Correspondence.

A Strong Gunpowder.

To the Editor of the Scientific American :

Those who are familiar with the properties of chlorate of potassa know that it cannot be employed as a material in gunpowder, as it explodes under friction. Recent experiments, however, have convinced me that, under certain provisions, the salt may be used. For the experimental purpose the following directions are followed: Three things are employed, namely, chlorate of potassa, gum arabic (prepared in the manner to be described), and charcoal. Take gum arabic pulverized, add to it half its weight of black oxide of manganese; mix thoroughly: place in a glazed stoneware retort, and add strong nitric acid, diluted, and apply heat. Continue the heat until the mixture becomes a thick, tenacious mass; then pour off into shallow porcelain dishes, and evaporate to dryness. A thick, gluey, resin-like mass will remain, and here extreme care should be observed: for if the evaporating heat be in excess, the substance will ignite like gunpowder. When the gum is prepared, mix in the following proportions: Chlorate of potassa, 1 oz.; prepared gum, ½ oz.; charcoal, 170 grains. Heat gently in an oven, and a powder is made which will not ignite under the hammer, as chlorate of potassa will when mixed with sulphur: yet, when ignited, it explodes with more violence than ordinary niter gunpowder.

I remember filling a gun cartridge with it, and discharging it. The hammer was driven back with such force from the recoil that the lock was injured. Whether this arose from some impediment of the bullet's progress through the chamber, or merely from the force of the explosion, I leave for others' consideration.

The manufacture of it appears simple; but it should be remembered that, in the preparation of the gum, if it be too much or not sufficiently evaporated, the powder will be a failure. Whether the above powder will stand the friction produced in grinding in a powder mill, I am unable to say.

Philadelphia, Pa. ELLSTAGLE.

Cheap Galvanic Battery.

To the Editor of the Scientific American :

I am using a battery much cheaper and (I believe) more permanent than the one described in your paper of January 30. It was set up by an Englishman in my employ, of the name of Baron, two years ago, and I have used this kind of battery ever since. It consists of a cylindrical glass vessel, eight inches deep and about the same in diameter. On the bottom of this vessel, a circular sheet iron plate is placed, with an insulated wire extending from the plate over the top of the jar. This plate is covered to the depth of one or two inches, with sulphate of copper. Another iron plate is suspended above the sulphate of copper, and soft water is poured in until the upper plate is covered, to the depth of one or two inches. Thus made up and the circuit completed, the battery will come up to its power in two or three days; but if needed to work at once, an eighth of an ounce of sulphuric acid should be added. The plates must be arranged horizontally one above another, and both must be of iron. If the upper plate is a quarter of an inch thick, it will last a year. These iron plates work just as well as zinc and copper, and can be had everywhere at a trifling expense. W. H. S.

Philadelphia, Pa.

Small Steam Engines.

To the Editor of the Scientific American:

The articles concerning the performance of small steam engines, which have appeared in your journal, are particularly interesting, and I hope that further communications on the subject will be published.

Some time ago I tried an experiment with a two horse power engine, in order to ascertain how it compared with the power of a horse. The latter, working in a treadmill attached to a 22 inch circular saw, was two hours in sawing a cord of pine wood, making four cuts and five sticks. The engine attached to the same saw performed the same amount of work in just forty-five minutes; the cylinder was 3¼ inches in diameter by 6 inches stroke. Steam pressure was 35 to 40 lbs., and the revolutions of engine about 300 a minute. The power was transmitted through a 4 inch belt running from a 19 inch balance wheel on the engine, directly to the pulley on the saw. The horse could stand the work only part of the day at a time; but the engine was good for it every hour in the day and every day in the week.

Waltham, Mass. GEO. F. SHEDD.

Mill Dams.

To the Editor of the Scientific American:

Allow me to add a few facts to the communication published in your issue of January 23.

A dam of about 120 feet in length, across a small stream which was at times strong and rapid, had originally been built of flattened timbers, laid up in the form of a crib, and filled in with gravel; it thus constituted a bridge, except about 30 feet for waste water, which regularly flowed over. Year after year the gravel would be washed out by the water making its way between the timbers, causing leaks and requiring an annual expense for repairs. In 1819 I removed the timbers on the lower side of the dam, and dug about 3 feet deep to the hard pan for a foundation 8 feet broad, upon which a wall was carried up, 18 feet high, 8 feet thick at bottom, and 4 feet at top, the slope being wholly on the lower side. Immediately against this wall on the upper side, a puddling of clay was carried up, the whole hight of the wall, along with the general filling for the bridge and dam. In this clay puddling, broken stone was laid as in macadamizing a road; the stones were broken on the work itself, so that it was thoroughly pounded together. One year ago last summer, I saw that dam again (54 years after its construction); it was still in good condition, except that the stone had crumbled from the effects of frost and weather.

The point of improvement that I would suggest is the puddling and broken stone upon the upper side of the wall, as an effectual safeguard against leakage from the pond above, and consequent security against undermining from that source. J. W.

Canajoharie, N. Y.

Singular Mathematical Fact.

To the Editor of the Scientific American:

Under the above heading there appears in the SCIENTIFIC AMERICAN, for February 13, a rule for multiplying numbers by 5. There is nothing singular about it, as it is virtually multiplying by 10 and then dividing by 2, which is equivalent to multiplying by 5. The rule might be more simply and clearly stated thus: Annex a cipher to a number, and divide by 2.

There is no end to these "dodges" for abbreviating arithmetical processes. A convenient one, which I do not recollect to have seen in print, is a short way of squaring numbers ending with 5. It may be concisely stated thus: Multiply the tens (that is, the number with the last figure cut off) by the tens plus one, and annex the figures 25 to the product. Thus, to square the number 25, multiply 2 by 3, and affix 25, making 625. To square 195, multiply 19 by 20, and affix 25, or 38025. Any number of two figures can obviously be squared mentally. Thus $75^2 = 7 \times 8$ (or, really, 70×80) $25 = 5625$.

For a longer number, the work will stand thus:

43|5	61|5
43|5	61|5
172	122
172	61
1892|25	732|25

This process may be readily explained algebraically. The square of $a+5$ (a representing any number of tens) is $a^2+10a+25$. But $a^2+10a=a(a+10)$; that is, the product of the tens into the tens plus one ten.

When I first learned this rule, many years ago, it did not occur to me that it would often be of use; but I have found since that one does often have occasion to square numbers ending with 5, and the rule has saved me not a little time and figuring. R.

Cambridge, Mass.

Experiments with Honey.

To the Editor of the Scientific American:

The crystallization or candying of honey has received much study from apiarians; and a remedy has been sought, with no successful results. Light evidently has considerable influence upon this condition of honey, and placing the honey in a cool dark cellar for preservation has been many times recommended.

During the past autumn, I have experimented as follows: I put up six 1 lb. cans of beautiful linden honey, being careful to make it into one homogeneous mass by stirring. It was thrown from the combs by an extractor on July 20, and put into cans on August 1. The cans were placed respectively as follows: one in a dark, dry cellar, one each under shades of red, yellow, green, and blue glass, and the sixth can in full light. On November 8, the honey in the cellar candied to a white. November 22 to December 10, honey under colored shades candied, first in the red, next in the yellow, green, and blue; while the honey in full light remained transparent until January, when it soon candied after exposure to intensely cold weather. From my experience an equal temperature would preserve certain kinds of honey, while other kinds would candy under almost any circumstances.

I think that candied honey, instead of being looked upon with disfavor, should be recognized as evidently pure. I hope, however, that the above experiments will lead others to follow up the light theory with beneficial results.

Hartford, N. Y. SCIENTIFIC.

A Match under the Microscope.

To the Editor of the Scientific American:

Those of your readers who are fond of investigations with the microscope will find a beautiful object in the head of an ordinary parlor match.

Strike the match, and blow it out as soon as the head has fused sufficiently to cause protuberances to form on it; on that part of the head which took fire first, will be found a white, spongy formation, which, under the microscope and with a bright sunlight on it, has the appearance of diamonds, crystals, snow, frost, ice, silver, and jet, no two matches giving the same combination or arrangement.

Tarboro, N. C. H. A. WALKER.

A Railroad on the Ice.

To the Editor of the Scientific American:

The invention mentioned on page 85 of your current volume of a railroad on the ice, is a powerful effort of genius, and will do credit to Duluth; but, why use rails? Put a spiked tyre on each driver of the locomotive, remove the bogie, and put in its place a pair of sled runners fitted with steering gear, mount all your cars on runners, and—clear the track!

No rails will be left behind to absorb the heat of the sun and sink through the ice, or to be lost by a sudden thaw, or to be laid and removed. All this expensive track business will be saved. Duluth thought to save the grading, etc., but didn't think far enough. That city can just as easily save the rails and spikes too.

Permit me to thank you for the beautiful and convenient shape in which your paper now comes to hand. Old as it is as a publication, it seems to renew its youth, and to become brighter and better every year. C. E. T.

Washington, D. C.

The Transportation of Concentrated Sulphuric Acid.

The danger attending the transportation of concentrated acids renders it desirable to manufacture them as near the place of consumption as possible; but this is not always feasible—the acid must be transported. Its power of destroying both organic matter and the metals (except lead), in case a carboy breaks, is well known. Other phenomena, not so well known, have also been noticed, and are worthy of a brief description. A boat plying upon the river Rhine was laden with 600 carboys of sulphuric acid of 66° Baumé, and, owing to some misunderstanding between shipper and receiver, was obliged to remain laden for six or seven months. Some of the carboys were broken, by the rolling of the vessel or other cause, and the acid escaped into the hold of the vessel. Of course the wood work with which the acid came in contact was charred, and the iron nails, etc., were dissolved, endangering the safety of the vessel, which began to leak. The remarkable part of the story is yet to come: The iron work on the deck of the vessel was injured without having been in contact with the acid, and the boatman, who slept in the room where the acid was stored, was attacked with a severe inflammation of the eyes, and suffered from asthmatic difficulty.

Dr. H. Vohl conjectured that, through the action of the acid upon the straw and other packing, and upon the woodwork of the vessel, some volatile organic acids were produced, as well as sulphurous acids. To test the correctness of this surmise, he placed two pounds of cut straw in a large tubulated retort, and poured upon it just enough acid of 66° Baumé to moisten it. Heat was at once produced, the straw was carbonized, and suffocating acid vapors were evolved. No sulphurous acid was detected by the odor. A glass tube was inserted through the tubulus, reaching almost to the mixture; the gases were drawn, by means of an aspirator, through a solution of pure caustic potash, the operation being continued for four hours. An analysis showed that, in addition to small quantities of chlorine and sulphurous acid, a considerable amount of acetic, formic, and metacetonic acids had been absorbed by the potash. After the mixture of sulphuric acid and straw had been standing two days, the volatile acid products were examined, and it was then ascertained that the quantity of volatile organic acids had diminished, and that of sulphurous acid had increased. At the end of four days, the quantity of sulphurous acid was sufficient to be detected by the odor.

The same experiments were repeated with basket willow, pine and oak shavings, etc., with similar results. These experiments were all made at the temperature of about 50° Fah., without artificial heat. There is no doubt that, when concentrated sulphuric acid comes in contact with straw, wood, or other organic matter at ordinary temperature, volatile organic acids and sulphurous acid are developed in considerable quantity. In the case above described, these acid fumes, no doubt, attacked the iron parts of the vessel and made the boatman ill. Hence it is dangerous to sleep in a room where this acid is kept or transported, unless special care is taken to secure good ventilation.

Photographic Parasols and Wearing Apparel.

Among recent applications of photography is the imitation of lace, by photo printing on parasols *The Photographic News*, speaking of one example, says: Every fiber of the lace was shown with extreme sharpness. So perfect was the result, indeed, that, unless one touched the parasol, it was impossible to believe that the lace was not actually a tangible reality.

The same process is now being further employed for printing handkerchiefs and shirts: and we were fortunate in seeing the other day some examples of what can be done in this delicate fancy printing process. Some handkerchiefs shown us had at the corner two or three butterflies most charmingly impressed, the images having evidently been taken direct from the insects themselves Other fabrics had sketches, evidently reproductions from woodcuts and engravings, obtained and printed by a photo-mechanical process, all of them being of a most delicate nature, such as could hardly be secured from blocks on lithographic stones. Photographic portraits of various kinds were also to be seen impressed upon fabrics in the same way; but these, perhaps, can scarcely be called novelties, neither was the result so successful as in the case of the other objects we have mentioned. The prints were undoubtedly all produced by fatty ink, and would, no doubt, be very permanently printed upon the fabric. This method is much simpler and more satisfactory than printing in the ordinary way by silver salts; for very great care has to be exercised in the latter case, and failures are far from unfrequent, the dressing in the fabric being most difficult to remove and apt to discolor the silver print. Moreover, there are the troublesome operations of salting and albumenizing, and flattening the stuff, which is by no means an easy proceeding, any more than the examination of the print in the pressure frame. This photo mechanical printing upon fabrics is certainly an art to be cultivated