A MONSTER LOCOMOTIVE.

We illustrate on our first page this week the new monster locomotive of the Mexican Central Railway, designed by Mr. F. W. Johnstone, superintendent of motive power of that railway, and built by the Rhode Island Locomotive Works. This is probably the largest and most powerful locomotive engine now extant. It has been built for special service in drawing freight trains over the heavy grades and curves between Tampico and the city of Mexico. Some of the grades are 158·4 feet to the mile and curves 18 to 22°. The weight of this great machine is 130 tons. In exterior appearance it looks like a couple of locomotives of the mogul pattern backed up together, with the two cabs joined. Flexibility sufficient to go round the sharp curves with least frictional resistance is gained by securing the driving wheels in a truck which is free to move in a line different from that followed by the main frames.

The cylinders and boilers are carried on the main frames separate from the driving wheel truck. As the cylinders are not in line with the driving wheels in rounding curves, it is necessary that a special method of transmitting power from the cylinders to the crank pins should be employed. This is done in a very ingenious way through levers that transmit the power and compensate for the varying distances between the pistons and the crank, due to the swiveling of the driving wheels. But for this compensating arrangement, it would be necessary to give the engine so much cylinder clearance that the loss of steam would be very great. The power-transmitting levers are at the back of the cylinders, connected at the top by a short link, and the bottom ends pinned to the front end of the main rods. There are two of the latter, one connecting with a crank pin, the other with a return crank. The piston transmits motion to the back one of the two levers, and that gives motion to the front lever, which is fulcrumed securely to the frame near its center.

The engines are compound, with annular cylinders, the high pressure cylinder being in the middle and the low pressure cylinder outside. The high pressure cylinder is 13 inches diameter and the low pressure 28 inches. The stroke is 24 inches. It is calculated that the cylinder capacity of each pair of cylinders is equal to a 19 by 24 simple engine.

The boilers are of Otis steel, 9-16 inch in diameter, and carry 180 pounds of steam to the square inch. They are 54¼ inches in diameter and have 201 two-inch tubes, 15 feet 9⅛ inches long. The fireboxes are of the Belpaire type, 56 inches long and 56 inches wide.

The arrangement of working is that the valve motion of the two engines is operated by one screw reverse lever.

In the new locomotive the engineer sits on one side of the cab with all the necessary apparatus for working the double-ender within easy reach. On the other side the fireman pours in the fuel through side doors. A coal passer is necessary to aid him.

Safety of Steamboat Travel.

The efficiency of the existing steamboat inspection laws is well illustrated in the following extract from the recent report of the inspector-general:

The present steamboat laws went into operation February 28, 1871; and, therefore, with the beginning of the present year, they have stood the test of twenty-one years.

During that time the number of steamers inspected has increased from 3,102 inspected in 1870, under the law of 1852, with a total tonnage for that year of 942,272 gross tons, to 7,661 steamers inspected during the fiscal year ending June 30, 1892, with a total tonnage of 2,000,553·37 gross tons.

During the nineteen years of the operation of the law of 1852 there were 1,504 disasters to steam vessels, with a loss of 9,320 lives, or an average per annum of 490 lives lost caused by such disasters.

Whereas, notwithstanding the great increase in the number of vessels since 1870—over 100 per cent—there have been but 729 disasters to steam vessels, with a loss of but 5,057 lives, or an average of 240 per annum; the number of passengers carried per annum having increased from 122,589,130 carried in 1870 to not less than 650,000,000 carried in 1892. The average loss of life under the law of 1852, as obtained by dividing the number of passengers carried in 1870 by the average (490) number of lives lost for those years, was one person to every 250,181 passengers carried; while under the operation of the law of 1871 an average obtained by dividing the number of passengers carried in 1892 by the average (240) number of lives lost in the years covered by the latter law gives only one life lost in each 2,708,333 passengers carried, or a reduction in the number of lives lost of nearly 11 to 1 in proportion to the number of passengers carried.

These results show that under the present steamboat laws, travel by steamboat is safer than by railroad or any other vehicular mode of travel—in fact, safer than is pedestrian travel in large cities.

The number of railway passengers carried last year was 530,000,000, of whom 293 were killed.

Correspondence.

The Elliptical Sprocket Wheel.

To the Editor of the Scientific American:

Will some one who is conversant with the advantages claimed for the elliptical sprocket wheel in bicycles, of which so much is said of late, kindly oblige a reader of the SCIENTIFIC AMERICAN by explaining in detail just what those advantages are? Some claim an advantage of ten per cent in power, but fail to give the philosophy on which this claim is based.

EDW. J. PRINDLE.

Torrington, Ct., February 13, 1893.

[The only advantage we can see is in the increase of power that may be put on the crank by the weight of the rider in its horizontal position, at which moment an extension of the diameter of the sprocket driver is made by the vertical position of its longest elliptic axis—increasing as it does from its horizontal position to the vertical, and decreasing to the horizontal, twice during a revolution. There is no absolute mechanical gain during an entire revolution of the elliptic drivers, by virtue of their ellipticity, but the advantage lies in the facility of economizing the value of the foot tread at the best points in the revolution of the sprocket ellipse by enlarging its radius at the moment of greatest foot pressure.—EDITOR.]

Virginia at the World's Fair.

To the Editor of the Scientific American:

I notice in your issue of February 18, in speaking of the World's Columbian Exposition, and giving foreign and State appropriations, you have left out the State of Virginia entirely in your tables. This State made an appropriation, through her legislature, of $25,000, which was approved March 4, 1892, nearly a year ago, for the purpose of being represented in Chicago at the World's Columbian Exposition. She also authorized counties and cities to make such appropriations as they might deem proper. The governor appointed a State board and also an auxiliary board from every county and city in the commonwealth. These boards have been actively at work, and the appropriation from the State and these other sources aggregates over $50,000. They have constructed a building on the grounds of the World's Exposition at Chicago which is a reproduction of Mount Vernon, both as to the construction of the building exterior and interior, and also a reproduction of all the furniture, or the use of similar furniture, which has been tendered by descendants of the Washington family and others of the colonial period. This Virginia building, on account of its historic association, will probably be one of the most interesting State buildings on the Exposition grounds, and will be visited by more people, both foreign and from this country, than any other State building.

V. D. GRONER,
United States Commissioner from Virginia.

Norfolk, Va., February 17, 1893.

The Snow Shoe.

To the Editor of the Scientific American:

The article in the SCIENTIFIC AMERICAN for February 4 on "Snow Shoe Exercise in the German Army," taken from *L'Illustration*, is, as regards description of the snow shoe, very faulty compared with the very excellent illustration accompanying the same. For the benefit of your many readers to whom a snow shoe of the kind referred to is a novelty, let me describe one:

A strip of any kind of close-grained wood, about 3½ inches wide (tapering slightly backward), 6 to 9 feet long, 1¼ inches thick at center, tapering to about ⅜ of an inch at ends. From end to end it is turned sufficiently to give a spring of about an inch, and the surface is slightly concave or furnished with a shallow longitudinal groove in center. The front is curved upward like a sleigh runner. Slightly back of the balancing point a toe band is adjusted, through a transverse opening in the snow shoe. This, with another band passing around the heel, is the only fastening used. Norway may be said to be the home of the snow shoe (*ski*), and such is the kind used—the shorter for speed and jumping, the longer for service. Ingredients to make the surface smooth and hard are used, but they are never shod with iron, as stated in the article. Lightness is an advantage sought. While it is true that snow shoes have been used in military operations, as stated, for centuries back in Northern Europe, the hunters never attempt to pursue the boar on them with any hope of dispatching it with a stick. It is, however, true that the Finns sometimes run down a troublesome wolf when the snow is deep and loose, but it is always a question of endurance rather than speed.

J. C. NORBY.

Ada, Minn., February 9, 1893.

Association of Inventors and Manufacturers.

The second annual convention of the American Association of Inventors and Manufacturers was lately held in Washington, Dr. R. J. Gatling, the inventor of the Gatling gun, presiding, with a large number of members in attendance. Papers were read by members of the association as follows: Mr. Arthur Stewart, of Baltimore, on the distinction between the patent system of the United States and those of other countries; Mr. Wm. C. Dodge, of Washington, on the benefits of the United States patent system; Mr. Oberlin Smith on a proposed Patent Office department of standards; Mr. Stephen H. Emmons on inaccuracies in the metric system of measurement; Mr. A. T. Andrews, of Connecticut, on the rights of inventors.

Among the business transacted was the adoption of resolutions asking of Congress such legislation as will perpetuate and perfect the American patent system, and the use of so much of the funds paid by the inventors as may be necessary to provide the Patent Office with the room, force, means, and appliances necessary for the proper and prompt transaction of the business intrusted to it, and also to provide a special court for the trial of patent causes, to the end that speedy and uniform decisions may be had with a minimum of litigation, delay, and expense.

A committee was appointed to select a committee of representative inventors and manufacturers from the different States to constitute an inventors' congress, to be held some time during the World's Fair. A committee on subjects and publications, consisting of James T. Dubois, Washington; Octave Chanute, Chicago, Ill.; Irving Elting, Poughkeepsie, N. Y.; Elihu Thomson, Lynn, Mass.; and George N. Bierce, Dayton, O., was also appointed.

The Weight a Man can Handle in Ten Hours.

I was past 22 years of age when I hired with a Mr. Grimes, the boss of the Manchester Machine Company. I was to work in the yard as laborer until a better opportunity offered, which did come when I went into the machine shop. There arrived by rail some 500 tons of pig iron, which was hauled from the cars on dump carts and dumped in the yard and piled up in rows about four feet high. The pigs weighed from say 60 to 150 pounds each. A man of the name of Bunting did the hauling, and each load was weighed on the scales as it came into the yard. One day's hauling had been done and piled up by four of us yard hands. In the morning Grimes said to me that a lot of machinery had arrived for the print works then being built, and that he would have to take all of the yard hands except me, so that I might pile up what I could and let the balance lie on the ground. We used leather pads on our hands to protect them from wear and soreness in handling the iron, which is always rough. I took into my mind the idea of piling up all that was hauled that day, just to see what could be done.

Mr. Bunting drove one of his teams. They hauled about one ton at a load. Every time he came in he would laugh at me, supposing that I could pile it all up as fast as it came in, and said: "Young man, we'll make you weaken before night." I considered this a sort of challenge and accepted it, and just as the whistle blew to quit work I had the last pig on the pile, about as used up a man as ever lived at the end of ten hours' work. Bunting and myself went into the office and had the clerk foot up the weight, which was 212½ tons.

I was so used up that I could scarcely walk to my boarding house. I retired early and had a good night's sleep, and was so stiff that I could scarcely get down stairs. I hobbled down to the yard office, when Mr. Grimes looked at me and said: "Emerson, what possessed you to pile up all that pig iron yesterday, you foolish fellow? Now you go home and rest, and your wages will go right on for two days, for you did more than three good days' work." I confess that I was pleased with the opportunity, but only lay off one day, and when I went to work it was to pile up a few cords of wood, and I shall never forget how light it felt. It seemed as though I was handling cork. I don't think that it ever injured me; but would not advise any man to try such a feat. J. E. EMERSON.

Bananas and Potatoes.

The banana and the potato disclose through chemical analysis that they are almost identical in composition, as witness the following comparison:

	Banana.	Potato.
Water	75·71	75·77
Albuminoids	1·71	1·79
Total carbonaceous matter (non-nitrogenous)	20·13	20·72
Woody fiber	1·74	0·75
Ash	0·71	0·97

W. M. Doherty deduces from these figures the fact that, so far from the banana being a perfect food for man, as is frequently claimed, the small quantity of albuminoids present indicates it as being insufficiently nutritious. The average man, under normal conditions, requires 4·2 ounces of flesh-forming substances daily, to obtain which he would need to eat fifteen pounds of the fruit, and this would contain nine pints of water. It is, therefore, a very unevenly balanced food, which is not suited alone for man's diet, but is an excellent and wholesome addition to a diet rich in nitrogenous substances.—*American Analyst.*

Whether suited for man's diet or not, it is pretty certain that many thousands of people in this world subsist mainly on bananas.