campaign on land. There seems to be little to choose between the fighting qualities of the average Japanese and Russian soldier. Both are equally brave and persistent. It is also true that in strategy, Kuropatkin s ems to be fully a match for Oyama. Therefore, the issue of the great Manchurian campaign next year will depend chiefly upon the relative ability of the contestants to place men, munitions, and supplies at the front. It will be largely a question of transportation. Can the single-track Siberian railroad, 5,000 miles in length, maintain at the front a larger army than the Japanese with their few hundred miles of transportation over three or four independent routes from Korean and Manchurian ports to the front? This is a vital question which will be answered very soon after the break-up of the severe eastern winter.

TIDAL WATER POWER—MEANS OF OBTAINING A CONSTANT HEAD OF ABOUT THIRTY-EIGHT FEET.

BY W. S. CLEVELAND.

The utilization of tidal water power, owing to its intermittent availability under existing and proposed methods of application, has received but little practical attention, although the immeasurable volume of water subjected to extraordinary tidal action on the Bay of Fundy coasts affords a limitless field for the development of cheap power, and consequent industrial activity, provided this one serious barrier is removable.

The estuaries of the numerous small streams flowing into the bay or its extensive arms are usually bordered by widespreading tracts of marsh lands, drained by winding creeks, and protected from tidal inundation by hundreds of miles of dikes. Some of these lands, without the dikes, would be submerged to a considerable depth at every tide, and, in localities where a creek or small river is available for use as a tailrace discharge basin, a sufficient area of these lands could be inclosed with dikes, provided with sluices, designed to maintain high water in the reservoir formed thereby, and a dam, also provided with sluices, thrown across the creek or river, to exclude the tides therefrom, but with the sluices so adjusted that the tailrace discharge would be drawn off at low tide. The capacity of creeks so used could be enlarged, if necessary, by dredging, and the fresh water flowing into them, if of sufficient volume to be troublesome, could be diverted into other channels, or impounded above a dam, constructed at the upper end of the basin, and also drawn off at low tide, through sluices designed for the purpose. This dam would be inexpensive, as the fresh water would not rise to any considerable height during the few hours between the discharge periods, which would be about four hours in length, or while the tide is out, leaving about eight hours when the low-water sluices would be closed, and a small rise in the water level of the discharge basin incurred. An infinitesimal loss of power, however, would be sustained, in basins suitably proportioned to the work. The capacity of the high-water basin would of course depend chiefly upon its area, and a depth of five or six feet would probably be sufficient. Allowing one or two feet for variations in the water levels of the basins, a head of from thirty-five to forty feet would be available, at points on Mines Basin, which, sustained by the limitless volume of ocean water, replenishing the basins every twelve hours, would afford an aggregate power far beyond the utmost capacity of Niagara.

The estuaries of two contiguous rivers, like the Avon and the St. Croix, could be used in a similar manner, the dam for the high-water basin in the one being provided with sluices, of suitable design and capacity, to supply the water drawn off through a power canal, discharging into the low-water reservoir in the other. These sluices would not need to be more than five or six feet in depth, located in the coping of the dam, and operating during the flooding period—about two hours in length at high tide.

Many of the inlets on Cumberland Basin could be used for the same purpose, the estuary of the Maccan River, and the head of Cumberland Channel, affording an excellent opportunity. In this case a tailrace channel would have to be excavated across Amherst Point, for an outlet from the low-water basin in the Maccan estuary. Single inlets, with narrow entrances, and low-lying shores, could be used for discharge basins, where sufficient land is obtainable, without excessive excavation for the high-water basins. The cost of excavating such basins, to a depth of five or six feet, would doubtless not be prohibitive.

Lands submerged at high water to a depth of fifteen or twenty feet, could be surrounded by embankments, and the inclosed area divided equally for the two basins. The discharge basin could then be excavated or dredged to low-water level, and connected therewith by a tailrace outlet. This work, however, would entail engineering difficulties and considerable cost.

One of the best of opportunities for applying this method of using tidal water power is afforded by the harbor of the city of St. John, N. B. Kennebecasis and Courtney bays are large arms of the harbor, but both, under present conditions, are of little service to shipping. The entrance to the former bay is located above the famous Reversible Falls, but subject to the action of the tides at high water, and the latter is studded with dangerous reefs and rocky flats, which render it worthless to shipping, except at high water. The entrance to Kennebecasis Bay is very narrow, and the embankment making it serviceable as a high-water basin could be cheaply constructed; but the mouth of Courtney Bay is much wider, although not imposing any serious engineering difficulties in the work of converting it into a discharge basin. In applying the thirty-foot head of water thus obtained, the narrow neck of land separating the bays could be crossed by power and tailrace channels, and the turbines located at the most convenient point thereon. Should previously suggested improvements, embodying the maintenance of continuous high water in this harbor, be carried out, a slight modification of the original plans would facilitate the application of this great water power, and make St. John city one of the leading industrial centers of the continent.

At Moncton, a city of about ten thousand people, located on a sharp bend of the Petitcodiac River, a magnificent harbor, of several square miles in area, is created at every tide, beginning with a rushing, boiling, wall of water, about six feet in height—the famous Moncton Bore. The water level rises, at flood tide, to a height of about thirty feet; but at low water, an insignificant streamlet winds through the muddy flats of the river bottom, boiling like a caldron, at intervals, in its passage over dangerous quicksands, and again spreading onto the outer fringes of sandbars, with thick indurated crusts, over which the pedestrian may stroll with safety. A traffic bridge crosses the river at the upper end of the town, the use of which would facilitate the construction of a dam at this point, where the turbines for a great water power would be located, discharging into the low-water basin above the dam, the outlet channel for which should be excavated through the peninsula of marsh land to a point below the river bend, where a dam, provided with flooding sluices, would complete the work necessary for the formation of the high-water basin. The cost of the outlet channel, about two miles in length, through marsh land, only a few feet above high-water level, would be moderate, and, with the rest of the equipment, fully justified, considering the unfailing source of the enormous power that could be developed at this point. A gate, permitting the entrance of shipping at high water, constructed in the lower dam, would remove one of the most serious obstructions to the commerce of the port, which is now restricted to the carriage of small vessels, passing inward with the flood tide, but stranded at the docks when the tide is out. The completion of this work would substitute a beautiful sheet of water in place of the yawning gulf and unsightly mudbanks that now meet the gaze of visitors, who would only have to row to the lower dam to still get a view of the bore.

WIRELESS BURGLAR ALARM FOR SAFES.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

An interesting experiment to demonstrate the possibility of the application of wireless telegraphy to burglar alarms for safes has been carried out by a well-known firm of British safe builders. The ordinary type of electric alarm for this purpose possesses two great disadvantages, which to a very appreciable extent militate against their utility. They either refuse to ring at the critical moment, or they ring suddenly for some inexplicable reason. Furthermore, the expert burglar can always circumvent their usefulness by cutting the wires where the system is the completion of an electrical circuit to produce the alarm or where the current flows constantly through the wires, apparatus, and contacts, and the alarm rings when the circuit is disturbed by joining the wires together and completing the circuit outside the safe. There is another protective system generally adopted in this country, arranged with constant current when on guard, which will give the alarm if the wires be joined so as to produce a short circuit, and thus cut the object which is protected out of circuit, so that the alarm bell will commence ringing, no matter what sort of attempt may be made to tamper with the wires. This latter system, however, is essentially dependent upon the introduction of a fine resistance coil inside the safe or object to be protected. When the wires are tampered with, the effect is to cut out this resistance coil from circuit, and by so doing a galvanometer needle is thrown over from its normal position to make contact for the relay which works the bell.

With an efficient wireless system, however, tampering so as to destroy the efficiency of the apparatus would be impossible. In this arrangement the safe is equipped with a small but efficient transmitter. When the safe is opened waves are radiated, which coming into contact with the usual coherer at some distant central point, ring a bell and so announce the fact that the door has been opened. To effect this, the battery power and induction coil which make the electrical waves are both contained inside the safe, while the steel of which the safe itself is made acts in a similar way with a long wire supported on a high pole, as the antennæ in wireless telegraphy.

The application of the principle to this particular purpose is still in its infancy, but the experiments made up to the present conclusively demonstrate the possibility of its general utilization, provided that satisfactory instruments are used, and careful tests made every now and then to see that all the various parts of it are in proper working order.

The one great drawback to the general employment of this system, however, is the expensive nature of the necessary apparatus, the cost of which varies from $1,000 to $1,500. For the purpose of these tests, however, instruments of a much cheaper description have been employed, so as to roughly enable the experimenters to test the possibility of their application in a general way.

The success of the trial, however, opens every possibility of its successful and widespread utilization, and no doubt a cheaper though equally efficient form of apparatus will be evolved, so as to render the system commercially practicable. Incidentally, it may also be mentioned that the whole of the safe is so charged with electricity that it gives a slight disconcerting shock to anyone who touches it.

SCIENCE NOTES.

In the Comptes Rendus of the Paris Academy, Mr. Lowell gives the result of a series of spectrographic determinations of the rotation of Venus and Mars. For Venus, the speed of motion of a point on the equator was found to be practically *nil*, the probable error of the observation only amounting to 0.008 kilometer per second, the result thus supporting the idea that Venus rotates in the same period as her revolution. For Mars the speed was found as 0.228, the computed value being 0.241. The probable error in the case of Mars was 0.036. The satisfactory result obtained for Mars lends support to that for the larger and brighter planet.

The recent discoveries of wonderful new types of extinct animals in the tertiary deposits of the Fayum Desert of Northeastern Africa, and their bearing on the origin of the modern African fauna, are discussed by Dr. C. W. Andrews in the Quarterly Review. The new evidence shows unmistakably that the Proboscidea (elephants and mastodons) and the Hyracoidea (the "coney" of Scripture and its relatives) were developed in Africa itself; but it does not appear to invalidate the long accepted theory that the bulk of the modern African fauna is of northern origin. It might, however, have been added that, in view of the discovery of certain antelope and other remains in the later tertiaries of Africa, the migration may have been somewhat earlier than commonly believed. Probably, indeed, there have been several migrations of African types to the north and of European and Asiatic types into Africa. In this connection it may be mentioned that Dr. C. W. Andrews, the chief describer of the extinct Fayum fauna, has brought to notice in the November number of the Geological Magazine a remarkably fine shell of the giant land tortoise, *Testudo ammon*, of the Upper Eocene beds of the district in question. This appears to be the earliest of the big land tortoises, and may have been the ancestral type from which those of Madagascar, Mauritius, and the Mascarene Islands, together with the extinct Indian species, were derived.

The past year has been noteworthy for the amount of literature devoted to the members of the horse tribe, or *Equidæ*, writes R. Lydekker in Knowledge. One of the latest contributions to the subject is an article by Mr. R. T. Pocock, the superintendent of the London Zoological Gardens, on South African quaggas, published in the November number of the Annals and Magazine of Natural History. According to the author, we have to deplore the extermination not of one, but of several distinct forms of these animals; the quaggas of the older writers, of which two races are recognized, being distinct from those exhibited forty years ago in the Regent's Park and other menageries. Without for a moment saying that the author may not be right in his view, it certainly does seem strange that the whole of the quagga-skins which have come down to us should differ from the animals described by the older zoologists. The Asiatic and African wild asses form the subject of a paper by the above writer published in a recent issue of Novitates Zoologicæ, the organ of Mr. Walter Rothschild's zoological museum at Tring; an apparently new race of the "onager" from Central Asia, now living in the Duke of Bedford's park at Woburn, being described and figured. The description of one of the two races of the African wild ass is based on specimens killed in the Eastern Sudan by Mr. N. C. Rothschild, one of which is now mounted in the British (Natural History) Museum, while there is a second in the Edinburgh Museum, and a third in Mr. Rothschild's own collection. As the construction of the Suakin-Berber railway is only too likely to lead to the extermination of this race, these specimens are very precious.