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NEW YORK, SATURDAY, MAY 18, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE EXISTENCE OF BODIES SMALLER THAN ATOMS—THE CORPUSCULAR HYPOTHESIS.

If Prof. J. J. Thomson's corpuscular hypothesis be absolutely demonstrated, our ideas in regard to chemistry will be revolutionized. In a recent lecture before the Royal Institution he selected as his subject "The Existence of Bodies Smaller than Atoms." He briefly referred to work which had been done by others in theory and practice, in order to determine the size of an atom. One method of doing this was by ascertaining the charge of electricity which an atom carried during the process of electrolysis, and from the charge to calculate the mass. The experiments of the lecturer were made with the view of ascertaining the mass of small particles which carry an electric discharge through attenuated gases. The next experiment was made with the object of ascertaining the mass of all the particles used to carry the charge and also their number. For this purpose some of the experiments of Mr. Wilson on the sudden expansion of a gas saturated with moisture were used. He found that a cloud was not produced by the sudden expansion if the air was quite free from dust. It was also found that if either the dust or the charged particles of gas were present a cloud was formed. The total quantity of moisture in the cloud can be calculated from the expansion. Some experiments of Prof. George Stokes were then employed to ascertain the volume of each particle. These experiments had for their end the careful determination of the rate at which particles of water would fall, the speed being dependent upon the dimensions. From the formula which Prof. Thomson obtained, he was able to ascertain the size of the particles by observing the time it took for the cloud formed in the tube by a sudden expansion to fall. Once he knew the size of one particle and the total mass, it was not difficult to make calculations. He concluded that the small particles carrying the charges of electricity were only one-thousandth of the size of an atom. These experiments were all made with discharges of negative electricity. It was also found that these small particles negatively charged were given off from incandescent matter and from radium.

Prof. Thomson expressed mathematically the laws of Becquerel and cathode rays and then showed from his equations that the rays possessed momentum and, therefore, must have mass. When he first enumerated his theory to the scientific world three or four years ago, it was received with considerable incredulity, but has now been adopted by many scientists. He regards the chemical atom as made up of a large number of similar bodies which he calls "corpuscles." A normal atom forms a system which is electrically neutral. The electrification of a gas consists in the breaking off from the atoms of a few corpuscles. The remainder of the atom is positively electrified, and the more corpuscles that are broken off the stronger is the attraction that binds the remainder to the atom.

Prof. Thomson has calculated from the results of his experiments on very different substances that the mass of a negative corpuscle is about the five-hundredth part of the hydrogen atom. The subject is treated at considerable length in the current issue of our SUPPLEMENT.

PROPOSED ABOLITION OF THE ARMY TRANSPORT SERVICE ON THE ATLANTIC.

We greatly regret to learn that the United States Army Quartermaster in this city has received notice from the War Department to close contracts with the steamship companies running between New York and the West Indies, for the transfer of men and material between the United States and Cuba and Porto Rico. The reason given for this radical change of policy is, that the steamship companies concerned are said to have offered rates to and from the West Indian military depots, which are lower than the actual cost for similar service as carried on by the regular army transports. This statement, however, is not authenticated, and we seriously doubt its truth.

If our readers turn to the articles published in the SCIENTIFIC AMERICAN for March 23 and April 27, 1901, giving an account of the army transport service on the Atlantic and Pacific, they will find some statement of the costs of operation as compared with the cost of similar service if carried on by the civil lines. A recent voyage of the "Crook" from New York to San Juan and return cost $9,761.39, whereas the cost estimated at the current rates of the civil lines of steamships at the time the voyage was made would have been $19,907.00, a clear saving of $10,145.61. Another voyage of the "Crook" between the same ports would have cost $26,419.28 if the men and supplies had been carried by the regular lines, whereas the actual cost by the army transport vessel was $14,062.93, a clear saving of $12,356.35. In the presence of such figures as these one is filled with very natural astonishment on learning that it is proposed to abolish a system which has proved itself so highly economical, and to transfer the whole of the service into the hands of civil corporations. The change may well prove to be highly profitable to the latter; but the profit will be at the expense of the government, and the whole proceeding will savor of that paternalism and pseudo-benevolence, the last vestige of which we had hoped was disappearing from our national affairs.

The question of the abolition of the transport service, however, is to be deprecated on higher grounds than that of mere finance. One of the great lessons which we have learned, or rather which we ought to have learned, during our war with Spain, a lesson, by the way, which has received strong indorsement in the naval transport operations of the South African war, is that army transport service on the sea is second only in importance to army transport service on land, and that it is just as essential that the army should have a fleet of its own furnished with accommodations suited to its particular needs, as it is that it should have its own special wagons and packing outfit for transportation on land. If we are to abolish army ships and put up with the haphazard accommodation of private steamships, let us be consistent and abolish army wagons, cars and what-nots and benevolently call in the farmer and huckster to help us out with whatever vehicles may be on the farm or in the stable, much after the fashion of poor old Braddock when he went to his defeat in colonial days. As a matter of fact, the needs of the army transport service are so special that it is impossible for any private steamship to meet them. Proof of this is shown in the fact that when such steamships have been purchased for the transport service, it has been necessary to spend about $400,000 in the mere work of refitting them with the necessary bunks, lavatories, hospitals and accommodations for provisions and freight.

Nor must we forget the most powerful argument of all in favor of a separate service, namely, that since wars come swiftly and with but little warning, a fleet of troopships specially fitted for the conveyance of an army and its supplies, and available for duty at any time that it may be called upon, is an imperative necessity. For proof of this statement, it is enough to refer back to the precipitate scramble which occurred in scraping together enough ships to carry our army to Cuba, and to the pitiable sufferings to which the invalided troops were subjected on account of the insufficiency and unfitness of the extemporized troopships which brought home the sick and wounded soldiers.

Looked at from any and all points of view, there are very positive advantages in the possession by the navy of a large fleet of thoroughly equipped transports, with as many of them on the active list as will meet the needs of the army when it is on a peace footing, and the rest in reserve in such a state of readiness that they can be rushed into service at a few days' notice. Indeed, so firmly are we convinced of the wisdom of this policy that we think the construction of ships designed and equipped specially for this service is as necessary to efficiency as the construction of ships of war for line of battle and for scouting on the high seas.

A NEW TYPE OF COAST DEFENSE GUN.

The Gathmann gun, a detailed description of which will be found on another page, was built in consequence of an appropriation made by Congress in March, 1899, and was proved at the Bethlehem Steel Company's proving grounds in the summer of 1900. The Bethlehem Steel Company undertook to design and build the gun complete—the problem set being to produce a gun weighing about 59 tons which would fire a projectile weighing 2,000 pounds with 1,800 feet velocity, and would safely withstand a chamber pressure of 18,000 pounds per square inch.

In a recent communication to this journal Lieut. Meigs, Ordnance Engineer of the Bethlehem Steel Company, informs us that the ratio of the muzzle energy of this gun at 2,200 feet velocity, which the gun can safely reach, to its weight is to that of the ordinary type of gun usual in this country and abroad as 125 is to 100. That is to say, for a fixed weight of gun this one is about 25 per cent more economical in its performance, that is, in its rendering of muzzle energy, which constitutes the destructive power in projectiles. To look at it in another way, this gun will have great power upon armor or any other target in consequence of the weight of its projectile, which is very great as compared with the weight of the gun. Its *smashing* or *racking* effect, to use a term which was often met with in artillery matters at the time our monitors were built in the civil war, is very great.

The gun is now at Sandy Hook, and at its last session Congress made an additional appropriation which will enable the inventors to purchase a number of projectiles for the further proof of the gun. For while the gun is interesting as above indicated, owing to its large bore for its weight, the primary intention of its inventors is to use it as a torpedo gun. The projectile will carry 500 pounds of guncotton or other high explosive, and it is believed that, upon detonation of so large a mass of guncotton, even outside of a fort or ship, great destruction will ensue. It is now to be shown that a charge of this size can be safely landed on a structure which it is intended to destroy, and there completely detonated by the action of the fuse. Even, however, if the danger of firing so large a charge from a gun prohibit its use, or if so large a charge cannot be completely detonated in close contact with a target, which is necessary for the full effect of the explosive, it still remains that the Gathmann 18-inch gun is an extremely interesting one; for the reason that, for the weight of the gun, it strikes a more destructive blow, except possibly at very great ranges, than existing guns. If the greater blow it strikes includes practically all distances at which ordinary targets can be hit at all, which distance artillerists will place perhaps between 4,000 and 8,000 yards, then these large-bored guns have much to recommend them.

"SHAMROCK" AND "CONSTITUTION."

Limitations of space prevent our offering for comparison with the views of "Constitution" which will be found on another page, some photographs of "Shamrock," taken as she was starting from the Clyde. These views, which give an excellent idea of the lines of the challenger, will be found in the current issue of the SUPPLEMENT. If our readers compare the two boats, they will agree with us that the models of the yachts, as far as can be judged from their above-water lines, are radically different. The beam of "Shamrock," at least in the deck-plan, has been maintained to well abreast of the mast, while the boat begins to narrow in from slightly abaft the chain plates and is drawn out into a stern which certainly does not measure more than 6 feet across the taffrail. The photographs also show that her freeboard has been reduced to something less than four feet amidships, so that while Mr. Herreshoff has been increasing the height of his topsides, Mr. Watson has been going to the opposite extreme. What renders this more curious is the fact that, judging from her lines, the Watson boat will have less initial stability, and would, therefore, seem to require the deeper topsides to lie down upon. Another curious fact brought out by the photographs of the English cutter is that the sail-spread will evidently be much smaller than has been reported, and certainly smaller that that of the American boats. The value of the time-allowance thus gained will depend entirely upon the strength of the wind in which the races are sailed.

NEW ELECTRIC TRACTION SYSTEMS IN EUROPE.

Among the numerous systems of electric traction which are being installed in Europe may be mentioned the following: Bilbao, Spain, is to have a traction system, and the lines from that city to Durango and Arratia will be transferred to electric traction; the material has been ordered from the French Thomson-Houston Company. The energy for operating the lines will be supplied by two hydraulic plants which will furnish current at high tension, and this will be carried over a distance of 10 miles to the sub-stations, where it will be transformed to direct current at low potential by rotary converters. The total length of the tramway lines is to be 11 miles, most of which is double track. In Sicily a number of installations are in projection. Up to the present none of the cities of the island are provided with electric tramways. Palermo will be one of the first of these to have a lighting and traction plant; this is being installed by the Schuckert Company. The Allgemeine Company, another large German firm, is soon to undertake several important projects in Sicily. The Helios Company, of Cologne, has already installed a 2,000 horse power plant at Catania, on the