SIDE SHOW SCIENCE.

There has recently been exhibited in the Circus of the Champs Elysees, in Paris (we learn from *La Nature*), a curious example of the ability to remain a considerable time under water without asphyxia. This is "Miss Lurline, the Queen of the Water," as she is called. The aquarium in which she performs consists of a large rectangular vessel with glass sides (the larger about 10 feet long by 7 feet high), and filled with water which is slightly tinted green, and is strongly illuminated by means of five or six oxybydrogen lights.

Miss Lurline dives, swims, lies down and eats at the bottom of the water, passes between bars of a chair, etc.

At a certain moment, the music ceases, the girl draws a few long breaths, then lets herself sink to the bottom, where she kneels on one knee, crossing her arms on her breast. A man outside stands with watch in one hand and hammer in the other, with which latter he counts the half minutes by striking. One half minute—one minute—a minute and a half—two minutes—two minutes and a half! During the silence, interrupted only by the sound of the hammer, the minutes seem very long, the spectators are painfully intent, and experience a relief when the diver returns to the surface.

To appreciate what is implied in passing two minutes and a half without taking breath, let any one (says M. Kerlus in the journal named) make a small experiment, holding his breath as long as possible, while watching a seconds watch. Few persons reach one minute; the majority are obliged to take breath before forty-five seconds have elapsed, and it is only exceptionally and with much difficulty that some attain one minute fifteen seconds.

The fishers of sponges, mother-of-pearl, and of pearl oysters in the Mediterranean and elsewhere, do not ordinarily remain under water longer than two minutes. It has never been authentically observed, *watch in hand*, that they effected a voluntary immersion of more than three minutes. The mean time is one minute to a minute and a half. Even under these conditions, the work of a diver in deep water is excessively painful. On coming out of the water, they usually remain some time motionless, the face congested, the eyes bloodshot, and often blood given out by the mouth from rupture of blood vessels in the lungs. These divers do not live long; they sometimes die of apoplexy after coming out of the water; they also frequently lose sight by reason of congestion of vessels of the eyes.

The public divers in aquaria run much less risk. They have not to bear any great pressure resulting from thickness of the layer of water above, and, besides, they remain still in the water, whereas the fishing divers have to perform active work during immersion, and so exhaust more quickly the supply of oxygen retained in their lungs.

During the last twelve years, four or five divers (male and female) have exhibited in Paris, under various aquatic names, such as "l'Homme-poisson," "l'Homme-amphibie," "La Femme-Sirene," "La Reine des Eaux." Their exercises have been much the same. One of them, however, the fish man, made a very curious experiment. He smoked a cigarette almost entirely, but without emitting the smoke. Then he lay down at the bottom of the water, and let a succession of gray bubbles of smoke rise to the surface. The quantity of smoke thus returned seemed enormous. At intervals the series stopped, to commence again a few seconds later, greatly to the surprise of the spectators. Some of these estimated that the experiment lasted quite five minutes. In reality, it did not exceed one minute.

While a diver is immersed, if one do not look at a watch, one finds it difficult to calculate the time of immersion correctly, and generally exaggerates. Hence, in all probability, the accounts of many wonderful divers. It is said, *e. g.*, that Ionian and Sicilian divers employed after the naval battle of Navarino, in 1827, remained five to ten minutes under water, and one of them even a quarter of an hour. Exaggeration here is evident.

Whence comes this power, possessed by some persons, of remaining longer than others without breathing? The old physiologists attributed it to the aperture of Botal not being closed in the heart (as in the child before birth). This is easily proved to be an error.

It has also been supposed that divers feed only on vegetables, their food yielding blood less rich in corpuscles, and so requiring less oxygen. Another idea is that divers exhibiting in public take either morphine with the view of retarding the circulation, or digitalis with the view of retarding the heart beats.

These supposed means (says M. Kerlus) are not practicable, or they would tend to the opposite of the end aimed at. The power of remaining a long time without respiration seems due simply to a great development of pulmonary capacity, to lungs of large volume and perfectly sound. This great capacity may be natural; it may be the result of heredity, as is probably the case with the sons and grandsons of fishing divers; it may be acquired, or at least developed, by exercise. The profession of diver is similar in this respect to those of the runner, the gymnast, and also the singer.

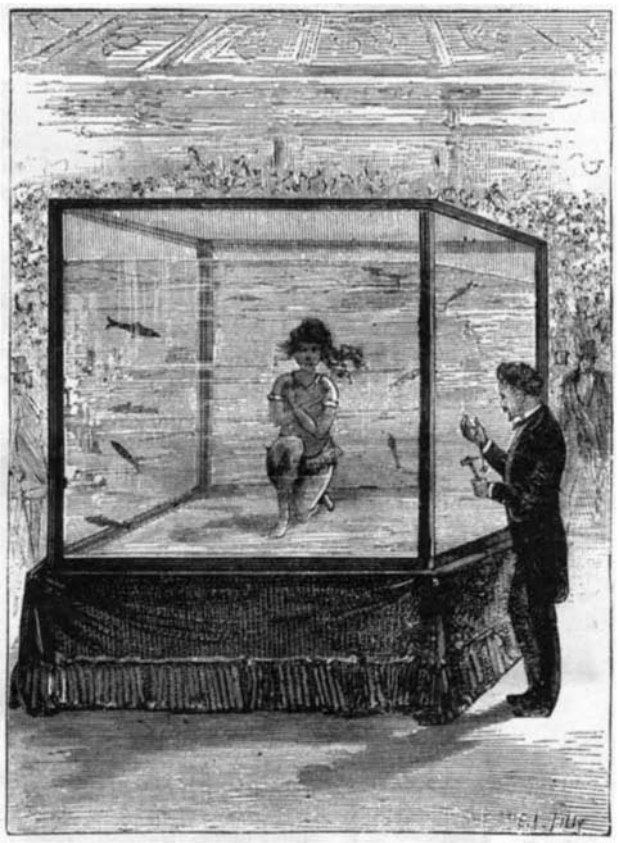
THE London *Medical Record* concludes from Prof. Koch's experiments that the only certain disinfectants are chlorine, bromine, and corrosive sublimate. Solutions of one part of the latter to 1,000 parts of water will kill spores in ten minutes, while a solution of 1 in 15,000 is strong enough to arrest the power of development in micro-organisms.

Manufacture of Tinned Sheet Copper.

An interesting patent case has been decided by Judge Shipman in the United States Circuit Court of Connecticut, in which the following particulars of the above art were brought out:

Tinned sheet copper for the manufacture of culinary utensils was formerly furnished to the coppersmith in the form of a soft sheet of copper tinned on one side, and the copper side discolored by the action of the heat and acids employed in the tinning process. This soft, porous, flexible sheet was then made dense and hard by tedious and expensive hand hammering, or "planishing," as it was called, which consisted of hammering the sheet upon an anvil with hammers of a curved surface to make the sheet dense, and then with hammers of a plane surface to smooth and brighten it. Tinned copper had been also sometimes cold-rolled or passed through polished rolls, whereby the sheet was made more dense; but the form in which the coppersmith generally received the sheet for manufacture into utensils was the one which has been described. Sometimes the discoloration was attempted to be removed by the use of acid. Mr. Andrew O'Neil, in 1867, received letters patent for a tinned copper sheet prepared in this way. A varnish, made after a prescribed formula, was applied with a brush to the copper side of the tinned sheets in the rough state "without subjecting them to any acid bath, scouring, planishing, or any other chemical or mechanical preparation." The varnished sheets, when dry, "were passed through highly polished rolls of steel, or case-hardened or chilled iron." In 1869 another patent was granted to Mr. O'Neil.

This invention, which consisted in subjecting the sheet to cold-rolling, whereby the surface was made dense and glossy, and to polishing, whereby the discoloration was removed,



MISS LURLINE IN HER AQUARIUM.

and, if need be, to an additional enameling process, was received with great favor, went into extensive use, entirely superseded hand planishing, and was very useful. In 1877 a reissue of this patent was obtained, on which reissued patent this suit was brought. In the specification the patentee says that "in some instances the sheet had been passed through rollers before my invention;" but in consequence of the acids employed in preparing the sheet for tinning and the heat in the tinning operation the copper surface became dark and mottled.

The reissued claims are as follows:

"1. As a new article of manufacture, the tinned sheet copper herein described, the same having a bright or polished copper surface, and the whole being cold-rolled, as and for the purpose described.

"2. The improvement in the manufacture of tinned sheet copper, consisting in tinning one surface, cleaning or brightening the other surface, and subjecting the sheet while cold to pressure between rollers, substantially as set forth.

"3. The sheet of tinned copper prepared by cleaning and rolling, and protected by a varnish upon the copper surface, as and for the purpose set forth."

The first claim is identical with the first claim of the original. It is not for a tinned sheet, cold-rolled, and having a bright copper surface, made such by the use of acids, but having a surface made bright or polished by the wheel, or by any approved mode of polishing. The second claim is for the process of manufacturing described in both original and reissue, not including the varnishing; but it is not to be construed as including any mere "cleaning" of the surface, although the word "cleaning" is introduced both into the description and the claim. To include in the patented process cleaning by acid, or by scouring with acid and sand, would be an undue expansion of the original patent.

In 1876 Thomas James obtained a patent for an improvement in the manufacture of tinned sheet copper, under which the defendants now make the article which is said to be an infringement. After the sheet is tinned the discoloration is removed by the use of diluted acid, or by scrubbing with acid and sand. The sheet is then washed in pure water, and after it is dry is cold-rolled between bright chilled rolls, two sheets having been placed together with their tinned surfaces in contact. By this process the discoloration is removed by the application of acid, and then the surface is polished by the chilled rolls. By the O'Neil process the surface is polished and made glossy by the rolls, and the discoloration is removed by the buffer or other approved polishing method.

The defendants' process is not the patented process. It omits a patented step, and in its stead includes one which the patentee intended to avoid.

There is no infringement, and the bill is dismissed.

Work for Inventors To Do.

We have machines for doing almost all kinds of work in field, shop, and factory. But most of the machines we find in them now will not be used twenty years hence. They will give place to something vastly better. All the machines now styled "perfection," will be found to be very imperfect.

The machines now employed for making paper, weaving cloth, printing, sewing, shaping brick, and working up lumber will soon be displaced. A very valuable invention is seldom very valuable, in itself, beyond the term for which it is patented. It is improved to such an extent that only a single principle remains to be kept in operation.

It is likely that much will be done in the future in restoring old processes, and in combining them for doing certain kinds of work. In many departments of industry little has been done to lighten the burdens of human labor. Kitchen work is performed in about the same way as it was when the first kitchen was constructed. Clothes, dishes, and floors are washed after the most primitive fashion.

Our methods of doing all kinds of housework are twenty centuries behind our methods of doing farm and factory work. Knives and forks are made by machinery, but are scoured by hand. A new tin dish is made in a factory quicker and with less trouble than an old one is cleaned in the kitchen. When drudgery was driven out of the field and workshop it took refuge in the kitchen, seemingly with the determination of making it its permanent place of abode. It clings to it with desperation. New dishes for the table and new garments for the person all make work, but the persons who bring them out produce no labor-saving machine for cleaning the first or keeping in order the last.

It is likely that most of the valuable inventions in the future will be made by persons who will devote themselves to inventing as a business. More knowledge, skill, time, money, and higher talent are now required to make inventions than were formerly needed. A person must now study to find out what is wanted in any department of industry, and then learn what has been accomplished. He must read many books and consult with many persons. If a proposed invention pertains to the application of any science to the arts, he must become familiar with both the science and the art for improving which it is designed.

Messrs. Bessemer, Ransome, and Edison, three of the most illustrious inventors of our time, afford good illustrations of what men of genius, judgment, and perseverance can accomplish by devoting themselves to specialties. A technical education and a library are as necessary to an inventor as to any professional man. For a mechanical inventor a workshop is as necessary as it is to a mechanic. Some capital of course is necessary to enable a person to devote all his time to this business. Ability to concentrate one's thoughts on a particular subject is of prime importance to a successful inventor. A "happy idea" may occur to him, but patience is required to make it of any practical value. Many scientific men and mechanics can devote considerable time to inventing and go on with their regular pursuits, as they have unusual facilities. Much always depends on little things in the perfection of great inventions. Goodyear and Morse found their greatest difficulties with matters that at first appeared trifling.—*Chicago Times.*

An Artificial Aurora.

A telegram has been received by the Finnish Academy of Sciences from Professor S. Lemström, chief of the Finnish Meteorological Observatory, at Sodankylä. He states that, having placed a galvanic battery with conductors covering an area of 900 square meters on the hill of Oratunturi, he found the cone to be generally surrounded by a halo, yellow-white in color, which faintly but perfectly yields the spectrum of the aurora borealis. This, he states, furnishes a direct proof of the electrical nature of the aurora, and opens a new field in the study of the physical condition of the earth. A further telegram has been received, in which Professor Lemström states that experiment, with the aurora borealis made December 29, in Enare, near Kultala, on the hill of Pietarintunturi, confirm the results of those at Oratunturi. On that date a straight beam of aurora was seen over the galvanic apparatus. It also appears from the magnetic observations that the terrestrial current ceases below the aurora arc, while the atmospheric current rapidly increases, but depends on the area of the galvanic apparatus, to which it seems to be proportional. The Professor regrets that with the means at his disposal further experiments cannot be made, and that he intended almost immediately to withdraw the apparatus.

The Vocal Statue of Memnon.

On the low marshy plains near Thebes, on the banks of the Nile, are situated the wonderful colossal statues of Memnon, which for so many centuries have attracted the attention and excited the wonder and admiration of travelers and students. These two colossal monoliths, which are supposed to represent the royal personage of Amenophis III., and to have been erected by him some 1,700 years before the Christian era, are of the same dimensions, and are hewn from the same sort of granite.

The height of the figures from the soles of the feet to the crown of the head is about fifty feet, making a total height with the pedestal of over sixty-five feet. One of these monoliths being mounted upon an unsufficient foundation, began to assume an inclined position many centuries ago, and a little crack forming in the stone was increased year by year, until, about the year 27 B.C., an earthquake taking place in Egypt, the upper part of the statue was broken off and overturned, and there it has been lying ever since.

Soon after this occurrence, certain curious rumbling noises were heard to proceed from the standing portion of the statue. These sounds were observed to occur at break of day, immediately after the rising of the sun. That this phenomenon was noticed by a number of travelers and savants is pretty well proved by the inscriptions chiseled on the pedestal of the statue by different persons at different times, and all bearing witness to the same fact.

Strabo, who visited the statue some dozen years after its fall, thus speaks of it: "There are two colossal monoliths, one of which is still standing, while the upper portion of the other has been overthrown, I am told, by an earthquake. It is believed, also, that once each day a sound like a slight blow proceeds from that portion which remains standing on the base. As for myself, when I visited this locality with Alius Gallus, I most assuredly heard a noise at the first hour. Did it proceed from the base, from the colossal, or from some of those who were standing about the base? Was it done designedly? This is what I cannot assert positively, for without knowledge of the truecauseit is better to imagine almost anything than to admit that stones so placed can emit sounds." Later observers were more decided in their opinion, however, and assert positively that they distinctly heard the sounds proceeding from the interior of the stone. In the time of Septimius Severus, the statue was restored, and the upper portion, consisting now of five pieces, was replaced to its original position, and since then there is no record of any sound having proceeded from the austere figure.

It has been noticed that the sounds were heard at the time when the first rays of the sun fell upon the statue, and further that these noises did not begin to be noticed until after the upper portion of the statue had been overturned, and that as soon as the monolith was restored to its original condition they were heard no longer. Taking all these facts into consideration, M. De Roziere, who has made a considerable study of this matter, considers the phenomenon to be due to the fact that the rays of the sun, striking on the broken portion of the monument, dry up the moisture which has been absorbed during the night. The dew deposited in the fissures of the rock and thus caused rapidly to evaporate tends to open the crack still further.

If the matter were homogeneous throughout or composed of fine particles, no noise or vibrations would be discernible; but as the stone consists of an agglutinous mass of hard grains, the larger grains will resist more than the others the tendency in the rock to crack and separate into fissures, and will be left alone to support the strain. This tension being continually renewed, these grains finally give way. This rupture causes in the stone a concussion or rapid vibration, and it is this which produces the groaning sound in the stone at the rising of the sun.

Humboldt speaks of having discovered musical stones, called by the inhabitants *lejas de musica* on the banks of the Orinoco. These were granitic in character and were full of cracks and fissures, and emitted sounds, as he says, immediately after the rising of the sun, like the tones of an organ.

The seventy inscriptions which make mention of this prodigy leave almost no doubt as to the facts in the case, and the great matter for regret is that the religious or perhaps superstitious ardor of Septimius Severus should have led him to set about those restorations which have for ever closed the mouth of the royal Memnon.

Government Profit on Coinage.

Some curious facts relating to unredeemed obligations of the Government have been collated by the New York *Sun*, which show a considerable source of profit to the United States Government. The amount of paper money and coin which is never presented for redemption comprises a large sum. Much of this is destroyed by fire. Some of it is buried or hid in places known to no person alive. A large quantity of the coin is melted to make sterling silverware. Considerable amounts of both paper money and coin are exported never to return. Not long ago a United States bond, issued about 1819, was presented at the Sub-Treasury in this city. The interest on it had ceased over fifty years. It had come back from Europe through Baring Brothers. The outstanding principal of the public debt of the United States last year was nearly two billions of dollars, chiefly represented by bonds and treasury notes.

It would be, of course, impossible to say how much of this will never be presented for redemption, but some idea may be formed from the fact that $57,665 of it was issued so long ago that the date is not recorded. It appears in the report as "old debt" that may safely be put down as profit. There is an item of $82,525 of treasury notes issued prior to 1846. Some of them were issued nearly fifty years ago, and will not, in all probability, ever be presented for redemption. One thousand one hundred and four dollars of the Mexican indemnity of 1846 has never been claimed. The last of the fractional currency was issued under the act of June 6, 1864, yet, although nearly twenty years have elapsed, $7,077,247 has not been presented for redemption. Some of this is held as a curiosity. Some of it is still used by banks and merchants for transmitting small sums by mail. Several New York banks have considerable sums of new fractional currency, which they distribute for the accommodation of their customers.

As to the coin, the Government derives a considerable profit from it. The silver in one thousand silver dollars costs, on an average, about $803.75. The coinage of a silver dollar costs about 1¼ cents. The total cost of one thousand silver dollars to the Government is therefore $816.25. Since the organization of the mint, in 1793, 127,190,618 silver dollars have been coined, on which the Government has received a profit of over twenty-three millions of dollars.

In the same period $122,758,510 was coined into half dollars. At the same rate of cost for coinage the Government profited $19,395,769 on these. The total silver coinage of the Government since 1793 is $347,766,792. Estimating the profit on the halves, quarters, and subsidiary coins at the same rate as on the dollars, the total profit received by the Government on its silver coinage has been about sixty-four millions of dollars.

In the coinage of the five cent nickels the Government reserved to itself the liberal profit of nearly 50 per cent. This gave to the Government last year the handsome revenue of over $100,000 from nickels alone. The wide margin between the intrinsic value of the five cent nickel and its face value led to extreme counterfeiting. Several years ago an assay was made of some of the counterfeit nickels, and it was discovered that the counterfeiters had put into their coins more valuable metal than the Government uses in making the genuine coins.

Does Snow Protect the Soil from Frost?

Prof. Alexander Edmond Becquerel, of the Conservatoire des Arts et Metiers in Paris, the celebrated investigator of electro-chemical decomposition, has recently been investigating a question of considerable scientific interest as well as of great practical importance especially, to agriculturists, namely, whether a blanket of snow prevents frost from entering the ground or hinders it to any great extent.

The numerous experiments which it was necessary to make to obtain a precise answer to this question were carried on last winter in the Jardin des Plantes. The aim of these was to ascertain, first, to what extent the temperature of the ground was influenced by the temperature of the air, both under bare ground and in sodded soil, with and without snow. Also to ascertain what depth the temperature of the air was able to make its influence felt. In these very complicated investigations the electric thermometer invented by Becquerel himself was employed, an instrument which needs some description to make the following details intelligible.

Two covered wires of unlike metals—copper and iron—are soldered together at both ends, which are left uncovered for this purpose; otherwise they are covered their whole length, for the purpose of insulation, with gutta-percha and silk. If the soldered ends of these double wires are exposed to different temperatures, an electric current is generated in them, and the greater the difference in temperatures the stronger the current, but the current ceases when both are exposed to the same temperature. This electric current acts on a magnetic needle suspended so as to move freely over a graduated circle, a kind of compass. The copper wire forms a vertical frame around the needle parallel to the normal direction of the needle. As long as both ends of the double wire are at the same temperature the needle continues to point to the north, being subject only to the earth's magnetism, but as soon as there is any variation in temperature the needle is sure to move instantly and take another position, which it will keep until some other change of temperature takes place.

The application of this ingenious instrument for the measuring of soil temperatures was made as follows:

One of the soldered joints was buried in the earth to a depth at which it was desired to take the temperature, and the other end was put in a water bath at any desired distance from the first. The temperature of the latter could be increased or diminished at pleasure, and was measured by a very sensitive thermometer. To ascertain the temperature in the soil where the other end is buried, it is only necessary to raise or lower the temperature of the water bath until the magnetic needle stands at zero, and then read the thermometer. The thermometer will stand the same as if it were buried at that point. The results obtained were absolutely accurate, and the method itself very simple and easy.

Prof. Becquerel began his observations at the end of November. Simultaneous observations were made of the temperature of the air at the height of 33⅓ feet and 66⅔ feet, and of the soil at the depths of 2, 4, 8, 12, and 24 inches. They were made under sod and bare ground. On November 26, a dry frost began which lasted without interruption until December 3. At this date the air had a temperature of 7° Fahr., and a heavy fall of snow began that covered the ground to the depth of 10 inches. From the 6th to the 19th of December, the cold steadily moderated until on the morning of the 19th and 20th it was above 32°. A variable cold weather followed, and the snow sank to less than 8 inches.

Observations of temperature showed that both before and after the snow fell the temperature of the soil, where it was covered with sod, remained above the freezing point even on the coldest day. On November 26, at a depth of 2 inches the temperature was 40° Fahr. From this time it sank continuously until December 14, when it reached 32½° Fahr., but it never fell below this minimum.

The results were quite different in soil not covered with grass sod. On November 26, the day when the dry frost began, the temperature at a depth of 2 inches fell below 32° Fahr.; on November 29 it stood at 26¼° Fahr., and on December 2, before the snowfall, it was 25° Fahr. During the whole time when its surface was covered with snow from 10 to 8 inches deep, the temperature never rose above 32°, but only varied, at a depth of 2 inches, between 28° to 30° Fahr.

From these observations, which were repeated a great many times, although we have given but few of the results, we may deduce a whole series of very interesting results of great importance to agriculturists.

In the first place it was proved that changes in the temperature of the air make themselves felt to a certain distance in the earth even when the surface is thickly covered with snow. Hence the generally received opinion that a mantle of snow keeps the earth warm is in general erroneous. Snow does not protect the soil and seed at all from freezing, but only hinders to a certain degree the too extensive radiation of heat from the soil, and is converted into water at 32°, which sinks into the earth and somewhat raises its temperature.

Becquerel's experiments also prove that the best protection for the soil is a heavy sod, which does more to raise its temperature than ever so thick a layer of snow.

The matted roots of the sod form a sort of felted covering which not only excludes the cold in a high degree, but also draws up the moisture from the lower strata toward the surface. Our winter grain does not have the thickness of a bed of sod and cannot act the same, having much more the character of bare ground, and hence we are not entitled to consider our grain fields sufficiently protected from the strongest frosts when only covered with an ordinary layer of snow.—*F. Von Thumen, in Weiner Landwirthschaftliche Zeitung*, January 6, 1883.

The Deepest Sounding in the Atlantic.

The Coast and Geodetic Survey steamer Blake returned to this port February 14, from a winter cruise for deep sea exploration between the Bermudas and the Bahamas. On the 19th of January, in latitude 19° 41′ N., longitude 66° 24′ W., about 105 miles northwest of St. Thomas, there was found the greatest depth ever measured in the Atlantic, or 4,561 fathoms.

The place was about eighty miles southwest of the place where the Challenger made her deepest sounding, of 3,862 fathoms. It was inside a basin—that is, many hundred fathoms down it was inclosed by a ridge. The temperature of the water at this great depth was 36 degrees. It is a curious fact in connection with such basins as this that the water of the bottom of them is of exactly the same temperature as that which runs over the top of the ridge several hundred fathoms above. The specimen of the bottom secured at this sounding showed a soft, brown ooze, with evidences of fauna.

Mortality of Our Great City.

Thirty-seven thousand nine hundred and fifty-one persons died in New York city in 1882, the ratio being a little over twenty-nine per thousand of population. These figures show that New York has no equal among Northern cities for funerals and that the business of undertakers is remarkably active.

The number of cases and deaths from the principal contagious diseases for 1882 was as follows:

Diseases.	Cases.	Deaths.
Smallpox	708	269
Measles	4,733	912
Scarlet fever	6,594	2,070
Diphtheria	3,842	1,521
Croup	..	730
Whooping cough	....	655
Erysipelas	....	151
Typhus fever	207	66
Typhoid fever	684	363
Malarial fever	....	533

The average death rate for the United States, as indicated by the census returns for 1880, is between 17 and 19 per thousand. Of suicides there were 199; of these, 165 were men, and 34 were women; 71 were Germans, 50 Americans, and 20 Irish.

Mexican Tin.

The first ton of Mexican tin ever sent to this country was recently received. The metal is said to be bright, clear and apparently of good texture. It came from Durango. The ores of placer origin are said to average 73 per cent of smelted tin. Mr. Henry Freeman, an Australian tin mining engineer, has been for a year or more exploring the region between Chihuahua and southwestern Durango in search of evidences of the tin lodes and placers spoken of by the old Spanish settlers, and has secured for St. Louis merchants and capitalists a considerable tract in the southwest quarter of Durango believed to contain tin ore in large quantities. The famous iron mountain of Durango is in the northern part of the district.