Correspondence.

Findlay Natural Gas.

To the Editor of the Scientific American:

In your paper of January 3 you quote from Prof. Orton's geological report that the gas in the northwestern Ohio gas fields is "rapidly and surely being exhausted."

I am a citizen of Findlay, which is about central in the field, and know that the population of the city is constantly increasing every year, and that the gas service *was never better or more satisfactory.* It is just now shut off from several factories, not for a lack of gas, but because these factories would not pay an increase in the gas rates which the gas trustees have put upon them. It is not true that the gas is lavishly wasted; but, on the other hand, it is economically and carefully used. F. M. CASE.

Findlay, January 5, 1891.

Bacillus Tuberculosis.

To the Editor of the Scientific American:

I notice in the SCIENTIFIC AMERICAN of January 3, 1891, an error which cannot fail to be misleading. In the illustration, on page 7, of bacillus of tuberculosis the first picture is given as "magnified 900 times," and the second as "magnified 2,000 times." The fact is the first illustration shows the microbe as magnified 900 diameters, and the second 2,000 diameters; the first being enlarged 810,000 times, and the second 4,000,000 times. The only way to demonstrate and identify these microbes is by certain processes of staining, by which the microbe will take a different stain from the surrounding tissue. These stains are produced by preparations of aniline colors, of which several methods are known to bacteriologists. It is needless to remark that these bacteria require the highest powers of the microscope for their exhibition. L. A. WILLSON.

Cleveland, O.

Flow of Sap.

To the Editor of the Scientific American:

I have just noticed in your issue of November 1, 1890, in an article headed "Natural History Notes," a theory that the ascent of the sap in trees is produced by the "vacuum made by the transpiration of the leaves." It occurs to me that one fact has not been taken into consideration in putting forth this theory. If a tree has been cut during the winter, the next spring the sap will flow from the top of the stump as freely as though the tree was still standing. In logs, too, if they have not lain too much in the sun, there will be quite a flowage at the regular time in the spring. This is not a leakage, because the flowage occurs the same, even when the log lies with the small end elevated. There are several other illustrations of the movement of the sap when there are no leaves to operate.

GEO. W. PERRY, *State Geologist.*

Rutland, Vt., Jan. 3, 1891.

Engines of the Steamship Mackinaw.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of December 27, I notice a description of the steamship Mackinaw, built by F. W. Wheeler & Co., of West Bay City, Mich. West Bay City is about three miles above the mouth of the Saginaw River, and is, therefore, on Lake Huron, not Lake Michigan, as your article states.

My purpose, however, is to give you some further information concerning the engines, which are of my own design. The cylinders are $\frac{21'',\ 34'',\ \text{and}\ 56''}{42''}$ H. P. valve of the piston type, actuated by a Joy gear; I. P. and L. P. valves being flat and driven by Stephenson double bar link gear. The condenser shell is of cast iron, and supports the rear frames which carry the crosshead slides. Over 2,000 square feet of cooling surface is afforded by 988 ¾ inch brass tubes, 11 feet 3 inches in length. The circulating water is supplied by a No. 10 Baldwinsville centrifugal pump driven by an independent engine. The condensed steam is delivered by the air pump to a heater and filter, from which it is taken by the feed pumps and returned to the boilers.

WM. L. MAHON, M.E.

Duluth, Minn., Dec. 29, 1890.

Ingrowing Nails.

To the Editor of the Scientific American:

It is a very remarkable fact that in all the communications that I have read in relation to ingrowing nails, no one has explained why they do grow in.

Some years ago I was much troubled with the big toe nail growing down into the flesh on the side, and had it "lifted" and "stuffed or packed," all to no purpose. At last I came to ask myself, "What makes this nail grow down at this side?" and give the matter what might be called scientific consideration and observation, and I found that the top surface of the nail was thick and hard. I withdrew the packing and went to work scraping, reducing the thickness of the nail so much that, when pressed on, it would indicate that it was quite thin.

Relief was instantaneous, the pressure on the cutting edge of the nail being relieved. In about a week it came up flat or nearly so.

The fact is this—with ingrowing nail, the surface becomes horny, dry, dead-like, and has no grit in it.

A member of my family had a very bad ingrowing toe nail, unable to wear a shoe. The remedy I described was tried, and in ten days was well and wearing her shoe.

The nail must be scraped thin with a sharp knife from the root to the end, and relief will follow sure.

Philadelphia, Pa. A. ROELOSS.

Soldering Aluminum.

A late issue of *Neueste Erfindungen und Erfahrungen* says: The soldering of aluminum is a matter of so great importance that it cannot fail to be of interest to many to know that the Aluminum Company, of Neuhausen, Switzerland, is now offering to the trade a specially prepared aluminum, in sheets, which can readily be soldered with an ordinary soldering iron and tin solder. The line of juncture is prepared by applying a mixture of resin, tallow, and neutral chloride of zinc. Scraping or otherwise cleaning the place to be soldered is to be avoided, although alcohol or turpentine may be used when cleaning is absolutely necessary.

Sheet aluminum may readily be soldered if previously given a light plating with copper. If aluminum so prepared is suddenly heated, there is considerable of the copper stripping off and rendering the joint unreliable. Nevertheless in many cases the process is very satisfactory, and particularly so when the copper plated edges are allowed to lap over each other.

Aluminum bronze containing as much as 5 per cent of aluminum may be readily soft-soldered with ordinary tin solder. Increasing percentages of aluminum render the soldering more and more difficult, until with 10 per cent of aluminum it becomes impossible. The method above referred to, of slightly plating with copper, will be found a help in such cases. When no tank is convenient for dipping the edges into the plating solution, very fair results may be obtained by using a number of pieces of blotting paper well soaked with solution of cupric sulphate. The paper is placed in contact with the article to be plated and with a piece of copper. The battery is then attached by wires with the positive pole to the copper and the negative pole to the casting or other object to be plated. A very short time is sufficient to give a plating heavy enough for soldering purposes. If for any reason a battery is not attainable for plating, the bronze may be prepared with a mixture of resin, tallow, neutral chloride of zinc and corrosive sublimate

Hard-soldering offers no difficulties. A good solder for this purpose is made by smelting together 52 parts copper, 46 parts zinc and 2 parts tin. Borax is used as the flux, and the process is the usual one. Tests of joints made with this solder were made at Neuhausen, and showed that aluminum bronze plates butted together gave a resistance to pulling strain of 26 to 28 kg. per square millimeter; lapped joints (5 mm. lap) required 39 kg. per square millimeter to part them.

Tubes made from sheets with this solder can be drawn down on a mandrel.

Aluminum bronze castings can be united by the process known to foundrymen as sweating or burning. The parts to be joined are placed in a sand mould and an excess of hot metal flowed over the joint. When carefully done the joint cannot be seen, and shows as great strength as the body of the casting. Thin cylinders may be made in this way by bending sheets and sweating their edges together.

Jastrow on a Writing Test.

In a paper entitled "A Study in Mental Statistics," Prof. Jastrow describes the results of a mental test in which fifty students of a class in psychology, at the University of Wisconsin (twenty-five men and twenty-five women), took part. The task consisted in writing 100 words as rapidly as possible. The material thus collected was utilized to shed light upon (1) the similarity of our ideas and habits of thought, (2) the links that bind our ideas together, and (3) the time required for these processes.

1. The general tendency to regard one's mental habits and products as singular and original, and consequently to look upon every evidence of similarity of thought as a strange coincidence, receives a set-back from the result of the present and similar studies, for it is found that these fifty persons, independently writing one hundred words from the many thousand with which they are acquainted, all in all, select from the same 2,024; *i. e.*, of the 5,000 words written, only 2,024 are different. Again, 1,266 words occur but once in the aggregate lists, and omitting these we find that about 3,000 of the words are formed by the repetition of only 758 words. Passing to an analysis of this "mental community," it becomes clear that it is greatest at the beginning of the list, and becomes less toward the end; *i. e.*, the habit is to write first the most common, and when these are exhausted, the more unusual words. A very interesting point is the comparison of men and women in their tendency to repeat one another's thoughts. The evidence is unmistakable that the lists of words drawn up by the women are much more like one another than are those written by the men. The women use only 1,123 different words, the men 1,376. The women write but 520 words that occur but once in the lists, the men write 746 such words.

2. A study of the processes involved in these lists bases itself upon a careful analysis of the ideas therein represented. The relative sizes of such classes, in a measure, indicate the prominence of different classes of objects in the minds of the writers. It may be interesting to mention that the five best represented classes (of the twenty-five adopted in the paper) are "Names of Animals," "Articles of Dress," "Proper Names," "Actions," "Implements and Utensils." The sexes present characteristic preferences for the various classes. The women contribute most largely to "Articles of Dress," writing 224 such words, while the men write but 129. They show an equal favoritism for "Articles of Food," writing 179 such words to but 53 for the men. The men, on the other hand, show fondness for "Implements and Utensils," "Names of Animals," "Professions," "Abstract Terms," etc.

Of the various links by which the one word suggests its successor, it may suffice to indicate as prominent types, (*a*) association by sound, in which words are rhymed, or begin with the same letter; (*b*) by belonging to the same class, as when a series of animals or articles of dress is formed; and (*c*) by more general but not briefly describable relations. One may combine the two inquiries (1) and (2) to ask how often the same word is associated with the same word in different lists. If we take the twenty words most frequently occurring, we find over 500 mentions; and if we examine in each case the word preceding the given word, we find it to be the same in 111 cases, and the succeeding word the same in 145 cases—certainly a remarkable result. Here, again, the women are found to repeat one another more than the men.

3. Regarding the time occupied in the process, the result reached is that (roughly speaking) it takes, on the average, 308 seconds to write such a list of 100 words; that 210 seconds are consumed in the mere act of writing, 114 seconds in thinking of what to write, and 16 seconds in which both may be done.

These results are offered, in addition to whatever value they may possess, as an illustration of how, by simple experimental methods, we may become more intimate with the processes that we constantly but unconsciously perform.—*American Naturalist.*

Experiments with Explosives.

Lieutenant Willoughby Walke, instructor in charge of the United States Artillery School laboratory, has recently made a series of experiments with the object of determining the strength of various explosives. The Quinan pressure gauge used consisted of a heavy block of wood, upon which was bolted a cast iron block. In this block four wrought iron guides were twisted around the circumference of a circle 4 inches in diameter and were connected by a ring at their outer ends; a steel plate was let into the block and was flush with its upper surface. The piston, which rested on a plug of lead, was of tempered steel 4 inches in diameter and 5 inches long, and moved freely between the guides. It weighed 12½ pounds. On the top of this piston was a parabolic cavity to hold the charge of explosive. The shot, made of tempered steel, was 4 inches in diameter and 10 inches long, weighing 4½ pounds. It was bored down its center to receive a capped fuse. To operate the instrument a plug or cylinder of lead was placed on the steel plate and the piston lowered gently down on it. The charge of explosive being placed in the cavity, the shot was gently lowered upon the piston. On firing the charge the shot is thrown out and the piston forced down on the lead plug, which it compresses, the amount of compression being a measure of the strength of the explosive. Twenty-seven explosives in all being tried, the results were compared with those obtained with a sample of nitro-glycerine, the strength of which was reckoned as 100. The results placed explosive gelatine and hellhoffite first with a strength of 106·17. Gun cotton and dynamite had each a strength of over 80; emmensite, a new American explosive, one of nearly 78; bellite, one of 65·70; and melenite, the famous French explosive, which is not nearly so safe to handle as bellite, had a strength of only 50·82.

Electrical Copies of the Dead.

According to *La Nature*, Dr. Variot paints the skin with a concentrated solution of nitrate of silver, and reduces this with vapors of white phosphorus dissolved in sulphide of carbon, the skin being thus rendered dark and shiny. The body is then ready for the electric bath, which is served by a thermo-electric battery, giving a regular adherent deposit of copper if the current is properly regulated. With a layer of one-half to three-fourths mm. the envelope is solid enough to resist pressure or shock. Dr. Variot further incinerates the metallic mummy, leaving holes for the escape of gases. The corpse disappears, and a faithful image or statue remains.