Correspondence.

To the Editor of the Scientific American:

In my list of non-venomous serpents appearing in the SCIENTIFIC AMERICAN, issue of October 10, 1891, No. 19 is given as Kirkland's snake, *Regina kirklandi.* It should read Kirtland's snake, *R. kirtlandi.* This little snake has been placed in a new genus, *Tropidoclonium*, which is unnecessary, and certainly not euphonious. As to the largest, or rather longest, species of snakes inhabiting the United States, Prof. Robert Ridgway, the ornithologist, says that in 1854, in the State of Missouri, Dr. Hoy captured a pilot snake, *Coluber obsoletus*, which measured eleven feet in length, and that his (Prof. Ridgway's) father killed one of the same species measuring nine feet eight inches.

C. FEW SEISS.

The Steam Yacht Mascot.

To the Editor of the Scientific American:

I built the Mascot in 1881, and put into it a Colt disk engine, made at the Colt's Patent Firearms Company, Hartford, Conn., and have run it every year during the yachting season, this season closing up the 10th. In 1888 I broke a crank pin, the first and only accident or break of any kind that has happened since the engine was put in motion. Not a dollar's expense for any purpose connected with the engine. Not a moment's delay in all these years for repairs of any kind to the engine. The engine has been managed this season by the son of my former engineer, and is the first engine he ever had charge of. The yacht has made, I think, better time this season than ever before. The Mascot is 65 ft. long and 10 $\frac{8}{12}$ ft. beam, and being finished inside with mahogany and ten mahogany doors, 600 pounds plate glass in windows and doors, and 400 pounds sash weights, and 500 pounds brass rail, 6,500 pounds boiler, engine 4,500 pounds, two marble washstands, and two Sand's water closets, make the Mascot an unusually heavy boat, and still it is no trouble to make 15 miles an hour with ten or fifty passengers. She has done this this season with fifty on board. The engine is a six-cylinder one, each cylinder being 7 inches diameter and 6 inches stroke, driving a 44 inch wheel, 6 foot pitch, 220 revolutions.

GEORGE S. WEAVER.

Keuka Lake, Branchport, N. Y., Oct., 1891.

Rain Making.

To the Editor of the Scientific American:

The whole country, and, in fact, the whole civilized world, has been greatly interested in the recent attempts to coax or drive moisture from the Texas skies. It is of some interest to inquire whether science can favor any such attempts, and also to bring together some of the reports that have been sent out regarding the experiments. It has been thought that a mixing of air strata of different temperatures would produce rain, but a short computation will show how impossible it is to obtain precipitation by mixture. A cubic foot of saturated air at 50° contains 4·09 grains moisture, and at 60°, 5·79 grains; mixing the two we have two cubic feet at 55°, containing 9·85 grains; but two cubic feet at 55° will hold 9·72 grains, and we must allow for the liberation of latent heat, so that there would be no moisture to precipitate, even under those favorable conditions which can occur but rarely in nature. This is the old Huttonian theory of rain, which was abandoned by meteorologists a good many years ago.

In the early part of 1889, the present writer made a few experiments on the formation of rain in dust-free air. These consisted, for the most part, in forcing air into a glass jar and suddenly releasing the pressure, thereby causing quite an explosion or sudden rush of particles in the jar. It was found entirely practicable to form mist in perfectly dust-free air, and it was suggested that possibly the sudden bombardment of the molecules might cause a mechanical aggregation of the mist without the intervention of dust particles as nuclei. (*Science*, June 21, 1889.)

Prof. John Aitken, of Edinburgh, Scotland, had taken rather strong ground that the presence of dust was needful in order that mist or cloud might form, and in a correspondence with him he writes as follows: "I must however remark, and I have pointed it out in one of my papers, that it is possible to produce condensation in dust-free air. It is done by drawing out the air pump very rapidly and accompanying the process with a shock. Condensation then takes place for the same reason that water cooled below 32° immediately solidifies when treated in the same way." "Now it is not so much the amount as the *speed* of expansion and consequent rush of air that produces this 'spontaneous' form of condensation." I had suggested that possibly his failure to obtain mist was due to not making the expansion rapid enough to prevent the heat from outside reaching the air. He says farther, "I have no theory with regard to shocks; I merely stated the fact that shocks tend to assist in producing the spontaneous form of condensation." It seems as though these experiments and Prof. Aitken's suggestions have an important bearing upon the question of the production of rain by concussion of the atmosphere, and they may serve to explain a few of the recent results in Texas.

While it would be unsafe to say, with our present knowledge, that vapor molecules may be made to combine by concussion, yet it is very certain that they may be combined without the intervention of solid dust particles. It is easy to see, however, that if any such effect is to take place it must be at once, and not after an interval of even fifteen minutes after the explosion. With the ordinary theories of rain formation in mind, there seems to be no possible way in which a concussion of the atmosphere, extending with some force to a distance of perhaps 2,000 feet, can produce even a sprinkle except immediately, nor can the concussion be considered as effective at a distance greater than a mile or two. It seems plain that such explosions cannot give mist suddenly and also after an interval, so that it should be decided to accept one or the other as the direct result, and not either, as the case may happen to be.

Turning now to the experiments, we find that it was decided to make the first attempts in a region of undoubted dryness, in order that there might be no doubt thrown upon the results. Now while western Texas, the place chosen, in most seasons of the year has a very dry climate, it is far otherwise in its rainy season, which extends from the middle of June to the middle of September. The dates of natural rainfall in western Texas during these experiments were as follows: August 9, 10, 11, 13, 14, 17, 18, 19, 21, 22, 25, 26, 27, 28, 29, and 30. That is to say, during this interval of twenty-two days there were sixteen on which we would have anticipated a natural rain, as shown by the actual rain which fell over widely extended regions. It is by no means certain that even this represents the whole truth in this case, for there are very few stations in this region, and it might well be that rain fell on other days not noted above.

The first explosions, on August 9, were very few in number, and a rain occurred the next day, but the experimenters decided that this rain was not caused by them. It would seem that this is a most important point in this connection; if this first rain was simply a coincidence, it would require strong proof to show that all other rainfalls in this rainy time were not the same. Again, on the 18th there were more preliminary explosions followed by rain. It was then declared that all arrangements had been completed for the final and decisive tests on the 20th. On the 21st it was announced: "The circumstance of the 20th seemed to favor the experimenters, yet nothing has been improved." This was certainly a singular admission on the part of those so deeply interested.

In a report on these experiments the following expressions occur: "Wherever there has been moisture in the air and they have reached it, rain has followed the explosions. This was to be expected, because no one can produce anything without having material to work upon. After each explosion so far made under proper conditions, there has followed rain." On the other hand, it has been insisted all along that there had been a great drouth in this part of Texas, and the very object of going to this dry region was to try and coax rain to go or fall there. It is gratifying to learn that the attempt has not been made to produce rain in a dry atmosphere, for such an attempt must have inevitably failed.

A most significant fact has also come to light in connection with the later El Paso trials. It had been announced that no rain had fallen at this point for several weeks, but, unfortunately for the experiments, on the very morning, just before the explosions, there was a rain at this point. Notwithstanding these favorable conditions of the atmosphere, a most thorough and long-continued bombardment of the atmosphere produced no rain whatever, and the attempt had to be abandoned. It seems quite plain that, from the reports of the experimenters themselves, viewed in a proper light and with a knowledge of the natural rains in this region during this time, we must think the results have shown the entire impotence of man to bring about any rainfall except a few sprinkles just at the moment and point of the explosion. Certainly the results prove incontestably that money cannot be spent profitably in any such attempts by crude and gross explosions to produce precipitation.

There is no doubt that there is here a most intensely interesting field for research, and it is to be hoped that the present agitation will lead to a few scientific experiments on the condition of the clouds at the time of rain formation and on the condensation of moisture. Such experiments would be invaluable in setting at rest a good many doubtful questions.

H. A. HAZEN.

October 9, 1891.

The Artificial Production of Rain.

To the Editor of the Scientific American:

Here in Central Nebraska, during the season of thunderstorms, we often see the commencement of thunder showers and sometimes even of a cyclone.

A thunderstorm always begins to develop here with a sultry, close atmosphere and a low barometer, and generally in the afternoon.

The sky will show a few scattered, fleecy clouds, which begin to draw together into a single mass, parts of which mass slowly roll and tumble upon each other.

Very soon a clap of thunder is heard, and at the same time the rain begins to fall. Am quite sure that I have heard the thunder before we could *see* the rain, but usually we can see the rain before the thunder is heard. Perhaps there were very light flashes in the cloud, the report of which could not be heard before the first fall of rain.

Might it not be that the particles of aqueous vapor were differently electrified, and thus caused to attract each other, in this manner forming a drop of sufficient weight to fall?

Here our heavy thunderstorms nearly always come from the northwest and north, and are preceded almost invariably by a hard wind for a day or two from the south. This south wind always blows up dust, which sometimes extends a mile high. The dust, of course, is very fine, at least that which extends very high up, and it might easily be that this dust, being silicious and hot and dry, might be electrified from friction and thus attract particles of vapor differently electrified, in this way causing an accumulation of cloud and a fall of rain.

It is a fact well known that *a static discharge will settle dust.* This it can only do by disturbing the electric equilibrium of the particles, causing them to adhere, forming a particle heavy enough to fall through the air.

It seems to me that sudden showers are caused by electrical disturbances, even though the disturbances be not great enough to cause lightning flashes.

Perhaps it may some day be demonstrated that the causing of rain is one of the natural uses of electricity.

Palmer, Neb., October 7, 1891. M.

Aluminum Air Ships of the Future.

To the Editor of the Scientific American:

I think it was about 1843 that aluminum was discovered, and for some years the process of separating it from the clay near the earth's surface was very tedious and quite costly, it being sold at about $12 per pound, and for many years French chemists held a monopoly of its product.

At length Yankee genius took hold of the business, and in a few years reduced the price to about $1 per pound, and it being three times lighter than steel and nearly as strong, and no doubt it will still be cheapened, and it has been hinted by some to even five cents per pound, and we dare not dispute this. Be this as it may, we can but hope, and I really expect, that an air ship will yet be constructed principally of this wonderful metal, with buoyant and propelling wheels similar to those of an ocean steamer, driven by electric power, possibly carried in a storage battery, or produced by the air ship itself.

The balloon, so far, has proved a very dangerous means of flying in the air, as well as a very expensive means.

Possibly, some Yankee or French genius may discover a simple method of separating the 20 per cent of oxygen from the atmosphere, which is a supporter of heat, which will assist greatly in solving this difficult problem. Some aerial wizard will spring up, like Edison of Menlo Park, and then accomplishment is certain. At our 1876 centennial an electric light was produced as a mere curiosity. I then did not imagine that I would live to see cities and dwellings illuminated as they now are; but so it is. In my boyhood there was no railroad, no electric telegraph. No steamer had crossed the ocean. Talking with each other by telephone was scarcely thought of. Professor Morse, who, in 1842 I think it was, sent the first message from Washington to Baltimore, lived to stand in Central Park, New York, in front of the bronze statue placed there, and send a message under the ocean and around the globe, and I had the pleasure of being present when this was done; and now, no doubt, a man will soon be able to stand in New York City and talk with a man in London by telephone.

We truly live in the age of possibilities and probabilities. One scientific discovery aids another. And an aerial ship is more probable to-day than a steamship was two hundred years ago.

J. E. EMERSON.

Wool Grease Lubricants.

The soap formed by treating wool grease with alkaline lye is dissolved in water and filtered. To this a solution of alum or other alumina salt is added, whereby a brown precipitate is formed, which is called "aluminum lanolate." With this substance, when dried, lubricating oils of any viscosity may be produced by dissolving it in any fluid mineral oil. If dissolved in a small quantity of mineral oil, a gelatinous substance is obtained which may with advantage be mixed with India rubber or gutta percha. Solvents for India rubber are said to be also solvents for "aluminum lanolate." In textile industries this substance may also be used as a scouring agent.—*R. Krause.*