

cow milk containing tubercle bacilli with perhydrazase milk proved that the latter destroyed the tubercle bacilli. In contrast to heat sterilization, the amount of albumen remains unchanged. This was ascertained chemically, and by means of the addition of tetanus antitoxin. The renneting power does not change. Peroxide of hydrogen cannot be determined in the milk one-half hour after the addition of peroxidase. With paraphenylenediamine the reaction does not take place immediately, as in the case of raw milk, but only after four to seven hours. To the taste perhydrazase milk does not differ from raw milk. The cost of the milk is increased four to five cents per liter. Perhydrazase milk must be kept in a dark place. Exposure to light will give it a bitter taste, but there will be no appearance of germs. As the German law prohibits any addition whatever to milk, a general introduction of the method cannot now be made. At present its use is confined to agricultural practice.

RECENT PERFORMANCES OF THE FRENCH AIRSHIP "PATRIE."

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The new airship "Patrie," which was built for the French government on the same general plan as the "Lebaudy," and which we have already described, finished the series of military experiments which went on for some time in the region of Paris by a brilliant performance and one which speaks most favorably for this airship in particular as well as showing what can now be accomplished. On the 15th of December, having made all the trial flights around the balloon shed which were required, the airship started to its destination, the military aeronautic grounds of Chalais-Meudon, near Paris, and reached this point after a very good flight in a straight line of 52 kilometers. It started on the trip at 10 o'clock in the morning and attained high speed, seeing that it reached the aeronautic establishment at 11:12 A. M. The flight was made under the orders of the chief of the Etat-Major, and it was remarkable to see an airship start off at command and arrive without difficulty at a distant point and one which was difficult to light upon on account of the obstacles which surrounded it. We give a few details as to the flight, which is without doubt the most remarkable of the year for an airship. It was brought out of the balloon shed at 9:30 A. M. and then taken to the flat ground, where the preparations for the start were made exclusively under the direction of the army officers and the military aerostatic corps. In the car were Capt. Voyer, the pilot on this occasion, Lieut. Bois, aid, also the mechanics Duguffroy and Rey. At 10 o'clock the airship started up and commenced the flight toward Meudon. Well guided by the pilot, in spite of a rather stiff breeze of 45 feet per second which blew against the side of the balloon, it proceeded in a straight line toward its destination, being very well balanced in the air and keeping at about 656 feet altitude. Passing over the neighboring town of Mantes, then coming above Maule and Versailles, it finally reached Chalais-Meudon, where part of the corps of military aeronauts which had been stationed for some weeks at the establishment, was waiting for its arrival, under the orders of Commandant Boutheaux. Soon the long cigar-shaped balloon was seen above the woods which surround the Chalais balloon shed. It made a half-turn so as to bring the front against the wind, then headed for the point where the group of aeronauts was waiting, and they brought it down to the ground by hauling upon the cords. The landing took place at 11:12 and the 31.4 miles in a straight line had been made in 1h. 12m., which makes a speed of about 28 miles an hour. But the real speed must have been more than this, because the airship had to slow up for several minutes while making the evolutions before the landing. For the present, the "Patrie" will be housed in the Meudon balloon shed, while waiting for it to be transferred to the fortified post of Verdun, where the army corps is preparing a model balloon ground especially for it. It is thought that in the meantime it may make a trip to Paris, as the "Lebaudy" formerly did with such success. It will be remembered that the third balloon of the series, the "Republique," is to be built next year, and there is some talk of constructing a fourth airship the year following, which will be known as the "Democratie."

Quite a sensation was awakened in Paris by the flight which the great airship "Patrie" made above the city at a great height on the 17th of December. Soon after the arrival of the airship at the Chalais-Meudon grounds in the suburbs of town it was decided to give the Parisians an opportunity to see the new airship, and therefore it made the trip in spite of the somewhat foggy weather which prevailed that day. Preparations for the flight commenced at the Chalais grounds at 2:30 in the afternoon, and at 3 o'clock the airship left the establishment and directed its course for Paris, running against a rather strong northeast wind. Capt. Voyer piloted, and with him were Capt. Gaucher, another officer, and two mechanics. Soon the balloon

disappeared in the fog, but upon reaching the city it re-appeared, and could easily be seen sailing along at what appeared to be a slow speed, but was in reality a good rate. Somewhat after three o'clock it was seen flying above the Grand Palais, where the crowds assembled on the occasion of the automobile show could observe it very well, and were much impressed with its appearance and the ease with which it made the evolutions in the air. The airship ran at a good speed keeping at a height of about 1,000 feet, and passed above the different government buildings such as the president's residence, the Chamber of Deputies and the War Department. Not more than three-quarters of an hour was needed for the whole trip, and the airship continued to keep about the same height, giving signals from a siren which were heard on the ground. Before four o'clock it had regained the military headquarters, where it came down and was put in the shed with the usual maneuvers with which the military aerostatic corps are now quite familiar. As usual, the airship distinguished itself for its remarkable stability in the air, which is one of its chief characteristics and speaks well for Engineer Julliot's design. A very good speed was also made and the airship was handled with ease.

FACTS ABOUT BLACK LEAD PENCILS.

BY KATHERINE S. CALHOUN.

It is difficult to determine the exact period in which "black lead" was first utilized as an instrument for writing or drawing, as it has been confused with other mineral bodies to which it bears no relation. The ancients used lead, but the metal was formed into flat plates, and the edges of these plates used to make the mark. If an ornamental design was desired, the transcriber drew parallel lines, and traced their illuminated designs, usually with a hard point but also with soft lead. That lead was known to the ancients is also proven by the fact that it is mentioned in the Book of Job.

During the year 1615 there was a description of the black lead pencil written by Conrad Gesner. He says that pieces of plumbago were fastened in a wooden handle and a mixture of fossil substance, sometimes covered with wood, was used for writing and drawing. About half a century later a very good account of this mineral was given, and it was then used in Italy for drawing and mixed with clay for manufacturing crucibles. We are informed in Beckman's "History of Inventions" that the pencils first used in Italy for drawing were composed of a mixture of lead and tin, nothing more than pewter. This pencil was called a stile. Michael Angelo mentions this stile, and in fact it seems that such pencils were long used in common over the whole continent of Europe. At this period the name plumbago or graphite was not in use, but instead the name molybdena or molybdoïds, which is now applied to an entirely different mineral.

Graphite or black lead is formed in the primary rocks. In the United States it occurs in felspar and quartz, in Great Britain in greenstone rock and gneiss, and in Norway in quartz. The mine at Borrowdale, England, has supplied some of the finest black lead in the world, but the quantity varies, owing to the irregularity with which the mineral occurs.

The Jews were for a while the only manufacturers of pencils. It required great skill to perfect the manufacture, according to the degree of hardness or softness required. Of recent years the manufacture of pencils has increased to such an extent that the price of these articles has decreased proportionately. Graphite and pure clay are combined and used in the manufacture of artificial black lead pencils, and on the other hand the greatest perfection is attained in the making of the higher class pencils. Graphite is exposed to heat to acquire firmness and brilliancy of color. Sulphur is also used to secure a more perfect color.

THE YAWNING CURE FOR THROAT DISEASES.

A little book, recently published in Vienna, is devoted to a method of vocal culture, and also health culture, that has stood the test of practical experience in numerous cases but is not as well known as it deserves to be. It is based upon the vocal method of the concert singer Josephine Richter, the mother of the celebrated orchestra leader, Hans Richter, and consists essentially of peculiar movements of the jaws which ultimately give the pupil an astonishing command over the soft palate, besides strengthening the muscles of the face, neck and chest.

Herr Lanz, the author of the book, quotes a letter written to Mme. Richter by the late Prof. Helmholtz in which that famous physicist says: "I can readily understand, from theoretical considerations, that the flabbiness of the soft palate and the back of the mouth must act as a damper upon the voice and an obstacle to precision of attack and utterance. Hence if the command of the palate, tongue and larynx which you possess can be acquired by your method of exercising the muscles of the face and throat, as your own example appears to prove, the fact is clearly of great

importance. It is physiologically probable that such exercises would have that effect."

That the exercises do have that effect is proved by an examination of an average untrained throat and the throat of a singer trained by the new method. In the former the soft palate and its conical extension, the uvula, hang limp and constrict the vocal passage, which is further narrowed by the prominent tonsil at each side. In a mouth so encumbered, as in a room filled with furniture, it is impossible for the voice to ring loud and clear. The tonsils and soft palate of the trained singer, on the other hand, are retracted and hardened and the pendent uvula has entirely disappeared, giving the voice a clear and wide passage with firm walls, and consequently increasing its volume and improving its quality.

The method is recommended for the cultivation of the speaking as well as the singing voice and for the prevention and alleviation of various diseases of the throat. "It gives astonishing relief in catarrh of the throat and suggests new possibilities in the treatment of enlarged tonsils."

Now these exercises consist essentially of yawning, which has recently been recommended, independently, as a valuable exercise for the respiratory organs. According to Dr. Naegli of the University of Luetlich, yawning brings all the respiratory muscles of the chest and throat into action and is therefore the best and most natural means of strengthening them. He advises everybody to yawn as deeply as possible, with arms outstretched, in order to change completely the air in the lungs and stimulate respiration. In many cases he has found the practice to relieve the difficulty in swallowing and disturbance of the sense of hearing that accompany catarrh of the throat. The patient is induced to yawn through suggestion, imitation or a preliminary exercise in deep breathing. Each treatment consists of from six to eight yawns, each followed by the operation of swallowing.

It should be added, however, that it is quite possible for deep breathing to be overdone, particularly by persons with weak hearts, and it is at least open to question whether the obstacles to free respiration which the yawning cure is alleged to remove are not useful in preventing the entrance of germs and other foreign bodies.

CLIMATE: PAST AND PRESENT.

In the Monthly Weather Review, F. M. Bail argues that the popular belief that the climate is changing is not supported by an examination of some of the oldest records available, such as Angot's dates of vintage days since the fourteenth century, and temperature averages at St. Petersburg (since 1743), Philadelphia (since 1758), and St. Paul, Minn. (since 1822). Geology, on the other hand, teaches us that the climates must have changed many times. Mr. Bail discusses the general factors which determine climate, with special reference to the changes in the distribution of land and sea, changes of elevation, to Croll's theory, to T. C. Chamberlin's hypothesis that refrigeration and glacial sparks might be due to a depletion of the atmosphere of carbon dioxide, water vapor, and dust particles, and to the changes in the winds that would result from change in the configurations of the continents.

THE CURRENT SUPPLEMENT.

The great Union Station at Washington is nearing completion. Few pieces of work under way in America excite more interest and curiosity than the construction of this vast Roman palace of shining granite. Mr. Frank N. Bauskett writes instructively and eloquently on the subject in the opening article of the current SUPPLEMENT, No. 1620. Mr. E. J. Bolton contributes a well-considered and illuminating explanation of the manufacture of brass wire. Last year Prof. Berthelot published some results of experiments which tend to rehabilitate theories long since abandoned and to furnish a fresh proof that science moves in circles. In an article entitled "Radium and Geological Changes," the results of Berthelot's investigations are imparted. The ability of the modern gas engine to take the place of the steam engine in general power work has been questioned, as well as the ability of the gas engine and producer to work harmoniously together under widely varying load demands. Mr. J. R. Bibbins throws much light on the subject in his article on "A Producer Gas Power Test." Load diagrams, fuel consumption curves, efficiency test charts, and indicator cards accompany the text. Gas engine types are discussed by Jonas E. King. William McDonald writes on reinforced concrete in greenhouse construction. One of the most interesting papers read before the recent meeting of the British Institution of Civil Engineers was that of the president, Sir Alexander B. W. Kennedy, on the "Work of the Engineer." The paper is published in the current SUPPLEMENT. The development of battleship protection is simply set forth. E. Walter Maun-der, the well-known English astronomer, reviews the progress of astronomy in 1906.