

Our Country's Progress as Seen by a Foreigner.

The English statistician, Michael G. Mulhall, publishes, in the June number of the North American Review, an article on "The Power and Wealth of the United States." Mr. Mulhall's conclusion is that:

"If we take a survey of mankind in ancient or modern times as regards the physical, mechanical, and intellectual force of nations, we find nothing to compare with the United States in this present year of 1895, and that the United States possess by far the greatest productive power in the world."

Mr. Mulhall shows that the absolute effective force of the American people is now more than three times what it was in 1860, and that the United States possess almost as much energy as Great Britain, Germany and France collectively, and that the ratio falling to each American is more than what two Englishmen or Germans have at their disposal. He points out, by a careful comparison between the conditions in these different countries, that an ordinary farm hand in the United States raises as much grain as three in England, four in France, five in Germany, or six in Austria. One man in America can produce as much flour as will feed 250, whereas in Europe one man feeds only thirty persons.

Mr. Mulhall calls special attention to the fact that the intellectual power of the great republic is in harmony with the industrial and mechanical, eighty-seven per cent of the total population over ten years of age being able to read and write.

"It may be fearlessly asserted," says he, "that in the history of the human race no nation ever before possessed 41,000,000 instructed citizens."

The post office returns are appealed to by Mr. Mulhall in support of this part of his statement, these showing that, in the number of letters per inhabitant yearly, the United States are much ahead of all other nations.

According to the figures of Mr. Mulhall the average annual increment of the United States from 1821 to 1890 was nine hundred and one millions of dollars, and he adds that "the new wealth added during a single generation—that is, in the period of thirty years between 1860 and 1890—was no less than forty-nine milliards of dollars, which is one milliard more than the total wealth of Great Britain."

Classifying the whole wealth of the Union under the two heads, urban and rural, Mr. Mulhall finds that rural or agricultural wealth has only quadrupled in forty years, while urban wealth has multiplied sixteen-fold. Before 1860 the accumulation of wealth for each rural worker was greater than that corresponding to persons of the urban classes; but the farming interests suffered severely by reason of the civil war, and since then the accumulation of wealth among urban workers has been greatly more than that among rural workers, a fact which Mr. Mulhall thinks explains the influx of population into towns and cities.

In a series of figures Mr. Mulhall shows that the "rise in wealth and increase in wages came almost hand in hand." In dealing with the development of farm values, he makes the following statement:

"If the United States had no urban population or industries whatever, the advance of agricultural interests would be enough to claim the admiration of mankind, for it has no parallel in history."

The Almaden Quicksilver Mines in Spain.

The complete statement of the work done at the Almaden quicksilver mine for the year 1894, as given by the Revista Minera, is important and of much interest. During the year there was excavated at Almaden 6,680 cubic meters of ore, and only 561 cubic meters of barren rock had to be taken out. Most of the mineral was obtained in the crosscuts and galleries on the 12th level, and it was on this level that most of the stoping has been done during the year. The permanent work required the construction of 8,309 cubic meters of masonry in the various galleries and chambers. In weight the extraction for the year amounted to 19,428 metric tons of ore and 1,828 tons of barren rock.

In the furnaces of the Almaden during the year 1894 there were 18,744 tons of ore treated, which produced altogether 44,521 flasks of quicksilver, representing a total weight of 1,535,988 kilos. of quicksilver, the average yield of the mineral treated having been 8.19 per cent. This shows an improvement over the preceding year, when the yield was only 7.82 per cent. The furnaces were run for seven months of the year, having

been shut down through the hot season, from May to September inclusive. The highest yield reported was 8,059 flasks, in December, and the lowest 2,912 flasks, in October.

A NAUTICAL BICYCLE.

La Ilustracion Española y Americana describes a new boat invented by Don Ramon Barea, of Madrid, which is said to pass over the water with ease and rapidity. This machine is composed of two cases of steel, which serve as floats and are connected by cross bars. In the space between the two, and near the stern, is a paddle wheel operated by pedals something like a bicycle.

This nautical bicycle weighs about 100 pounds. Its construction will be readily understood by a glance at our engraving. The machine was lately tried with much success. Mr. Barea demonstrated the facility with which he was able to pass over the water on his machine. The vessel is steered by a small rudder at the stern. The speed which can be obtained is about six miles per hour. The apparatus is well spoken of in Paris. It may be used upon lakes and rivers with success.

Examples of aquatic contrivances, something like the above, have heretofore been published in the

**A NAUTICAL BICYCLE.**

SCIENTIFIC AMERICAN. In our numbers for November 8, 1890, and February 14, 1885, illustrations will be found.

Egyptological.

The tomb of Senmut, the famous architect of the temple of Queen Hatshepsut, has just been discovered by Mr. Newberry, of the Fund, and Professor Steindorff at Gurneh, consisting of three chambers elaborately decorated.

Professor Petrie announces that he has discovered the graves and remains of a hitherto unknown race on the soil of Egypt, and that his work the past season produces results "filling the greatest blank in Egyptian history." He claims for them a period between the fourth and twelfth dynasties. This, if true, dispels the notion, at first conveyed, that he had found evidences of a prehistoric race. He thinks the race a cross between the Libyans and the Amorites. They used metal and flint, and the variety of fineness of their pottery is surprising. Further and established evidences of this remarkable discovery, between Ballas and Negada, will be welcomed by the anthropological world.

Professor Adolf Erman, Ph.D., has just accepted the position of vice-president of the Egypt Exploration Fund for Germany.

The Ashmolean Museum, at Oxford, has been enrich-

ed by the chief results of the excavations last year at Coptos by Mr. Petrie, which he considers to have yielded prehistoric fragments of archaic sculpture and terracotta. Among the sculptures are the colossal head of a bird, a lion's head, and the head of the god Minz, the rest of whose statue is en route. We cannot assert these remains to be prehistoric, but may indulge the fond belief that they belong to Egypt's mythic era.

Captain H. G. Lyons, R.E., of the Fund, has presented the same museum with stelæ of the twelfth dynasty, found on the site of the temple at Wady Halfa, and with two hieratic stelæ from the village of Mut in the Dakhla oasis, which refer to the artesian wells in that district and the water supply.

The value of the Archaeological Survey department of the Egypt Exploration Fund, whose chief mission is the recording of important inscriptions, which are being constantly obliterated, is well illustrated in a letter from Professor Sayce. At El-Kab, near an ancient well and under the cliff, he found a platform of rock which had been cut for the foundations of a chapel of some size. Here he discovered many texts relating to the Old Empire, including one of special value, as it gave the names of two temples built on the spot in the period of Pepi of the sixth dynasty. One of them was named Kenb-set (Corner of the Mountain).

The texts are so numerous that weeks of labor would be required to transcribe them.

At Esneh, the recently found paintings in two subterranean Coptic churches, Dr. Sayce says, are already nearly destroyed by the fanatical Arabs. Of the few still untouched paintings, he writes that "one representing the Virgin and Child is especially good, though it will probably have been destroyed by the Mohammedan iconoclasts before this letter reaches England."—W. C. W., Boston Commonwealth.

Ampere's Induction Experiment.

At a recent meeting of the Physical Society, Prof. S. P. Thompson read a note on "A Neglected Experiment of Ampere."

Ampere, in 1822, made an experiment which, if it had been properly followed up, must have led to the discovery of the induction of electric currents nearly ten years before the publication of Faraday's results. While attempting to discover the presence of an electric current in a conductor placed in the neighborhood of another conductor in which an electric current was flowing, Ampere made the following experiment: A coil of insulated copper strip was fixed with its plane vertical, and a copper ring was suspended by a fine metal wire so as to be concentric with the coil and to lie in the same plane. A bar magnet was so placed that if an electric current was induced in the suspended ring, a deflection would be produced. No such deflection, however, was observed.

In 1822, in conjunction with De la Rive, Ampere repeated this experiment, using, in place of the bar magnet, a powerful horse shoe magnet.

He describes the result in the following words: "The closed circuit under the influence of the current in the coil, but without any connection with this latter, was attracted and repelled alternately by the magnet, and this experiment would, consequently, leave no doubt as to the production of currents of electricity by induction if one had not suspected the presence of a small quantity of iron in the copper of which the ring was formed." This closing remark shows that they were looking for a permanent deflection. When, however, Faraday's results were published in 1831, Ampere, after again describing the experiment made in 1822 by himself and De la Rive, says: "As soon as we connected a battery to the terminals of the conductor, the ring was attracted or repelled by the magnet, according to the pole that was within the ring, which showed the existence of an electric current produced by the influence of the current in the conducting wire."

The Spider's Web.

The spider is so well supplied with the silky thread with which it makes its web that an experimenter once drew out of the body of a single specimen 3,480 yards of the thread—a length but little short of two miles. A fabric woven of spider's thread is more glossy than that from the silkworm's product, and is of a beautiful golden color.

American and Russian Petroleum.

The recent sensational rise in the value of American crude and refined petroleum, and the causes to which it may be attributed, are readily accounted for, and a study of the relative positions of the American and the Russian industry shows that the present revolution in the petroleum market may soon be accentuated by the replacement of a large proportion of the American oil by the Russian product. The Americans possess the advantage of having been first in the field, and of producing an oil which yields on distillation nearly twice as much illuminating oil as does that of Russia, and, furthermore, of producing a type of oil which is better adapted for burning in the ordinary lamp than that of any other country. It is true that the oil of Ohio is an inferior quality, owing to the presence of an excess of sulphur compounds, and that it yields only about as much lamp oil or kerosene as that of Russia, but at present it is not of great importance as regards the European markets, and American oil may be considered to be almost entirely derived from the States of Pennsylvania, New York, and Western Virginia.

The American industry, dating only from 1859, has hitherto grown year by year under the skilled guidance by which it has been fostered, and until within the last two years or so has shown no indication of diminution of supply; but it is now becoming evident that the depletion of the oil lands which Mr. Carll, Professor Leslie, and other American geologists years ago asserted would before long result in a large decrease of supply, is beginning to show its effects. The older fields are rapidly falling off in their supply, while, although new areas of more or less importance are constantly being opened up, the amount of untested territory is rapidly becoming less, and the prospect of a renewal of the enormous supply of the past is ever becoming smaller.

If we glance at the statistics showing the stocks held of late in America, we find that at the end of 1892 there was in the crude oil tanks no less than 17,395,389 barrels of 42 American gallons; that this fell, by the end of 1893, to 12,111,183 barrels, and was, at the close of 1894, 6,336,777 barrels; and that, on March 1 last, it was only 4,908,776 barrels—and this in the face of a demand which shows no sign of diminution, and of a supply which is inadequate and constantly decreasing. It is, of course, certain that the increased activity in the sinking of new wells, which is now in progress, will result in a large increase in production; but this

can only be at enhanced cost, and must bring ever nearer the time when the American oil industry shall become of secondary importance, and ultimately of only historical interest.

When we study the position of the Russian industry, we find that it possesses entirely different features. Although of great antiquity, its commercial importance only dates from 1872, when the monopoly of Prince Meerzoeff was abolished, and only within the last few years has it become a dangerous antagonist of the United States. The production shows no diminution, and, so far as appears at present, can be almost indefinitely increased at small cost, whenever occasion demands. The wells are shallow, usually about a fourth of the depth of those of Pennsylvania, and entirely dwarf the latter in output. Wells which are considered rich in America would not be worth sinking in the Baku district, which at present constitutes almost the entire producing area of Russia. From the fact that the Apsheron peninsula, on which the Baku fields stand, possesses an area of oil-containing land estimated at 1,200 square miles, and that only about 7 or 8 square miles is at present under the drill, we can readily realize how important a factor the Russian oil forms in the present position of affairs, and how probable it is that the Russians will soon take the leading position in the oil markets of the world. Furthermore, there are enormous tracts of country in the Caucasus and elsewhere in the Russian empire which, although scarcely tested, have given indications of richness even exceeding that of Baku, and showing a potential wealth of oil capable of supplying the world for ages to come. Wells drilled in the Grosnaia field to the north of Baku and in Gouria—Georgia—between the Black Sea and the Caspian, have given the most encouraging results, and both these fields, and also that of the Crimea, are more favorably situated for transporting the oil than Baku.

The conditions under which the oil occurs in Russia and America are very different. In the former it is found in strata of the Tertiary period, usually a formation resembling a quicksand, and at depths of only a few hundred feet; while in the latter it occurs at great depths in the older compact sandstones and limestones of the Carboniferous, Devonian, and Silurian periods. The oil of Russia consists of a class of hydrocarbons known as naphthenes, and belonging to the "benzene" group, while the American oil is mainly composed of paraffins. It is to this difference in composition that the great variation between the products from these

oils is due, for whereas the American oil yields a very large proportion—about 70 per cent—of illuminating oil exactly suited for combustion in our ordinary lamps, the Russian oil produces far less of such oil and a larger proportion of the high class lubricating oil for which that country is famous. The Russian illuminating oil also requires to be burned in a modified form of lamp with a more perfect draught, to overcome its tendency to produce a smoky flame. Hence, before the Russian oil can obtain a powerful position in the English market, the Kumberg or any other of the lamps which are employed in Russia must become naturalized among us, and, although that is a somewhat difficult operation with such a conservative people as we are, it is practically certain to result in the near future from the greater cheapness which Russian oil will now show as compared with that of America.—The Engineer, London.

Hematite Mining in Greece.

A new hematite mine at Marathon, in the village of Grammatico, Greece, was opened last year. The ore is carried down by a railway for about five miles to Limonia Bay, where there is a jetty on the west side 200 feet in length, by means of which 1,000 tons daily can easily be loaded. Proper appliances have been provided for mooring the vessels. The anchorage is considered quite safe, as it is well sheltered. The mine has been leased for twenty years by several French capitalists. The actual output is 6,000 tons monthly, but if necessary the quantity can be increased to 15,000 tons. The ore is of an excellent quality, and contains 56 to 58 per cent iron, 3.80 to 4 per cent manganese, and 1.60 to 2 per cent only of silica, but whenever the several lodes are found in contact with some small veins of yellow ochre, the presence of a very slight percentage of arsenic is found by analysis, but this seldom happens.

Spirit for Incandescent Lighting.

The problem of employing spirits for lighting on a new principle similar to the incandescent gas light has, it is stated, been solved with great success by a Berlin firm. Experiments have just been carried out in presence of the Prussian Ministers Herren Berlepsch, Miquel, and Hammerstein, which are reported to have been completely satisfactory. If this news is confirmed it is likely to prove of enormous importance to the German spirit industry, which has recently been in extremis.

RECENTLY PATENTED INVENTIONS.

Electrical.

TELEPHONE CALL.—Frederick J. Troll, Washington, D. C. This invention relates to a call in which the revolving armature is rotated by a flexible metal tape on a drum, the tape when drawn out revolving the armature in one direction, and the tape being re-wound by the tension of a coiled spring. By an improved construction and arrangement of parts the motion is transmitted to the armature direct, and the armature is made to ring a call by both the forward and backward movement of its oscillation, the armature being also cut out when the call is not in use. The call box is very simple and not liable to be damaged by inexperienced operators.

BOILER LOW WATER INDICATOR.—Charles D. Tisdale, Boston, Mass. According to this invention an auxiliary connecting piece is inserted between the lower end of the water gage and the water gage cock, the intermediate piece having contact wires extending up into the tube, and a float within the tube being adapted to form an electrical connection between the contact wires. The device can be applied to a boiler by removing the glass water gage tube and replacing it with a tube having the auxiliary connecting piece, the tube and attachments being made to replace the ordinary water gage tube. The alarm may, with this improvement, be given in the boiler room or at any desired distant point.

Mining, Etc.

REDUCING GOLD AND SILVER ORES.—John C. Garvin, Denver, Col. This inventor has devised a simple apparatus for rapid and economical work, in which the "firebrick" stack has a central shaft, alongside of which are ore-drying chambers connected by upwardly slanting apertures with outer gas chambers, there being in the central shaft opposite inclined shelves of tile, and the ore dropping from one shelf to the other, the central shaft being used for chloridizing and roasting and the outer chambers for making sulphuric acid. Below the central shaft is a roasting chamber with cone-shaped hearth on a revolving disk, and this chamber is connected with the fire box, the pulverized ore, mixed with chloride of sodium or salt, being kept upon the hearth until it is desulphurized, chloridized, and roasted.

Mechanical.

COTTON GIN AND WOOL BURRER.—Samuel L. Johnston, Boston, Mass. This machine belongs to the class known as roller gins, but it has a reciprocating stripping mechanism supported and held to operate in a more effective, rapid, and uniform manner. It also has a vibrating receiver and separator mechanism which receives the material from the hopper and delivers it to the roller and stripper, and also serves to clear the seed and dirt therefrom as it feeds. The machine likewise has other features designed to increase its capacity and improve the quality of the cotton and wool treated.

MACHINE FOR MAKING DRESS SHIELDS.—Emil Barsuck, College Point, N. Y. For pressing and

forming a flexible material into dress shields in a simple and inexpensive manner, this inventor has devised an arrangement of a male and female die, each provided with a heating chamber, and one of the dies being adapted for vertical reciprocating movement, while the other die has means for moving it bodily in a horizontal direction into and out of position to be engaged by the first die. Several shields are thus formed at one pressing operation, the dies remaining long enough in contact to firmly shape the material, after which the pressed material is cut transversely to form the individual shields.

Agricultural.

CORN HARVESTER AND HUSKER.—Gustave Leblanc, Mead, Neb. This is a machine for field use, gathering the ears from one or more rows of standing corn and conveying them to husking devices, from which they are conveyed by an elevator to a wagon, the husks being discharged on the ground. The machine may be drawn or pushed forward by a team at the front or rear, as found most convenient, and all the driving mechanism is actuated from the axle. The machine is designed to be durable, inexpensive to build, and simple in its operation.

Miscellaneous.

TACHOMETER.—James Donnan, Bal-laghaut, India. This is a distance measuring instrument comprising a pivoted telescope on one of the trunnions of which is clamped an arm adjacent to a scale, there being mounted on and adapted to move along the arm a lengthening bar having an index adapted to traverse the scale. The instrument is designed to enable the user to readily read off the horizontal distance of any point to about three thousand feet from the point of observation, through the rise and fall of this point relative to the point of observation, and also the bearing of this line from the magnetic north, or the horizontal angle subtended between any two lines which meet at the instrument.

LIBRARY STACK.—Dean A. Beckwith, New York City. The front and rear posts of this stack are provided with lugs connected by plates which form the supports for the shelves, each of the latter having depending flanges adapted to drop into position between the supporting posts, whereby the shelves cannot slip or be displaced, although they may be conveniently removed when desired. The construction is simple and durable, and a stack thus made presents a neat appearance.

WHEEL TIRE.—Samuel A. Smith, McKinney, Texas. According to this improvement the two ends of a wheel tire are connected in a very inexpensive and simple manner by a novel arrangement of a lug and screw, the lug forming practically a part of the felly, and the connection between the tire ends being firmly made, while the tire may readily be tightened at any time by simply turning a nut.

VEHICLE SAFETY DRIVING REIN HITCH.—Isaac A. Stewart, De Land, Fla. In a casing to be attached to the wagon body is held a rotatable

roller or drum within which is a retracting spring, while on the drum are two oppositely wound cords, one connected with the driving reins and the other with a wheel of the vehicle. When the cords are properly connected and the horse moves, a gradually increasing tension is put on the cords by the rotation of the wheel to check the animal, the tension being relaxed if the animal backs.

SEWER VALVE.—William Godfrey, Saugatuck, Conn. This valve is formed of two halves, an inlet and an outlet section, bolted together, the inlet extension having an inclined extension with beveled edge forming a seat for a hinged inclined valve, and the outlet section at its mouth being larger than the body of the inlet section. The bottom of the outlet section is sharply curved or bent down to form an offset or drop, affording a clear space under the lower edge of the valve for the passage of sewage, insuring the positive working of the valve and preventing any clogging which may obstruct its closing.

BOTTLE STOPPER.—James F. Martin, New York City. This stopper has two independent valve seats, to be secured at a suitable distance apart in the neck of a bottle, and two ball valves having forked stems each projecting through the central opening of its seat, the forks being bent outwardly at their ends to engage the under side of the valve seat. The stopper is designed to permit the ready pouring out of the contents of a bottle, but prevents refilling, thus making it impossible to adulterate or sophisticate the liquid originally placed in the bottle.

SOAP HOLDER.—Frank H. Milligan, High Lane, England. To allow the draining off of water from toilet and other bar soap after use, this inventor provides a holder consisting of a plate or disk from whose opposite sides project studs, between which are apertures, the outer studs being longer than the inner ones, and thus forming a central depression to receive the soap. The holder may be placed in a suitable dish if desired or directly on the slab of a washstand.

FRUIT JAR CLAMP.—Henry C. Dilworth, East Orange, N. J. Fitting over the top of the fruit jar, according to this improvement, is a clamping piece to which is secured a spring, a cam lever carried by the clamping piece being adapted to engage the spring. The device may be adjusted to form a water tight seal, with the fastening yielding to permit the escape of any steam or gas which may be generated, or it may be adjusted so as to bind the cap rigidly and hermetically seal the jar.

SKATE.—Henry D. Carryl, New York City. This skate is made to be readily and firmly attached to shoes having long or short heels. It has a runner of the ordinary form, to which is secured a sole plate having a narrow portion connecting the heel and ball foot rests, and on the narrow portion is an eccentric dog which engages the forward side of the heel and clamps the narrow part of the sole plate. The improvement is designed to cheapen the manufacture, and to simplify and facilitate the clamping of the skate upon the foot.

SPRINKLER.—William L. Van Horn and Martin Yount, Norfolk, Neb. For the sprinkling of lawns and planted beds, these inventors have devised a sprinkler to be placed at any desired point, and which has a revolving section through which the water may be delivered through the sides, or downwardly or upwardly, in the latter case falling in drops to imitate rain.

DESIGN FOR A RING HOLDER.—Adolph Sametz, New York City. This design comprises a series of elongated V-shaped tongue-like figures on a rectangular board, the edges of which display a lace work ornamentation.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

LEE'S CONDENSED CYCLOPEDIA. A comprehensive digest of the world's knowledge in history, biography, geography, philosophy and science. By Prof. C. M. Stevens. Chicago: Laird & Lee. Pp. 384. Price, library style, 50 cents; leather, full gilt, \$1.

NYSTROM'S POCKET BOOK OF MECHANICS AND ENGINEERING. Revised, corrected and greatly enlarged, with addition of original matter. By William Dennis Marks. Twenty-first edition, further revised and corrected by Robert Grimshaw. Philadelphia: J. B. Lippincott Company. 1895. Pp. 675. Price \$3.50.

We welcome the twenty-first edition of this book, which has had a wide popularity, this twenty-first edition only emphasizing its utility to the engineering profession.

MECHANICS. An elementary text book, theoretical and practical, for colleges and schools. Dynamics. By R. T. Glazebrook. Cambridge: At the University Press. 1895. Pp. ix, 256. Price \$1.25.

This excellent little work, one of the Cambridge Natural Science Manuals, in the Physical Series, is based on the idea of having the student make his own experiments. This it does without in the least impairing the thoroughness of the work, which is a genuine scientific treatise and by no means an intermediate manual. Nothing is clearer than the fact that a thorough knowledge of mechanics is the greater part of the foundation of physics, or, at least, represents the greater portion of the work that is to be done in acquiring a comprehension of the science. The experiments are somewhat in the line of the Harvard entrance examination work, but are far superior in type, a superiority, perhaps, partly due to the somewhat more advanced treatment of the subject employed. It will be understood, moreover, that they do