THE GREAT RUSSIAN STEPPES.

In the southern part of Russia lie vast tracts of country, uninhabited and solitary, save by wandering bands of Tartars; these are called "steppes," a name by which all plains and sterile flats in Russia are designated. They form one of the distinguishing features of that wild and semi-civilized empire. Dr. Hamm, a celebrated European scholar, has recently journeyed over them and embodied the results of his travels in a most interesting volume. The emotions which thrilled him upon viewing those plains for the first time, and their appearance he thus describes: "What a prospect! the sun had just appeared on the horizon and the steppe extended, measureless, in all directions. It produced the same effect upon me as I felt when standing for the first time upon the deck of a vessel with nothing but the sea and air around; the few houses were all that reminded me of man in the great, silent desert in which the eye lost itself. The brownish verdure was here and there rippled by the breeze, and the sparkling dew drops on the grass resembled the spray of the sea. In lieu of sea-gulls predacious birds circled above their hunting grounds, but there was no other living thing far or wide; in vain did the eye seek an object on which to rest, the plain stretched out monotonously in all directions; not a bush, a rock, a tree or smoke from a friendly chimney, revealed the presence of man; only steppe and that alone. The effect upon the mind is awfully grand, nor does it pall upon one with the daily contemplation of it." The whole of Southern Russia is supposed to have been at one time a huge lake, whose shores were the Hindu kush and Carpathian mountains. When this mighty sea broke its way out, it left behind a mass of slime which is now known as the Tchernazon or black earth, lying upon mummular limestone at a depth varying from a few inches to fifteen feet, and from which region the greater part of Europe is supplied with cereals. Moisture is however, an important factor, as the sun soon burns up the young crops if they have not been previously saturated with the spring rains, in the latter case vegetation bursts forth with unparalleled luxuriance, the whole steppe is covered with grass often reaching as high as a man's head, out of which grow flowers; these are called steppe gardens, and the traveler plucks with delight plants growing in the open air, which at home pined in hot-houses. By the side of these, however, through those freaks which nature seems to delight in, grow the most noxious weeds. Such is the burian, a generic title for all rank and useless growth, the steppe-needle, penetrating through the skin of cattle into their hearts, so that they perish miserably; the dumb-weed, which causes lameness in horses though harmless to oxen; the cholera-burr, which appeared with that plague and for which it is said to be a remedy, and lastly, the common salt-wort which is often rolled up by the wind in large masses, and preserved by the natives for fuel. These weeds spring up in some places almost as high as trees. Graceful, flowered-covered torch-weeds grow among them, while foxgloves, artemisias and other blooms produce a virgin forest on a small scale. Here the she-wolf has her lair, and hither she flies to hide her progeny from their numerous foes, at the head of which is their father; here too, is the uncanny schelto-pusik, a species of lizard, whose size and form startle the traveler who has heard of poisonous snakes in these wilds; and though the steppe appears empty and barren of life it contains abundance of it. Long trains of ants cross it in all directions, bees, flies and other insects flit about, while huge spiders spin their treacherous webs from stalk to stalk till whole patches are covered with their nets; locusts and grasshoppers flit through the verdure; moles and marmots sun themselves before their burrows, the hare comes leaping up devoid of fear, and hawks and kites dart along eagerly seeking their prey. All these Arcadian sights and sounds and many more the Doctor describes. His days were spent in the chase, or else in surveying districts devoted to the herds, of which he says, speaking of horses: "One almost fancies themselves on the South American plains when a tabun of half-wild, steppe horses comes dashing along, driven by a Tartar half-bred, clothed in the garb of raggedness; in front the leader charges on, despising danger. The colts, bounding from side to side, receive warning bites to keep them from straying, and the wild eyes and tails reaching to the ground perfect the impression received." Dr. Hamm also depicts with graphic skill the arts practised in taking horses, which are similar to those in use among our own herdsmen in the West, and alludes to the vast herds of whitish-gray oxen which roam those wilds, which, while they put on a bold front and are fierce-looking, yet bound away like stags upon the slightest appearance of danger. The chief staple of the steppes is wool, of which he says: "A German colonist who began a short time since with no possession but his strong arms and head, has now 300,000 merinos. As each fleece averages five pounds unwashed, owing to the want of water in that country, this man has an income of 225,000 silver roubles (a rouble being seventy-five cents) from the flocks alone. The native sheep is the fat-tail, a descendant of the Syrian breed. Unfortunately, sheep-breeding here is attended with many dangers not known in Europe, the most terrible of which are the snow storms. Unless the shepherd is weather-wise enough to foresee them, the most awful storms suddenly burst upon him, the air is full of driving lumps of snow which fall with a terrible rattle, depriving the boldest of his senses; under such circumstances there is no resource but to sit down and wait.

"The sheep do not possess that patience of which they are the symbol; the wind, the snow and the blows drive them mad; their fleeces become so loaded that they freeze hard, and their eyes so hidden that they become blind. At such times they can be no longer checked, and they speed away over hill and dale until the rivers, into which they have dashed in their mad career, become dangerously swollen with their bodies. Even when their better star brings them up against some wall they are not saved, if the storm lasts for days, as it does at times; for if the shepherd finds them, which is very doubtful, there is no way of removing them but to carry them one by one away, and the places of refuge are often miles distant. In addition to this the wolves annually carry off large numbers.

"Huge fires are lighted on these steppes by the peasants for the purpose of destroying the burian, which roll over the surface destroying everything green in the way. After such visitations the land gapes with a thousand cracks, and the blackened skeletons of plants are everywhere visible. The rains finally wash them into the earth, and with the return of spring the wasted plains grow bright again with verdure which beautifies the landscape and restores the herds that have suffered during winter for want of it. The locusts roam over these tracts in numbers appalling to contemplate, and in a short time lay waste everything before them. The people rally in great force to frighten them away, even felling the green corn to save it; but so fierce is their onslaught that but little is rescued from them."

With this brief mention we close our extracts, regretting only that our space compels us to part so abruptly from a pleasant and congenial traveler.

STRENGTH OF GUNS AND HOW TO CAST THEM.

The *Journal of the Franklin Institute* contains an account of an important conversation which took place at a late meeting of the Institute, on the subject of the metal, the molding, casting and cooling of large cannon. W. W. W. Wood, Chief Engineer of the U. S. Navy, who was present, stated that very great difficulties had been experienced in the casting of heavy ordnance. It was found that guns made of highly elastic cast iron were capable of greater endurance than guns made of more dense iron possessing greater tensile strength. He had been connected with a set of experiments wherein it was demonstrated by practical tests that heavy pieces of ordnance, the iron of which was capable of withstanding from 39,000 to 40,000 pounds' tensile strain per inch, with a corresponding density of metal, were not capable of the endurance of similar pieces made of iron which did not sustain a tensile strain of more than 17,000 and 23,000 pounds per inch, and which was of less specific gravity or density. In the latter case, one gun sustained, in addition to the proof charge, over 1,700 service charges with no perceptible enlargement except of the vent and slightly furrowing indentations leading to the same. This is certainly useful information on this subject, as it has generally been held that the most dense cast iron was the best for guns of all sizes. Chief Engineer Wood also stated that the accepted theory as to the cause of the breakage of heavy guns was, that in the ordinary method of casting and cooling, the exterior portions on cooling first produced a strain by unequal shrinkage in the mass. Captain Rodman's method of casting large guns hollow, and cooling the interior with a stream of water passing through the hollow core, is intended to obviate this evil, by equalizing the shrinkage on the inside and outside. Captain Dahlgren's method to obviate the evil consisted in casting the gun more nearly in the form of a cylinder, then turning off the additional metal on the exterior which had caused the strain in unequal shrinkage, by having been first cooled in the mold. His guns were cast solid, then the interior part, supposed to be the weakest, is bored out. The new 15-inch Dahlgrens for our armor-clads are cast hollow and cooled upon Captain Rodman's principle, but their rough form approaches to that of a cylinder 38 inches in diameter at the muzzle, which is afterward turned off to 26½ inches, as described on page 393, Vol. VI. (new series) SCIENTIFIC AMERICAN. All the English 13-inch cast-iron mortars used in the bombardment of Sweaborg burst in two equal halves after an average of 120 rounds. The age of a gun has much to do with its durability; the older it is, the greater number of charges will it withstand before bursting. Chief Engineer Wood believes that the great cause of bursting in heavy ordnance is owing to unequal expansion between the interior and exterior portions of the gun when being rapidly fired. The interior is first heated before the exterior acquires a corresponding temperature. A strain by such unequal temperature is exerted upon the gun equal to the difference of expansion due to the difference of elongation of the masses of iron. The gun which exploded on board of the *Naugatuck* afforded proof for entertaining this opinion.

Mr. John W. Nystrom, who was present, stated that it was a bad practice to cast a gun solid and turn off several inches of the exterior afterward, according to the method adapted for the smaller Dahlgren guns. The strongest part of the gun is thus turned off. He had made experiments in Russia with cast-iron bars one inch square and two feet long. One bar was cast the correct size and the other cast two inches square, then planed off half an inch on each side reducing it to one inch. The lateral strength of these bars was carefully tested, when it was found that the one which was not planed was 25 per cent stronger than the other. He had made cast-iron rollers for rolling angle irons, which were so correct that when taken from the molds and centered in a lathe there was but a mere trifle of work to be done by the tool. The mold was turned in the flask with an iron sweep of the correct shape of the roller, and no allowance made for turning the roller when cast. Since his return from Russia he had seen similar rollers molded with wooden sweeps at Phœnixville, Pa., and about ⅜ths of an inch was allowed for turning off in the finishing—just enough to take away the most valuable part of the roller. The mold should not only be formed by an iron sweep but the blocking and finishing ought to be accomplished with the same instrument, and the finishing of the roller could afterward be effected by simply grinding with emery, and thus the strongest part of the casting retained. This is the principle upon which Mr. Nystrom proposes to mold and cast guns. He believes that rifle guns may be cast so perfect that they can be taken direct from the foundry and used in active service. He would employ Rodman's process of cooling the gun from the core for the purpose of hardening it, and would then cool the entire gun by the mode in use for annealing the Whitney car-wheel by allowing one day for cooling each inch of caliber or 11 days for an 11-inch gun. When the gun has cooled down to 400° Fah., it should be lifted from the pit, the muzzle closed with a wooden plug to prevent the air conducting away the heat from the bore, and the outside should be cooled with water to the temperature of the atmosphere. No water should then be permitted to get inside. The object of this last cooling operation is to give the metal in the bore a slight tensile strain, while that on the outside is slightly compressed. When a gun thus made would become hot by firing, there would be the least strain in the metal by