

Correspondence.

A Musical Problem Solved by the Telharmonium.

To the Editor of the SCIENTIFIC AMERICAN:

There is a feature of Dr. Cahill's invention, the telharmonium, described in the SCIENTIFIC AMERICAN of March 9, which seems to have been overlooked, namely, the fact that it presents the possibility of solving a problem which has baffled musicians ever since the invention of keyed instruments.

I refer to the problem of constructing a musical instrument that will use the natural or perfect musical intervals in all scales.

As is well known, a scale founded on the key of C, and having proper intervals or vibration ratios for that key, does not contain the proper notes for the key of D, and the deviation is still greater for other keys. To provide correct intervals for all of the twelve keys would require the use of fifty-three notes in the octave, an entirely unmanageable number. To obviate this difficulty musicians have devised the "equal temperament," in which all of the intervals are, to a certain extent, incorrect, but in which each key is equally favored. To the untrained ear, these discrepancies are unnoticeable, but the musician hears a wavering of the tone which is disagreeable.

Many devices have been proposed for the purpose of making this small change in the vibration numbers as the music progresses from key to key, but none has been successful. Dr. Cahill's invention, however, makes the accomplishment of this comparatively simple.

Since the inductors giving the fundamental and all overtones of the same note are all mounted on the same shaft, it would only be necessary to make a small change in the rate of revolution of each of the twelve shafts (corresponding to the twelve notes of each octave) to accomplish the correct tuning for any particular key. While the performer was playing in one key the instrument could be tuned for that key, and as the music progressed to a new key a gear-changing device could be brought into action which would tune the instrument for the new key. Thus, correct intervals could be used for all keys and the dream of musical constructors would be an accomplished fact.

The objection that will probably be cited against this method is that the capacities and inductances are arranged to respond to one vibration period, and one only, and that this will not permit any variation. In answer to this, I will say that the change in the speed of the shafts will in no case exceed one per cent, and, since the curve of maximum current for given capacity and inductance is not a sharply peaked one when there is resistance in the circuit, the small change suggested will not interfere with the working of the transformers.

WILLIAM C. WOODLAND.

Warren, O., March 9, 1907.

The Meteorological Conditions Above St. Louis.

To the Editor of the SCIENTIFIC AMERICAN:

While I might hesitate to claim credit again in your columns for another investigation of my own, the fact that its execution was aided by the Louisiana Purchase Exposition and by the Smithsonian Institution leads me to correct a statement which appeared in your issue of January 19, 1907, page 74, under the title "International Aeronautic Contest of 1907."

The data relating to the wind at high altitudes above St. Louis, which you attribute to the government Weather Bureau, were in reality obtained by my assistants, Messrs. Clayton and Fergusson, during the closing months of the World's Fair, in the winter and summer of 1905 and in the spring of 1906. As I announced in your issue of August 6, 1904, the co-operation of the St. Louis Exposition would enable me to obtain the first observations in America at great heights in the free air with balloons carrying self-recording instruments, which, on account of the proximity of Blue Hill to the ocean, could not be employed here. After rising quickly to a great altitude these small rubber balloons filled with hydrogen gas burst, and parachutes bear the instruments gently to the ground, where they are usually found. Fifty-six of these balloons were sent up by us from St. Louis during the years 1904, 1905, and 1906, and, by remarkable good fortune, fifty-three were found and were returned to this observatory on payment of a small reward to the finders. Upon a revolving clock-drum coated with lampblack, continuous records are made of barometric pressure (from which the height is obtained) and of temperature, and, from the automatically recorded times of the ascent of the balloon from St. Louis and the descent at a known place, sometimes several hundred miles from the starting point, the direction and velocity of the drift can be calculated. You have summarized roughly the data which I obtained when you say that the usual wind prevailing in the upper altitudes proceeds in an easterly direction from St. Louis toward New York.

Classifying all the ascensions made during the different seasons according to altitude, I have calculated

the average drift of the air-currents at various heights in the vicinity of St. Louis, which, in view of the selection of that place as the starting point of the international race for the Gordon Bennett cup next October, seems to warrant publication here in some detail. Eight balloons, at an average height of 6,000 feet, moved from an average direction of 11 deg. north of west at an average speed of 25 miles per hour; thirteen balloons traveled at a height of 12,000 feet from 3 deg. north of west at 38 miles per hour; sixteen balloons, at a height of about 20,000 feet, moved from 5 deg. north of west at a speed of 56 miles per hour; and nine balloons, moving in the stratum 26,000 feet high, went from 9 deg. north of west at a speed of 47 miles per hour. These conclusions are confirmed by the numerous measurements of the drift of clouds which have been made at Blue Hill. Since the racing balloons probably will not exceed a mile in altitude, they are likely to travel toward some point slightly south of east at a speed of about 25 miles per hour. Although at the altitude of a mile or two in the month of October it will be only moderately cold, at the great heights reached by our sounding balloons extremely low temperatures prevail. Even in July, 1905, the temperature was 75 deg. Fah. below zero at a height of 45,000 feet, while in the preceding January, during the prevalence of cold weather at the ground, a temperature of 111 deg. below zero was recorded at a height of 48,700 feet. The latter temperature is one of the lowest temperatures yet recorded either on the earth or in the atmosphere.

The balloon furnishing this record moved with great speed and landed in northeastern Mississippi, 285 miles south-southeast of St. Louis. Two other balloons, which were dispatched on successive days in November, 1904, after rising to heights of 37,700 and 35,400 feet, respectively, landed, the first in Kentucky, 280 miles east, and the second in Tennessee, 235 miles south-southeast of St. Louis, both having traveled at the rate of one hundred miles an hour. As this represents their average velocity in the lower and upper air strata, it is probable that the highest currents moved considerably faster than one hundred miles per hour on these days.

A. LAWRENCE ROTCH,

Director of Blue Hill Meteorological Observatory,
Hyde Park, Mass., March 19, 1907.

The Gila Monster Again.

To the Editor of the SCIENTIFIC AMERICAN:

In a recent number of your periodical was an article on the "Gila Monster," in which was an account of two cases of bites by the lizard which happened in Arizona. Being perfectly familiar with the entire history of the cases cited as evidence of the poisonous characteristics of the reptile, I write to correct the narrator in a few minor details as well as to discuss the venomous nature of the bite.

The first case mentioned did not occur in Tombstone, Ariz., but in either Fairbanks or Contention (two small towns then existing about ten miles from Tombstone), the former, I think. The man was bitten and died, and I was one of the physicians summoned to attend him. The autopsy demonstrated cirrhosis of the liver, ascites, fatty heart, etc., and his history evidenced the cause of his death to be acute alcoholic poisoning grafted upon chronic alcoholism.

In the second case, that of Mr. Vail, the circumstances surrounding the accident were as related. Mr. Vail, believing as did most of us at that time that the lizard was a venomous reptile, followed the usual frontier methods of treatment—ligation of the finger with large quantities of alcohol internally; and his physician, Dr. Handy, after his arrival cauterized the wound, making an excessively sore finger for some time, but the finger neither was paralyzed nor withered nor useless afterward; and just prior to his death, which occurred a few weeks ago as the result of a street-car accident in Los Angeles, he had as free use of the finger as he ever had, and I saw him the day preceding his accident.

In December, 1891, the writer, who was then engaged in studying the Gila monster and other alleged venomous reptiles and insects, had in his collection a dozen or more "monsters," and while handling one of them was seized by the left index finger just back of the nail, and a severe bite inflicted. No crowbar, knife, or hatchet was required to disengage the enraged animal, which hung on viciously; merely a strong pull with pressure of the jaws liberated the digit, which was treated simply, and aside from the usual soreness accompanying a lacerated wound of the pulp of the finger involving the nail, no inconvenience was experienced, nor was the writer prevented from following his usual professional work, except—naturally—the surgical side of it. No constitutional symptoms whatever supervened. At that time, owing to the investigations which he had been making for some months, he had arrived at the conclusion that the belief in the poisonous nature of the lizard was purely

mythical and superstitious, the remnant of primeval man's antagonism to all creeping things.

In addition to the three cases mentioned, I have known quite a number of people who have been bitten by the lizard either on the foot or the hand, but in no instance has death been the result. If the usual folk treatment of ligation of the wounded part with alcohol internally was followed by cauterization of the wound, general malaise with a more or less sore member has succeeded, but not death.

The Gila monster, of which there are two species on the deserts of the Southwest, has neither poison glands nor fangs. Its teeth(?) are not hollow, consequently nowhere within the jurisdiction of its mouth is there the wherewithal to envenom a wound made by them, and this assertion is based upon numerous dissections and anatomical investigations. If much irritated it does eject the contents of its stomach, which are more or less fetid, while hanging to an object it has been exasperated into biting. This may or may not be accidental, for it does not always occur; only after swinging or shaking severely the reptile while still attached to the object bitten. That neither knife, chisel, hatchet, nor crowbar is needed to release an object from the grip of its jaws, simple inspection of the anatomical structure of its head will suffice to demonstrate. The grip is a firm one, but one released by an unterrified person with comparative ease.

About this same time (1891) exhaustive studies were made by some of the attaches of the Smithsonian Institution, among whom was Dr. R. W. Shufeldt, concerning the nature of the animal, and conclusions reached which the writer had previously attained—that the reptile was non-venomous; and it may be accepted as conclusively demonstrated that the bite of the "monster" is innocuous *per se*.

GEORGE GOODFELLOW.

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Sugar Statistics.

The consumption of sugar in the United States is increasing rapidly, more rapidly than is the production. During the year just ended we used the enormous amount of 6,500,000,000 pounds of sugar, worth \$300,000,000. If each citizen got his fair share, during the twelve months he consumed 76 pounds. Of this sugar only one-fifth was produced in the United States; one-fifth came from the island possessions, and three-fifths was imported from foreign countries. Of the American-produced sugar, a little over half was from the sugar-beet, the remainder from cane. This is the first time the beet-sugar has exceeded in quantity that manufactured from sugar cane. During the last ten years the increase in the consumption of sugar has been three times as great as the increased domestic production.

The Current Supplement.

"The Buried City of Ceylon" is the title of the opening article of the current SUPPLEMENT, No. 1630. Comparatively few people realize that on that island was once a civilization which, when Christianity was born, was at its height. A glimpse of that marvelous civilization is given in the article in question. The fight against yellow fever is discussed by A. Dastre. E. T. Lake writes on pattern making or molding of cylinders for two-cycle internal-combustion engines. Charles B. Steinmetz thoroughly discusses light and illumination. Baron Suyematsu writes on the ethics of Japan. Coming as it does from a well-known Japanese, this article is most authoritative. Waldemar Lindgren contributes a paper on gold and silver production in the United States. The commercial graphophone, which has been lately introduced to supplant the stenographer, has been so far improved that it meets the requirements of the business man. It is possible to expunge matter which the dictator wishes to cancel and to substitute matter for it. A signaling device is also used to indicate when the end of a blank has been reached. A special form of recorder and reproducing stylus completes the improvement. A full description of this instrument with illustrations is published. Single-phase vs. three-phase power transmission is the subject upon which Ernest Van Loben Sels writes. Emile Guarini presents a description of the Ella system of wireless telegraphy. The mutation theory of the origin of species is criticized by A. E. Ortmann.

The newest innovation that has taken place in the method of working a coal mine is the substitution of concrete for the mine timbering. The experiments along this line are being made by the Reading Coal Company at Shamokin, Pa. A plant for the manufacture of these cement props will be erected at the North Franklin colliery, Trevorton, from which place the new style of "timbering" will be sent to all the other collieries. The Reading Company has spent considerable time and money in determining the best method for preserving mine timbers, and the present step seems to indicate that in the future cement will replace wooden props.