Correspondence.

Connecting Telegraph Wires to Water Pipes.

To the Editor of the Scientific American:

During a thunder storm, does enough electricity pass through the ground wire of a telegraph office to make the connecting of said ground wire with a water pipe dangerous to persons drawing water from the pipe?

As an explanation of the above rather ambiguous sentence, I beg to state that in a certain telegraph office the ground wire is attached to the water pipe which supplies the building. Would it be dangerous to touch the pipe during a severe thunder storm?

During a recent storm, in which the lightning was very severe, striking a number of places within one-half mile of the office, reports as loud as those of 22 caliber cartridges appeared to come from a water faucet in the store next the telegraph office, and continued at short intervals during the entire storm.

Glens Falls, N. Y. H. P. BOYD.

[The occurrence you describe suggests an element of danger. In grounding by water or gas pipe, care should be taken that the wire is soldered to a part of the pipe near the water main. The pipe intervening between wire and main could readily give aerial discharges under certain conditions.—ED.]

Keely Outdone.

Several newspapers have referred to a new invention by one William Timmis, which, if successful, will revolutionize motive power. The inventor is an unpretentious English mechanic residing in Pittsburg, Pa., who claims to have invented a machine by which untold motive power can be stored or used without the expenditure of fuel. The story goes that he has been engaged for years in perfecting the invention, and is now negotiating with the governments of England, Russia, and the United States for the sale of the right to use his discovery, which, if after examination it proves to be what he claims, will revolutionize the motive powers of the world. He claims to be able to create a pressure of 20,000 pounds per square inch—more than sufficient to propel the largest ocean steamer afloat or to move eighty laden freight cars in one train.

The machine seems to be simply an air compressor of the simplest sort. It consists of one small cylinder (six horse power), with a balance weight of 75 pounds, which runs the entire apparatus; another small cylinder, 5 inches diameter, with 7 inches stroke, compresses the air into the tank from which the power is utilized. Under the piston plate the inventor has placed two layers of bars containing eleven different minerals, the magnetic influence of which is the secret of the inventor. The advantages he claims are durability, economy, and simplicity. Experts have examined the machine and pronounce it a success.

In submitting his design to the governments named, Mr. Timmis claims that the pneumatic generator can not only be applied to war vessels as a motor, but can be used as a defense against hostile attacks by means of air chambers placed behind the armor plating.

Naval War Balloons.

Captive balloons are to be employed at sea during the next stage of maneuvers by the Toulon evolutionary squadron, under Vice-Admiral Amet. The aerial machines and necessary material will be sent to the fleet from the Army Aerostatic School at Chalais-Meudon, near Paris, where a party of seamen from the Amet squadron, under Flag-Lieutenant Serpette, have been under instruction for ballooning duties for some time past. Preliminary trials with the marine aerial machines are to be made from Toulon harbor, and the balloons and inflating appliances will be subsequently sent to sea on board of a pontoon, in tow of one or other of the vessels belonging to the squadron, and from which the ascents will be effected.

This completes the realization of the picture joke given in our paper of July 21, and the publication of which, in 1801, so frightened the English. In that engraving the French were represented as crossing to Britain with a great fleet, by tunnel under the channel, and also, dreadful to relate, in balloons.

How a Hedgehog Kills a Serpent.

The *Arch. de Pharmacie* of May 5 describes the proceeding as follows: The hedgehog cautiously approached the sleeping reptile and seized the end of his tail between his teeth. Then he rolled himself up into a compact ball and awaited developments. The snake, awakened by the pain, turned upon his enemy and fought with his fangs. The hedgehog, retaining his hold, allowed himself to be dragged back and forth during the struggle, and, meanwhile, the serpent's jaws had become lacerated and useless from constant assaults upon the spines of its enemy. In a few minutes the serpent had become exhausted with his efforts, and the hedgehog, unrolling himself, disemboweled the serpent and ate his meal. In this case the hedgehog does not kill the serpent directly, but obliges him to kill himself by dashing upon the sharp spines.

Precious Aluminous Stones.*

The wonderful fact that the common charcoal is substantially the same material as the diamond has a parallel in the equally wonderful result of the chemical analysis of the ordinary red and yellow clay, so common and abundant, which is shown to have for its base the same material—alumina—as the group of minerals to which the general name of *corundum* is applied, including the incomparable stones, the ruby and the sapphire, which have the highest rank among colored gems. The various forms of corundum are found by the chemist to contain more than half their weight of that peculiar metal widely known as *aluminum*, which much resembles silver in color and luster, yet is very different from it in its extreme lightness The oxide of this metal is called *alumina*, which in its natural state forms the mineral corundum. The transparent crystals of corundum present the alumina in a state of purity, with just a trace of certain metallic oxides, from which the exquisite tints of color are derived.

The name of each variety of the corundum is determined by its color—the red being known as the ruby, the blue as the sapphire, the yellow as yellow sapphire or Oriental topaz, the green as green sapphire or Oriental emerald, and the purple as Oriental amethyst. All varieties of the corundum can be scratched by the diamond, but by no other mineral, and its extreme hardness has suggested the theory that the *adamas* of the early Greek writers was not the true diamond, but a form of corundum. In such a passage as the following, "The sin of Judah is written with a pen of iron and with a point of a diamond," the original word translated "diamond" no doubt refers to *emery* or some similar form of corundum, which has been used for ages as material for polishing other minerals. Although specimens of various colors have been found in many parts of the world, and during the last ten years in North Carolina especially, the chief source of supply is India. The red variety of corundum is known as the ruby.

The kingdom of Burma furnishes the greatest number of rubies, and, by the command of its king no Europeans are ever allowed to visit the mines. They are a royal monopoly, and the rarest and finest specimens are retained for the king's own use, and one of his titles is the "Lord of Rubies." One of the former kings had a wonderful ruby of the size of a pigeon's egg, which he wore as an eardrop. By a law which compels, under the penalty of death, the giving up of all rubies of over a certain size to the financial department of the government, many rubies of large size are lost, because the finder of them will break them up into smaller pieces in order to retain them. Very few persons are aware of the great value and rarity of really fine rubies. From the beginning of civilization to the present time the ruby has been the type of concentrated preciousness: "Her price is above rubies." About fifteen years ago the financial necessities of the Burmese government caused the appearance in Europe of two of the finest rubies of their size ever seen. After being recut one weighed about thirty-two carats, and was sold for $50,000, and the other, weighing about forty carats, found a purchaser at $100,000. Two such stones were not to be found in any European regalia, and their sale caused intense excitement in Burma, a military guard being considered necessary to escort the persons conveying the package to the vessel.

Rubies vary in color from the lightest rose tint to the deepest carmine, and are occasionally approached so closely, both in color and general appearance, by the spinel as to render a close examination necessary to distinguish them apart. The spinel is composed of alumina and magnesia, and has a wide range of color. The Rev. C. W. King states that "all the great historic rubies now extant are pronounced spinels by modern mineralogists."

The blue variety of corundum is known as the sapphire, and differs from the ruby only in its color. It is very slightly harder than the ruby, and occurs in much larger crystals. They were originally obtained from Arabia and Persia, but now come principally from Ceylon and Burma. The characteristic color of the sapphire is a clear blue, very like to that of the blossom of the little "corn flower," and the more velvety its appearance, the greater the value of the stone. The Oriental sapphire retains its exquisite color by gas light, while that of the inferior specimens becomes dark. The ruby and sapphire form a distinct class of the corundums by their being alumina in a pure and unmixed state crystallized, while the other varieties present the alumina in combination with other substances.

The true chrysoberyl is almina combined with glucina. The colors range from light asparagus green, brownish yellow, to columbine red. Of the three varieties, the best known are the cymophane, or true Oriental catseye, and the alexandrite. The catseye is found in Ceylon, is always cut in a highly convex form, and has a remarkable play of light in a certain direction, resembling a drop of water or the pupil of an eye moving about inside of it, or a band of light floating on its surface, ever shifting, like a restless spirit, from side to side as the stone is turned. No wonder that an imaginative and superstitious people regard it with awe and wonder, and, believing it to be the abode of some genie, dedicate it to their gods as a sacred stone. The particular variety of chrysoberyl which was originally found in the Ural Mountains, and owes its celebrity to its remarkable transformation of color from green to red as viewed by natural or artificial light, was named alexandrite after the former Czar of Russia.

* By F. C. Manvel, in the *Christian Union*.

The Causes, Degrees, and Means of Sleep.

The probable causation of sleep is a subject which has often in the history of physiological research attracted the efforts of scientific speculators. It cannot be said that, after all, we are now able to define the processes involved in its restorative influence; but some suggestion of its nature is, nevertheless, within the reach of rational explanation. Most of our readers have, doubtless, formed some opinion on this subject, and have, perhaps, accepted as a provisional creed one or other of the theories advanced with regard to it. To some it may appear that the accumulation of waste products in the brain is enough to account for sleep. Deficient oxygenation offers another tempting hypothesis. Each of these processes, no doubt, may exert a certain soporific power, and probably thus operates in its degree; but it is difficult to see how either can be taken to afford the sole interpretation of that state of rest which comes with singular regularity of recurrence to all more or less, whether sick or healthy, idle or actively employed.

There is something to be said also for the theory that sleep is a consequence of cerebral anæmia. The pathological drowsiness of hemicrania, of epilepsy, and some hysterical states favors this view, as does also the fact that pallor of the fundus of the eye has been noted in connection with natural sleep. These observations do not, however, settle the question whether such anæmia is commonly a cause or merely a part of the general relaxation of energy implied in the soporific process. So far, we can only say of sleep that, following and preceding a period of wakefulness and constant stimulation of the senses, it represents a transient interval of rest from the activities of tissue change. It, therefore, corresponds with the quiescence of every organ, and more especially of the nervous system, and with a timely languor of circulation in the resting tissues. By the gradual changes of evolution it has now virtually become a mere habit of mind and body. At first it was doubtless the outcome of exhaustion and an expression of the well known law, which it still fairly illustrates, that action is balanced by reaction.

The opposite condition of sleeplessness will commonly be found to originate in some continually acting cause of nerve excitement. This may consist in the presence of a local irritation, or very usually in the abnormal irritability of a sensorium overwrought and unduly sensitive to the most trifling impressions. We have already spoken of morbid somnolence in its relation to certain diseases, and have alluded to its connection with a defective cerebral blood supply. We might also refer to instances of an altogether different condition, in which anæmia and sleeplessness are closely associated. This fact is sufficient to show that healthy sleep requires a certain due nutrition of brain tissue, and that cerebral anæmia or hyperæmia has with respect to it only a relative significance. The influence of various toxæmic states must also be remembered in dealing with this subject. Whether due to impairment of function in the lung, liver, or kidney, the only reliable remedy for inconvenience thus caused is, of course, to be found in correcting the failure of excretion. Whatever, indeed, the form of error, be it the want or the excess of sleep, relief by means of so called sleeping draughts and the like is and must be only palliative. The one effectual means of cure in any case is no mere drug, but a method, and consists in the detection and removal of the source of mischief by a well considered system of treatment. —*Lancet.*

The Longest Tangent in the World.

The new Argentine Pacific Railroad from Buenos Ayres to the foot of the Andes has on it what is probably the longest tangent in the world. This is 340 kilometers (211 miles) without a curve. In this distance there is not a single bridge and no opening larger than an ordinary culvert, no cut greater than one meter in depth, and no fill of a height exceeding one meter. There is almost an entire absence of wood on the plain across which the western end of the road is located. This has led to the extensive use of metallic ties, which will be employed on nearly the entire road.

An Improvement in Photographing.

A German photographer, Herr Ottomar Anschultz, has succeeded in preparing photographic plates so sensitive that an exposure of 1-5000 of a second is sufficient. A very small lens must be used, so that the pictures are generally only 7-16 of an inch in length and breadth. Enlarged to an inch and a half on glass plates and rotated in series of twenty-four before a Geissler tube, the pictures are used for reproducing the motions of an animal on a large screen.