

powerful enough to reach the station 2, and act upon its long mast, but not upon the shorter; thus A, by using the long mast, may communicate with B and deflect its galvanometer. As to the station 1 which is nearer A, the distance is so much shorter that the waves may act upon both the long and the short masts, and as the effect of the two circuits is neutralized the galvanometer will not be deflected. In this case it will be seen that A communicates with station 2 but not with 1. To produce the contrary effect the short mast of the transmitting station is used; its waves are not sufficiently powerful to act upon the distant station 2, nor even upon the shorter mast of station 1, but they act upon the long mast of 1, and the galvanometer is accordingly deflected. By a proper disposition this system may be applied to a number of receiving posts placed at different distances, and each receives its proper message.

BUILDERS' TRIAL OF THE "ILLINOIS."

The builders' trial of the U. S. battleship "Illinois" took place off Cape Henry Tuesday, March 12. The "Illinois" left the dock at the Newport News Ship-building and Dry Dock Company's yard at 7 o'clock A. M., proceeding down Hampton Roads to Old Point Comfort and Cape Henry, then to sea about 25 miles, where the trial for speed was made. The greatest speed, which was taken by log, was 16.2 knots, during which time the engines developed 11,920 I. H. P. at an average of 108.5 revolutions, and under a boiler pressure of 175 pounds. The vessel had been lying beside the dock for ten months, and her foul bottom accounts for the poor showing in speed. From the high horse power developed the indications are that, with a clean bottom, she will exceed the speed of her sister ships on the official trial. The "Illinois" is fitted with two sets of triple-expansion engines with cylinders 33½, 51 and 78 inches in diameter and 48 inches stroke. There are eight single-ended Scotch boilers 15 feet 8 inches diameter and 9 feet 11½ inches long, with 685 square feet of grate surface and 21,649 square feet of heating surface. Forced draught is furnished by eight blowers 60 inches diameter and 14 inches width of tip, each run by a 5 by 4 double engine. The propeller is 16 feet 9 inches diameter and set at 17 feet 3 inches pitch. The builders are well satisfied with the showing made and are rapidly preparing the vessel for the official trial.

THE PATENT OFFICE--RESIGNATION OF THE COMMISSIONER OF PATENTS

We are advised that the President has received the resignation of Charles H. Duell as Commissioner of Patents, who is about to return to active practice in this city, after having held the position of Commissioner very acceptably since February 5, 1898.

At the beginning of his administration he found the work in the Patent Office greatly in arrears, and at once set about devising means to bring it up to a more businesslike standard. His success in this direction is a matter of record and the present celerity with which applications receive attention, despite their increase in volume, is a satisfactory proof that his efforts have not been in vain. The promptitude with which applications can be acted upon is helpful to inventors from the fact that it tends to keep alive their ideas and stimulate further invention. It frequently happens that important industrial enterprises are dependent upon the prompt or tardy action of the Patent Office officials, hence it is to be hoped that the present efficiency will continue, and if possible be improved.

Mr. Duell also brought order out of chaos in reforming the distribution of printed copies of patents which are so largely used by attorneys and inventors by placing at the head of this division a competent, active business man.

The printed patent copies were formerly stored in various nooks, corners and hallways difficult to find, often in the wrong places, improperly or carelessly numbered, entailing an amount of worry and delay in their procurement that was extremely annoying to the attorney and inventor.

On account of the vast accumulation of printed copies and the storage space required only seventy-five copies of each patent are now printed, unless special orders are received in advance of the printing. By this change much less shelf space is needed and a saving of room is brought about.

The new head of this division, with the approval of the Commissioner, has had erected many new alcoves of shelving readily accessible in the upper galleries of the Patent Office, where every patent, arranged in consecutive numbers, can be quickly obtained or "pulled."

An accurate daily journal is also kept of the exhausted patent copies by means of which the condition of the whole supply is readily noted. There is a pressing need for more room in the Patent Office, especially for the safety of the records in the assignment division, where it is reported about one thousand needs a day are received for record. These valuable

records are exposed to the danger of fire, a condition that would not be tolerated in any well managed institution, and one which is a menace.

During Mr. Duell's term of office the new system of classification has been introduced, the intent of which is to grade patents into kinds or classes so that the state of the art can be readily determined. Owing, however, to the multiplicity of subjects and subdivisions and the differences of judgment among individual examiners there appears at the present time to be no special advantage in the work accomplished over the old régime. The new Commissioner will need to give the system careful study if any improvement is to be effected.

Mr. Frederick J. Allen, of Auburn, New York, has been appointed to succeed Mr. Charles H. Duell to the important position of Commissioner of Patents, and will soon assume his new duties. We trust the new Commissioner will not only maintain the present standard of work, but greatly increase its efficiency.

RUSSIAN ARMY AND MARINE.

The Russian empire, occupying as it does such a vast extent in Europe and Asia, needs for its security the greatest army now existing. The present recruiting laws permit of mobilizing, in case of war, twenty-two classes of seven hundred and fifty thousand soldiers each, or, allowing a considerable margin, at least thirteen millions. This immense army must not be considered, however, as an instructed and mobilizable corps; it may be admitted that about four million soldiers ready for the campaign could, if necessary, respond to the call of the Czar. The Emperor is the supreme chief of the army, and no parliamentary assembly has the right to question his acts. Usually, the Minister of War acts as intermediary between the Emperor and the troops, and in such capacity his authority is of the greatest. To the Ministry of War are attached the higher Council of War, the Supreme Court of Military Justice, and the Military Cabinet of the Emperor; the War Department is divided into a Chancellery and eight grand divisions: Etat Major general, intendance, artillery, engineering corps, health, military schools, Cossack troops and military justice. The military territory is divided into 12 grand departments, at the head of which are the officers bearing the title of commander-in-chief; these have the command of the troops stationed in the region, those belonging to the territory and those of the various establishments. In several of the regions, in Finland, at Wilna, Warsaw, Moscow, Kieff, in the Caucasus, in Turkestan, in Siberia, and the Amour district, the commanders-in-chief are invested with a higher political authority, and take the title of Governor-General. The distribution of the Russian troops by army corps is not uniformly established, as in some other countries of Europe. It may be admitted, however, that in European Russia 52 divisions of infantry, 52 groups of mounted artillery, 23 divisions of cavalry and 44 batteries of mounted artillery constitute 25 army corps, of which two are in the Caucasus region. Beyond the Ural, in Siberia, in Turkestan and the Amour region, and, at present, in Manchuria, the organization is variable, and depends upon circumstances.

The corps of Russian officers is recruited in a great part from the Lower Military Schools, of which there are seven for the infantry, those of Kazan, Odessa, St. Petersburg, Tchougouiev, Tiflis, Wilna and Irkoutsk; two for the cavalry, Elisabethgrad and Tver; two for the Cossacks, Novoherkask and Orenburg. The remainder of the officers come from the Body of Pages of the Emperor and the Military Schools. These latter schools are open, in principle, to young men of all classes of society, including the under-officers and private soldiers; they are located at St. Petersburg and Moscow. The preparatory instruction for these schools is obtained at twenty-four cadet schools and three preparatory schools. For the higher military instruction four Military Academies are established, the Nicolas Academy of the Etat Major, the Michel Artillery Academy, the Nicolas Engineering Academy, and the Academy of Military Law. The Russian army on a war footing is composed of five contingents of the active army, thirteen contingents of reserve and four of militia of the first class; all these troops have received the necessary instruction and have been grouped by the officers of the active army and the officers of reserve. The militia of the second class has received no military instruction. The Cossack troops, which form a unique feature of the Russian army, are recruited in a special manner, and are clothed, equipped and mounted at their own expense; the State furnishes only the arms and ammunition. The effectiveness of the Cossack troops on a war footing would exceed 250,000 cavalry.

As to the Russian Marine, it may be remarked at the outset, that Russia has but a small coast development, and it is easy to defend by means of coasting

cruisers and line of torpedoes, without counting the ice, which forms during several months an impassable barrier around the Baltic ports. The entry of the Black Sea would be stopped by the fleet of modern battleships constructed on the docks of Nicolaieff and Sebastopol. For some years since, the efforts of Russia have been directed toward the extreme Orient, and the vessels which are being constructed are designed to reinforce the Pacific fleet, being thus upon the open sea; the ports of Vladivostock and Port Arthur are constantly developing, and new vessels are being constantly sent there.

The Emperor is the supreme chief of the Marine, but he delegates his powers to one of the members of the Royal Family, this being in the present case the Grand Duke Alexis. This Admiral-General, who presides over the Admiralty Council, has under his orders the Minister of the Marine. At the present time the Russian fleet has seven first-class battleships, with displacements from 8,500 to 11,000 tons; three coast-defense cruisers, of 4,000 tons; eight armored cruisers, of 6,000 to 12,700 tons; three protected cruisers of 3,000 to 5,000 tons. All these vessels are at least twenty years old; to them must be added those which form part of the Black Sea fleet, including seven battleships of 9,000 to 12,500 tons and one cruiser of 3,000 tons. Besides, a fleet of twenty destroyers, etc., and seventy-five torpedo boats is distributed between the northern and southern coasts and those of eastern Siberia. The personnel for these different vessels is made up of sailors coming from the recruitment, who remain seven years in service. These men are in general embarked upon the same vessels; they are sent to special naval schools where they complete their instruction. The under-officers come from the ranks and cannot become officers; they do not form a very compact body, and generally prefer to leave the service at the end of the seven years. The number of under-officers and marines is about 41,000. The officers must belong to the nobility or be the sons of officers of the Marine; they come from two sources, those who pass the Cadet School of the Marine and those who engage as volunteers and after eighteen months of embarkment pass a satisfactory examination. The Cadet School of St. Petersburg is established on land and has besides numerous vessels for practical exercises; the course lasts six years, after which the cadets become midshipmen. As to the officers of the Marine, these include 55 rear-admirals, 92 captains of the first class, 212 of the second class, 724 lieutenants, and 366 midshipmen. A number of special naval schools enable these to complete their instruction; some of these are of a theoretical nature, as the Nicolas Academy, devoted to astronomy, naval architecture, etc., and others practical, as the schools of marine artillery, diving, torpedoes, etc.

Russia has but one arsenal on the Baltic, that of Cronstadt. Another is being constructed at Libau, not far from the German frontier; it is called Port Alexander III., and the work has been going on since 1891. On the Black Sea are those of Nicolaieff and Sebastopol, the former of these is in the interior, on the Bug River; in the extreme Orient are Vladivostock and Port Arthur. In the Gulf of Finland are the secondary posts of Revel and Sveaborg. Besides these a certain number of state and private docks and establishments aid in the construction of the fleet; the principal of these are situated on the Neva, near St. Petersburg, and at Nicolaieff. As to the volunteer transport fleet of the Black Sea, its origin goes back to the Turco-Russian war of 1877. At this period, the government lacked transport boats, and some wealthy individuals associated together in order to purchase the necessary vessels in Germany; these, however, arrived too late to be of service on this occasion, but the institution of the volunteer fleet was kept up, and the vessels already bought were added to. At the present time they serve to transport the necessary troops and military supplies to Siberia; on the return voyage they bring back a load of freight, including tea. Besides 12 rapid transport vessels of 12,000 tons and a speed of 20 knots, this fleet possesses a number of slower vessels.

THE REMAINS OF AN OLD INDIAN VILLAGE.

Mr. J. A. Udden has recently printed the results of his investigations of the remains left by an ancient tribe of Indians of the Siouan stock who formerly inhabited a village in McPherson County, Kansas. A series of circular mounds were opened, each of them being about twenty feet in diameter, and none of them more than three feet in height. Fifteen such mounds constituted the village, and it is noteworthy that their distance apart was 125 feet or some multiple of this number. No human remains were discovered, but a quantity of domestic utensils, bones of animals, pottery, tools, arrow-heads, pipes, etc., were found. The most remarkable item was a piece of chain-armor, which is presumably of European armor, and which may have come from the expedition of Coronado, who passed through this region in 1542.