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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.

AGRICULTURE THE TRUE SOURCE OF OUR WEALTH.

It is believed by Mr. James J. Hill, whose life work of developing, by the provision of transportation, the unoccupied lands of the United States, has peculiarly fitted him to speak authoritatively on the subject, that the most serious economic question of the future will be to provide the food supply of the 200,000,000 people who will be seeking for homes and work in the United States by the time the present century has run half its course. In the course of an address at the opening of the Annual Agricultural Exposition of the Minnesota State Fair Association, Mr. Hill stated that no nation in history was ever confronted with a more pressing question than that of providing for the 50,000,000 of additional population which, within the next twenty years, must be housed and given employment; furthermore, he believes that the one and only adequate resource before us is the productivity of the soil. In solving the problem, the first fact which must be brought home is that of our dependence upon the cultivation of the soil; for Mr. Hill considers that agriculture, in the most intelligent and comprehensive meaning of the term, is something almost unknown in the United States. The government estimate of the value of all farm products last year was $6,415,000,000, which, after it had been discounted for high prices and current favorable conditions, would be represented by an average total of about $5,000,000,000. Government statistics also state that of the lands taken up in the United States, a little less than one-half is under cultivation. Were the other half utilized the output of the soil would be practically doubled, even if no change were made in the present methods of cultivation. But by directing surplus population, not, as now, so largely into the cities, but to the soil, and by the adoption of the advanced methods of cultivation used elsewhere, the present minimum yield would be so largely increased, that we could add ten billion or even fifteen billion dollars to the national wealth.

The methods by which the yield of the soil could be increased are three, and they are well known though but little practised. First is the rotation of crops, which is so little followed that the majority of our farmers have been raising, year after year, the same crops on the same land, until the soil is all but exhausted. The second method of increasing the yield is the liberal use of fertilizing material, and the third and most interesting of all is better tillage.

As showing what intensive cultivation will do, Japan is quoted as supporting 45,000,000 of people on ten thousand cultivated square miles, aided by the food products obtained from the sea; while a market gardener of Paris is quoted as declaring that all food, animal and vegetable, required for 3,500,000 people of two great departments of that city could be grown by methods already in use on the 3,250 square miles of garden surrounding the city.

What is needed is a return to conservative and economic methods, a readjustment of national ideas which will place agriculture in the very forefront. The present tendency to regard manufacture and trade as the only forms of progressive activity, and the false notion that riches can be built upon these at the sacrifice of the fundamental form of wealth production, must give way to a recognition of the fact, once so well understood, that the soil is the foundation of all wealth and prosperity. Acknowledgment of this principle will have the double advantage of vastly increasing the agricultural output of the country, and at the same time of checking that deplorable migration from the country to the city, which has lowered the percentage of agricultural labor to the whole body of persons engaged in gainful occupations in the United States from 44.3 in 1880 to 35.7 in 1900.

A SUGGESTED CURE OF GUN EROSION.

We direct attention to a letter on gun erosion published in another column from a correspondent who disagrees with the position taken in our editorial of September 15, in which we stated that the erosion is probably due to the escape of gases past the base of the projectile. Our correspondent is of the opinion that erosion is due to the fusion of the metal of the bore by the great heat of the powder gases, and his argument will well repay the perusal. While we are not prepared to state that this cause plays no part whatever in erosion, we are still of the opinion that the major part of the damage is due to what we may call the abrading effect of the white hot gases moving at enormous velocities past the projectile. We are well aware that our suggested remedy of providing more perfect sealing at the base of the shell is not by any means new; but we are inclined to believe that the failure of previous attempts has been due to the incomplete or inadequate means employed, rather than to a misconception of the true cause of the difficulty. That the destruction of the metal is due to the abrading effect of the gases is suggested, furthermore, by the fact that where leaks occur in the compressed air mechanism of the torpedo, it is found that the enormous velocity of the escaping air cuts away the metal, gradually enlarging the orifice. The fact that erosion is present throughout the full length of the bore (though in decreasing amount toward the muzzle) is due, we believe, to the fact that the copper rifling band, as now made, is too small, too narrow, for its work. If a band 50 per cent, or even 75 per cent wider than the present band were used in conjunction with a suitable obturating pad at the base of the projectile, the pad would prevent the initial escape of gases until the rifling band had been driven well home into the rifling, after which the larger band would, we believe, take care of the gases until the projectile had left the gun. The question, however, cannot be decided by theorizing on paper, and we believe that it would well repay the cost of thorough experimental investigation at the proving ground.

The suggestion of our correspondent that the best solution of the difficulty lies in the use of high-speed steel for the material of the inner tubes is well worthy of consideration, and we commend it to the investigation of our ordnance experts. No objection could be raised on the ground that steel of this quality would be liable to fracture, for the reason that the method of building modern guns, either by shrinking on hoops or winding on wire under great tension, throws the tube into a state of initial compression so great that even the powder pressures are unable to overcome it, and the tube is never, at least in the wire-wound guns, subjected to a tensional stress. The cost of making a test on a gun of small caliber would not be great, and in view of the rapid loss of accuracy and short life of modern breech-loading guns, the higher cost of the high-speed steel would probably not be found to be an insuperable objection to its use.

WIRELESS TELEGRAPHY AND TELEPHONY IN THE JAPANESE NAVY.

A representative of the SCIENTIFIC AMERICAN was recently accorded the privilege of an interesting talk with Dr. Shunkichi Kimura, professor in the Imperial Japanese navy, who is on his way to Europe to attend the coming International Wireless Telegraphic Congress at Berlin. Dr. Kimura is one of the foremost experts on this subject, in Japan, and the wireless telegraphic system employed during the late war and in use to-day by the Japanese navy is of his invention. All the methods of wireless communication extant at the present time are based upon the same principle, and the various systems are differentiated principally in detail. Hence it will be understood that Dr. Kimura's invention, as he himself says, was principally of a constructive nature; but nevertheless, as such, it was considered by the Navy Department to possess so many distinct advantages that it was adopted in all its details. The German "Telefunken" Company, the exploiter of the foremost German system, has claimed that Dr. Kimura's invention is an infringement of its own patent rights, and the matter has been taken to court, though no decision has as yet been arrived at.

In 1900 the Navy Department of Japan appointed a research committee for the purpose of investigating wireless telegraphy and telephony, and of this committee Dr. Kimura was a member. In 1903 a new laboratory for test purposes was erected at Yokosuka, at the Naval Ordnance Depot. The Japanese government conducts a similar laboratory under the Department of Communications for like investigative purposes, but the two laboratories are quite distinct and, unfortunately perhaps, there is no correlation of the work carried out in them. Considerable research apparatus was imported from England, Germany, and the United States when the Japanese government first took up the subject of wireless communication. Dr. Kimura in beginning his work at the Naval Laboratory, was enabled to study receiving and transmitting apparatus quite separately, one from the other, and thus, for instance, was able to measure the strength of the waves regardless of the action of the receiver, or to investigate the effect of syntonization regardless of the method of transmission. Practical experiments to test his theories and apparatus were carried out by means of temporary balloon stations at distances of 80 to 100 miles, and when these tests were found to be highly successful, the system was adopted by the Navy Department. At the same time Dr. Kimura discovered, quite unexpectedly, that there was a decided telephonic effect in certain phases of the wireless telegraphic phenomena, and this led to his most important invention of a wireless telephone system which is said to be on entirely new lines, and which has been so far perfected that it is of practical utility. We understand that the Japanese navy has adopted this system, and will shortly install it upon various war vessels. We are, of course, in ignorance of the details of this invention, as it, together with Dr. Kimura's wireless system, are government secrets jealously guarded by the Navy Department. These important inventions were made while Dr. Kimura was acting in his capacity as an officer of the Japanese navy, and he received no special remuneration as reward for his work; the inventions are not even patented.

As instancing the success with which Dr. Kimura's wireless telegraph system has been used, an occurrence during the late war may be mentioned. At the time of the battle of the Sea of Japan, the weather was foggy and hazy to such an extent that it was impossible to see for a distance greater than five miles. A Japanese scout cruiser while searching for the Russian fleet suddenly found herself, when the fog had lifted unexpectedly for a moment, practically in the midst of the numerous vessels of the enemy. A wireless message was at once transmitted giving notice of the discovery, and this message was simultaneously received by all the vessels of the Japanese squadrons, notwithstanding that these were some 150 miles distant. Admiral Togo immediately dispatched a squadron of scouts, which kept in touch with the enemy and informed him at five-minute intervals of the course, speed, position, and location of the Russians with such accuracy that Admiral Togo was able to forecast with absolute precision the actions of the enemy. It was through wireless communication alone that it was possible for the Japanese commander to maneuver and place his fleet to enable him to strike the enemy in the most favorable position and under the most advantageous circumstances. It is incomprehensible that the Russians made no attempt to interfere with the Japanese wireless communication, for it was afterward found that nearly all of the Russian ships were equipped with the latest and most efficient wireless outfits.

During the course of the war it was discovered that at certain times it was possible to transmit intelligible messages through remarkably long distances, even as great as 1,000 miles, notwithstanding that the installations upon warships are usually designed for maximum distances of about 300 miles. These phenomena were investigated statistically with the accuracy and thoroughness which so often characterize the work of the Japanese. The researches were carried on principally by Lieut. Yamamoto of Admiral Kamimura's staff. He studied the conditions obtaining at the times of these extraordinary messages, meteorologic and magnetic, paying great attention to the condition of the atmosphere, the hour at which they occurred, etc. It was found that it was possible to transmit messages over such great distances only when the atmospheric pressure was very high at both the transmitting and receiving points, as well as through the intervening distance, and when the atmosphere was practically devoid of outside electrical disturbances. These phenomena occurred most frequently between September and April during the colder months, and between dusk and dawn, the maximum usually being between 11 P. M. and 2 A. M. The study of these phenomena in the Japanese navy was begun about September, 1904. In January, 1905, the DeForest Company announced in the Electrician that a message had been sent across a distance of 600 miles. No statistics concerning this message are available, but it is probably true that the conditions described above obtained at the time that this message was transmitted. Marconi made similar observations as far as sending messages at night is concerned, but without investigating with regard to the atmospheric pressure. It is believed that the United States navy has been conducting researches on similar lines, and has been aware of these interesting phenomena for some time past.

According to a report of the Yokohama Chamber of Commerce, a plan for dredging the harbor of Yokohama inside the breakwater has been framed. It was originally intended to divide the harbor into four separate sections, having 20 feet, 24 feet, 28 feet, and 32 feet of water, to facilitate the anchorage of vessels, but, in view of the advent of large vessels, the authorities found it necessary to provide berths drawing at least 35 feet of water. The plan has, accordingly, been modified, and the dredging work is to be completed in nine years' time.