is considerably overestimated. These chiefs leave to-night, under guard, for Cheyenne Agency. *via* Fort Buford. These tribes broke from Sitting Bull immediately after the fight, he going with a few lodges toward Fort Peck. Too much credit cannot be given to General Miles for his energy and ability in this whole campaign.—*New York Herald.*

The Italian 100-Ton Gun.

Not one moment too soon have we made our English eighty-one-tun guns, and even now the Italians are more than abreast of us, for they have launched one ship—the *Duilio*—prepared for one hundred-ton guns, and another—the *Dandolo*—is in course of construction at Spezia. One sample gun has been supplied by Sir William Armstrong & Co.; seven more are in the various stages of completion at Elswick. The *Duilio* and *Dandolo* will each carry four of these guns, in turrets, and become the most powerfully-armed ships in the world for the time being.

The problem set before Sir W. Armstrong and his partners by the Italian Government was to build a gun with all its appurtenances, capable of throwing a 2,000-pound shot with such a velocity as would enable it to strike an ironclad with a force of 490 tons per inch of the shot's circumference. This would need only an initial velocity of about 1,350 feet a second, and there can be no doubt that such a velocity will easily be attained, and even considerably more; for since the gun was designed, experiments have shown that the power of any existing gun can be much increased by enlarging the powder-chamber, and there is no reason why the 100-ton gun should be an exception to the rule. However, the actual bargain has first to be fulfilled, and we shall now see what means have been taken to produce a force equal to that required *to lift 25,000 tons* through a space of one foot. Let us take the apparatus in order. First in importance stands the gun itself. Until quite lately a great difficulty stood in the way of artillerists. In order to load a gun within *the limited* space of a turret, the piece must be short; but short guns do not retain the projectile long enough to receive the full effect of a powder charge. The velocity was, therefore, lower than ought to be given in proportion to the charge and consequent strain on the interior of the gun. To obviate this difficulty, one of the members of the Elswick firm—Mr. Rendel—invented a method of loading the piece outside of the turret, but from below the deck, out of danger. His designs have already been carried out in the *Thunderer* and have answered admirably. We shall come to them presently. Meanwhile we arrive at the point that a long gun can now be worked in a turret without exposing a single man to the enemy's fire. The 100-ton gun is no less than 35 feet long—that is, only 6 feet short of half the length of a full-sized lawn tennis ground. The length of the bore is 30 *feet* 6 inches, and the interior steel tube is in two pieces. The diameter of the breech is 6 feet 5 inches, and the thickness of the metal round the powder charge is 30 inches. The calibre of the gun is 17 inches, and the grooves for rifling number 27. They are shaped like those of the old breech-loading Armstrong guns, and have a twist which rises from one turn in 150 feet at the breech to one turn in 50 feet near the muzzle, continuing at that inclination to the end of the bore. The gun is not yet chambered, but probably may be hereafter. The Palliser shell thrown by this monster weighs 2,000 pounds, or not far short of a ton, and stands 4 feet high. It is rather sharper pointed than the usual shape, and has no studs or projections of any sort on its body. The method of giving it the rifled spin in the bore is peculiar, and produces one of the best effects claimed as the birthright of breech-loading guns, namely, closing up all windage. A cup of copper, with a little zinc in it, fits on to the base of the shot, which is grooved to hold it fast. When the gun is fired the first pressure of the gas produced drives the cup forward, fills up the grooves of the gun, and, gripping the shot tight, forces it to spin with the velocity impressed upon it by the maximum inclination of the grooves—namely, one turn in fifty feet of its progress. The powder is the same as that used with the 81-ton gun; each grain has a thickness of one and a half inches, and, when all the details are settled, will probably weigh about 350 pounds.

Now, such a mass as 100 tons of metal leaping backwards with a recoil from the effort of throwing a shot of 2,000 pounds, with a high velocity, is a terrible power to deal with in any case—much more when it has to be stopped before it has moved four feet. The mere lifting such a gun is too much for any chains, so that a crane, with a solid rod to hang the gun to, had to be devised. How, then, is the monster to be controlled when in the midst of his violent recoil? And how is he to be pushed forward again? By the simplest and commonest agent—water. If water be confined in a tube without means of escape, it will stop anything so long as the tube does not burst, and if it be allowed, but small means of escape, it will check the action of any force and delay it while the liquid is taking the necessary time to escape. On the other hand, if water be pressed through a small tube, say one inch square, by a force equal to the weight of one pound, so that it rushes into a large tube, say one foot square, it will act on any opposing body with a force equal to one pound multiplied by the number of square inches which there are in a square foot—that is 144. Thus, a pressure of one pound in the small tube may be made, speaking roughly, to move 144 pounds in the large tube. These two principles of the science of hydraulics have been brought to bear on gun carriages. The recoil is checked by water in a large tube unable to escape except through small holes, and then under the pressure of spiral springs, which have a force of over fifty atmospheres and make the exit difficult. The gun is moved forward, elevated or depressed *by forcing* water through a small tube into a large one, where it acts with greatly multiplied force on the weight to be moved. Once accept this *principle*, and all becomes easy and *simple*. No more complicated apparatus of wheels, ropes, pulleys and chains. The gun is placed with its trunnions resting in two blocks *of* metal, which slide on fixed beams built in the floor of the turret. Guides prevent the sliding blocks from moving right or left or jumping. Behind the blocks are cylinders which act the part of the large tubes spoken of above—pistons attached to the rear of the blocks work in these cylinders, and can be driven forward by the action of water forced through small pipes into larger cylinders by means of the steam power always available on board turret ships. The breech of the gun is supported on a beam, which again has a hydraulic ram underneath it, so that the breech can be raised or lowered as may be wished—*that is, the gun can be depressed* or elevated. The rear end of the beam pivots vertically on a horizontal pin, and to this spot the breech always comes when the gun is run back, either by the natural *recoil or the artificial running back.* Thus, whenever the gun is *fully* back it must be horizontal, and all danger of its striking the top of the port in the turret is avoided. However high the muzzle may be uplifted when the piece is fired, it bows again to the horizontal position as it comes back after firing.

The next point is the loading arrangements. Think of the difficulty to be overcome. Here is a turret exposed to the fire of the enemy's small arms and shrapnel, and the gun is so long that its muzzle is always outside the turret. Into that muzzle must be a sponge to clean it, a jet of water to wash it, and extinguish any remains of fire left from the discharge, a cartridge weighing at least as much as two heavy men, and a shot, the weight of which falls little short of a ton; and all this must be done quickly with avoidance of all nervousness. A shot must be properly rammed home, lest the gun should be strained or even burst. Here, again, comes to the aid of the artillerist the silent, calm, irresistible force of water. The muzzle of the gun is depressed till it comes opposite a round iron door leading below the deck. The door, which is covered from the enemy's fire by a hood formed by sloping plates of iron, glides back and the head of an enormous sponge appears, carried in front of a metal rod. Swiftly and silently it enters the bore of the gun, lengthening itself like a telescope till it reaches the bottom of the bore, when a spring is touched, a valve opens and a deluge of water rushes from the head of the sponge, extinguishing every possible trace of fire. Obedient to the touch of one man on a handle, the sponge will advance and retire as often as is willed, then withdrawn, leaving room for the cartridge to appear. Cartridge and shot are safe below the deck, each shot with its charge on a separate truck in the magazine, always stowed in readiness for use at the moment of action. A word from the turret causes the truck with its freight of ammunition to be run out on to a small trap door on the main deck. Instantly the door rises, till the cartridge is in the turret between the sponge-head and the gun, which receives it by a short, quick thrust of the sponge-head, now become a rammer. Another short lift by the same power, always water, and the shot is in front of the muzzle. The sponge-rammer then sends home the shot and charge together perfectly steadily, and always by means of the water-power. Before going further, let us mark a peculiarity in the cartridge. It is not solid. A hollow cone of brass runs up from its base to its centre, and near the centre only does the ignition take place through the vent, which is in rear of the gun in the axis line.

Thus we have all the work done by water—hydraulic pressure, as it is called. If the gun has to be run forward, hydraulic pressure at any pressure up to fifty atmospheres is brought to bear behind the trunnion pistons. The same force is applied in front through another small tube if the piece has to be run back. *Only in case of the desperate force of recoil do the springs* come into play, because they hold down the valves with a power sufficient to close the large cylinder during all ordinary conditions of working the gun. A pressure of fifty atmospheres is taken as sufficient for all ordinary purposes, and the *springs* are not moved nor the valves opened till the pressure has become considerably higher. Hydraulic pressure is used to lift the ammunition from the main deck to the level of the fire in the turret, to cleanse the gun, and to ram home the cartridge and shot together.—*London Times.*

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POPULATION VS. PATENTS.—The last annual report of the Commission of Patents embraces a tabular statement showing the number of patents issued during the year to each State and territory, and the ratio between the patents issued and the population. We are indebted to Messrs. Louis Bagger & Co., patent attorneys, in Washington, D. C., for the following interesting data from this table—

The State of New York (quite *naturally, it having the largest population)* received more patents for new inventions than any other State—3,771. Next to New York comes Pennsylvania, with 2,034; next ranks Massachusetts, with 1,846; next Illinois, with 1,098; and next Ohio, with 1,091 patents. But the *proportion* of patents to population, as indicating the seat of the inventive genius of the country, is more significant. In the preceding report of the commissioner Connecticut (the land of wooden nutmegs) led the list; but this year the District of Columbia takes the lead, with one patent for a new invention issued to every 615 of the population; Connecticut having only one patent to every 761 of the entire population. Massachusetts, also in this respect, stands third in the list, the proportion being one to every 787. "Little Rhody" comes fourth, with one to every 913. The least inventive State, as shown by this table, is Arkansas, which received but one patent to every 44,042 of her population.

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GYMNASTIC TRAINING FOR GIRLS IN GERMANY.—Gymnastic exercises for young ladies have been the custom for some time in a number of educational establishments in Germany, and compulsory in all the upper town schools for girls at Berlin. This system is now extended, since October 1, to all the common schools for girls in the German capital. Some opposition has for years been attempted on the part of mothers; but the movement for the better physical education of the female sex is now rapidly spreading. At present, in spite of the obligatory character of gymnastics, nearly one half of the girls can still obtain a dispensation from it through certificates granted at the instance of the mothers. A public display was held a few days ago at Berlin in the gymnastic hall of the town, by one of the educational establishments for young ladies, when the exercises were performed with great precision and elegance. Between the various parts of the programme the girls sang patriotic songs. An agitation is being set on foot now, in connection with the Pestalozzi Society, for holding similar displays at regular intervals, as a part of the public school system.—*London Examiner.*

——It is said that Mr. Henry Irving, the English actor, who makes a specialty of "Hamlet," is one of the few very distinguished and refined looking men on the stage. He is lithe, agile and sinewy, and with this has great dignity of bearing.

DIED.

At West Ham, Essex, Oct. 3, 1876, by the breaking of a blood vessel, THOMAS CARR, aged 87 years.

Deceased was baptized by Elder William Dunbar, and joined the Church in the Island of Jersey, in the year 1849. He died as he had lived, in full faith and hope of a resurrection through the Gospel of Jesus Christ.—*Millennial Star.*