limit of possibility. The improvements in metallurgy and the technique of manufacture have rendered possible many things which half a generation ago seemed entirely beyond attainment. One of the most recent advances in metallurgic science has been the introduction of tungsten steel, which has enabled the German gun and armour makers to reduce the weight of metal employed by nearly twenty per cent. Strangely enough, this alloy has so far been ignored by the British Admiralty. The Germans have been much more alert than our own people, and the entire output of the wolfram mines of Portugal, which are owned by a British company, has been purchased for more than a year ahead by Germany.

The German eagerness to purchase this mineral has recently become somewhat remarkable, and practically every pound that comes upon the market goes to Germany. It is reported that nine inches of tungsten (wolfram) steel armour-plate is equal in resisting power to twelve inches of the nickel-steel plate used in the British service, and this is the material which Krupp's and the other German metal works are turning out with feverish haste. The hardness and toughness of this steel fits it peculiarly for gun-making.

RECENT ADVANCES.

It is difficult to realise the advance that has been made in death-dealing implements within the lifetime of persons now living. In Nelson's days ships fought side by side, and even fifty years later, when rifled guns began to come into use, a thousand yards was considered the extreme range at which it was considered advisable to engage the enemy. Contrast this with the 12,000 yards at which the Russo-Japanese fleets opened fire, while the critical part of the sea battles of the war in the Far East were fought at a distance of 7,000 yards. The ships which can hit the heaviest and the most accurate blows at these extreme ranges are the vessels which will win in the naval battles of the future.

Up to 1900 the 12in. gun of 40 calibres (that is, 40ft. long) was considered to be the utmost that was necessary for ships of war. The length of the weapon was then increased to 45, and finally to 50 calibres, with a muzzle velocity for the projectile of from 2,400 to 3,000 foot-seconds. In 1910, when Germany proposed to adopt a 12in. gun, greater shell power was demanded by our own Fleet, and the 13.5in. of 50 calibres was produced. Now the 15in. gun has been tested and perfected, though so far it has not been mounted on any ships.

BRITISH VERSUS FOREIGN GUNS.

There is one feature of British-made naval guns which the foreign gunmakers profess to regard as rendering them inferior to those of Germany and other Powers. They are said to be heavier for the same calibre and weight of projectile. This is, to a certain extent true, but it has compensating advantages. The British guns are much stronger, and an equally valuable result is that because of their greater weight the recoil energy is less. This enables the mountings to be made of a lighter pattern, so that what is lost in the gun is more than made up in the mounting. There is also this further advantage, that the weight of the gun is so disposed as to bring the centre of gravity as near the breech as possible. By this means the radius of the gun is reduced to the smallest dimensions, with a corresponding reduction in the size of the turret and the amount of armour necessary to protect it. The net result, therefore, is that the extra weight of the British naval gun, which foreign makers profess to regard as a disadvantage, is more than compensated for by the reduced weight of the mountings and turrets.

The United States coast-defence gun of 16in. calibre, with a shell of 1,1301b., has only a penetration in wrought iron of 31.8in. The American 12in. gun has a penetration of 52in. Of course, the destructive effect of the bursting charge of the huge 16in. shell on board ship would be much greater than that of the smaller projectile, though its actual energy and penetration of armour are much less. In some of the German coast-defence fortresses 12.01in. guns are mounted, for which a penetration of 53in. in wrought iron is claimed. It is undoubtedly a very powerful and effective weapon. The largest gun at present made is the 18in. gun, 60 tons weight, firing a 2,000lb. shell, with a muzzle energy of 70,185 foot-tons, manufactured at the Bethlehem Steel Company's works, Bethlehem, Pennsylvania. Some of these guns are said to be mounted in the sea defence of San Francisco, and a 20in. gun is said to be in contemplation for coast defence. For land works there even these monsters may be exceeded. The resources of modern metallurgists and steelmakers are capable of producing 24in. guns, but weapons of that size would certainly not be carried in ships.

THE LIFE OF A BIG GUN.

The "life" of modern high power guns is short, owing to the terrific energy and excessively high temperatures developed by smokeless powder. The intensely heated gases resulting from the combustion of nitro-glycerine and nitro cellulose powders may wear away the interior of the bore, so that after a comparatively few rounds there is great loss of power, and the shooting becomes inaccurate owing to the destruction of the rifling. In our own 12in. guns the effective "life" is about 150 rounds with full charges. After that the inner, or "A" tube, must be replaced. Of course most of the practice carried on from these costly and short-lived weapons in peace time is done with half-charges, of which 16½are calculated to be equivalent in wear and tear of one full charge.

One peculiar effect of the intensely hot powder gas on the steel of which the gun is made is to harden it to a very considerable extent, so that once a gun has been fired it is practically impossible to carry out any mechanical operation in the bore except grinding with an emery wheel. When the smokeless powder charge in a modern gun is ignited it burns with great fierceness, liberating large volumes of gas at a very high temperature, and producing great pressures in the bore. This intensely heated gas rushes through the bore at immense speed, and washes away the solid steel as a current of water carries away the sand on the bed of a stream. That the action of the gases is purely mechanical, and is not due to any melting effect, is shown by the fact that at the end of the powder chamber, where the temperature is highest and is continued for the longest period, but where there is no rush of gas, there is practically no erosion noticeable, even after a large number of rounds has been fired. The erosion is greatest in that portion of the bore immediately in front of the powder chamber through which the whole volume of the gas pours when the charge is ignited.

The rapid destruction of the bore of the gun from this cause is one of the most serious factors in connection with heavy artillery. It renders necessary the provision of a large reserve of guns to replace those which would be speedily worn out during the war. During the conflict with Russia the Japanese were unable to replace some of their guns which had become worn out in this manner, and at the battle of Tsushima Strait the shooting was very erratic. Some of the Russian survivors of the battle described how they watched the big 12in. shells coming towards them tumbling end over end in the most extraordinary fashion, and clearly indicating that the rifling of the guns from which they were fired had been completely eroded. Fortunately for the Japanese, the extremely sensitive fuses used by them almost always caused the shells to explode when they fell, and the Russians sustained heavy losses from these erratic "portmanteaus," as they termed the badly centred projectiles.

SUFFICIENT REASON FOR REFUSAL.

Clerk: I'm afraid I can't let you have that drug, sir.

Customer: Why not? Do I look like a man who would kill himself?

Clerk: Well, I wouldn't go so far as to say that, sir; but if I looked like you I should be tempted.