Correspondence.

Self-Mending Snakes.

To the Editor of the Scientific American:

In your issue of the third instant, I observe an article on the "Glass Snake," or on one variety of that somewhat diverse species. My acquantance is with a somewhat different one, which, so far as I know, is simply a snake, and not in any sense a lizard. I have seen many of them in earlier days here; but never saw one more than about 18 inches long. They are very beautiful, being a kind of steel gray and black, in small broken checks on the back, with two slightly defined stripes along either side, so far back as the vital organs extend. But I believe that you, like most scientific writers, are inclined to scout the idea of these snakes "putting themselves together" and crawling away after being broken in pieces. Now, facts are facts, no matter what philosophy may say. About ten years ago I caught one of these reptiles, broke him in pieces from one to two inches long, from the anus to the tip of his tail—two-thirds of the whole length of the way—then placed a cage over him so that he could by no means escape, and mistakes were impossible. Then, on returning to the place twenty-four hours after, the snake was there, sound and whole, in full length. On close examination, however, I could see where most of the breaks had been, and the first section, about an inch and a half long, was not perfectly in place, so that the fine longitudinal lines of the figure were perhaps one-sixteenth of an inch out of the way. The remaining fractions corresponded, not with that, but with the body. I did not know then that this putting together process was seriously controverted by scientific men, and supposed from previous careless experiments that it was only the illiterate who doubted. OLIVER WHITE,

Secretary of the Peoria Scientific Association.

Peoria, Ill., Sept. 6, 1887.

Annealing and Tempering Fine Tools.

To the Editor of the Scientific American:

Having had about twenty-five years' experience as a tool maker, I feel confident that I can give some of your readers a few good points on annealing and tempering fine tools.

I have occasion to visit the large railroad machine shops and other large shops that use large quantities of fine steel tools, such as taps, fluted reamers, thread cutting dies, milling cutters, etc., and I find that almost all of them lose from ten to fifteen per cent of these expensive tools when they are first tempered, or as soon as they are put into use, and at least twenty-five per cent the second time they are hardened, and about fifty per cent the third time. To avoid this large loss and annoyance, have your steel annealed by the steel manufacturers in short bars from five to six feet long, the sizes you may want, and cut off the required length you may wish for your tools. This will save the forging and consequently much expense, and your tools have not been overheated, and there is no uneven strain on the tool. If your tool is of such a shape that you have to have it forged, do not heat it too quickly, but thoroughly all the way through, and do not hammer nor *bend* the tool unless it is red hot. Do not hammer *cast steel* after the red has all *disappeared* in *any case.* You may hammer blister and shear steel to refine it at a black heat, but never do this *with cast steel,* for it will cause your tool to spring or crack. Forged tools should be annealed and roughed out by planing or turning off below the hammer marks, and then annealed again. This will avoid the springing when hardened. To anneal small sizes of steel, use iron pipes, plug up one end and fill up with the tools. Sift in fine charcoal dust, plug the other end, and heat it slowly until it is at a good red heat all the way through, then bury it in fine charcoal or wood ashes. If you have not got the wood ashes, use dry sawdust, and in a short time you will have the ashes and the most perfect annealing preparation in the world. Have this in a good tight iron box with a close cover. For annealing such tools as taps, reamers, and milling cutter dies, etc., use fine wood ashes, dish out the center and replace the ashes with dry sawdust. Heat your steel slowly to a good blood red, and bury it in the sawdust and cover it over with fine charcoal dust or fine dust from around the forge, put on your cover and let it remain until cold. I always make it a point to get my annealing in on Saturday if I possibly can, and let it remain until Monday or until cold. For hardening I use a good strong salt brine—about three pounds of salt to one pail of soft water, lard oil, and resin, about one-sixth resin to five-sixths of oil. When mixed together, the oil should be quite warm, also the resin. Pour the resin into the oil and stir it well. Heat your tools slowly and thoroughly all the way through, then immerse in the salt brine. If a tap or fluted reamer, put it down in the center of the tub as straight as you possibly can, and move it up and down slowly from one to two inches, so as to avoid a water line, until it is chilled about half way or one-third through, as near as you can judge. This you can determine quite accurately by the tremble of the tongs, caused by the condensing steam around the tool. The tremble will cease when the tool is chilled about half through. Then put the tool from the brine into the oil and resin as quickly as possible, move it up and down gently for a minute or two, then drop it into the oil and let it remain until cold, then take out, brighten, and test the hardness with a small sharp file, and you will find that you have about the right temper required. For cast iron and brass you will require the tool much harder than you will for wrought iron. Large tools after remaining in the oil will sometimes draw the temper a little more than required. If the oil commences to boil by the heat of the large tool, have a pail of boiling hot water close to your oil tub, take your large mill or whatever kind of tool it may be, and immerse in the hot water for eight or ten seconds as near as you can judge, and then return it as quickly as possible back to the oil, and let it remain until the oil stops boiling. We will suppose this to be a large mill cut on top and sides. If you are in a hurry for this tool, and cannot wait until it is quite cold in the oil, you may take it from the oil and put it over a clean slow fire and brighten a few of the teeth, and draw the temper at the same time to suit your work, then return again to the oil and let it remain until cold. It is the safest way to draw the temper on large tools a little on the outside at the same time the temper is drawing from the inside, but there is no occasion to draw the temper on most of your tools from the outside. With this process you will see that the temper is drawn from the inside of tools instead of the outside—the old-fashioned way. By tempering tools in this way, you have a *soft-centered steel.* The brine has hardened the tool so far as it is required to be hard, and the oil keeps it hard and allows the center or thick part to cool slowly. It will not throw your tool out of round, but will run on the centers as true as before it was hardened. Milling cutters, taps, and fluted reamers only require to be hard on the cutting parts, and with this process you have just what you want, and you can anneal and harden them a dozen times and never break them. The teeth will not crack off as they do in the old-fashioned way of hardening tools.

Chipping chisels, after forged, should be heated slowly at least three inches from the cutting edge, to take off the uneven strain caused by forging. Never hammer a cold chisel after the red has disappeared, especially on the edges. The corners will break off if you do. Immerse in clean soft water about two inches, and move the tool up and down slowly, keeping the point in the water at least one and one-half inches, until the water will not hiss on the tool. Then brighten and draw the tool to a sky blue, then drop it into cold lard oil, and let it remain until cold.

If a tap or any other fine tool should by chance get too hot or burnt, do not take the tool from the fire, but shut off the blast. Get some resin, put it on the tool freely, and let it remain in the fire ten or fifteen minutes, occasionally putting on the resin, and letting the tool cool down to a good cherry red, and then immerse as above described, and your tool is as good as if it had not been overheated. I do not recommend overheating steel. It should not be heated more than a cherry red for hardening, and should be heated in a furnace if possible. If you have much tempering to do, it will pay to have one built. A furnace suitable for heating will cost about one hundred and twenty-five dollars.

Oil City, Pa. C. B. HUNT.

Speed of Centrifugal Extractors.

Several instances are on record of the bursting of extractors, and these accidents usually entail not only the destruction of the extractor itself, but also damage to other property and the infliction of serious, sometimes fatal, injuries to persons. A prominent manufacturer of extractors stated to us that investigation into such mishaps has developed the fact that the machines were usually run at an unnecessarily high rate of speed, ranging up to 1,800 and even 2,000 revolutions per minute. In order to ascertain what an advantage, if any, is gained by increasing the extractor's speed, experiments were carefully carried out under the supervision of the gentleman alluded to. Batches of clothes were wet and then placed in an extractor running at a comparatively slow speed, and, when a sufficient time had elapsed, were taken out and weighed. After having been rewet, the clothes were again put through the process at a higher speed and then again weighed. This was repeated at different rates of speed up to 2,000 revolutions per minute. These experiments showed conclusively that nothing was gained by running the extractor at more than 1,500 revolutions per minute. In other words, all the water that can be extracted by centrifugal force is removed by the machine when making 1,500 revolutions per minute.

Any increase of speed over that figure is superfluous. It confers no advantage, does not dry the clothes any more; but, on the contrary, may do an enormous amount of mischief. From the foregoing statement a valuable lesson is to be learned. In order not to endanger life or limb or property, let every laundry proprietor see that the extractor is never run at more than 1,500 revolutions a minute. A small increase of 50 or 100 revolutions may seem unimportant; but it is unnecessary, and there is every reason against making it and none in its favor. In machinery, the old adage of "the last straw breaking the camel's back" is often too true. Once the limit of endurance or resistance is reached, a small *additional* weight or speed is about as bad as a tornado or an earthquake.

Another point that deserves attention is to guard against dropping anything between the perforated basket and the outer shell. About three years ago a horrible accident occurred in the laundry of a hotel, if we remember aright, at Lake Minnetonka, Minn. By the bursting of the extractor several persons were badly hurt, one of them fatally injured. The cause of the disaster was a mystery, and, of course, it was attributed to defective workmanship or inferior materials, and the manufacturer was severely blamed. In a short time, however, the truth leaked out. A girl had allowed a monkey wrench to slip down in the hollow space under the basket, and, being unable to reach it with her arm, had said nothing about it, fearing to receive a scolding for the loss of time that would have been required to take the extractor apart. Two or three weeks passed without the wrench being shaken or washed into the right position to cause a smash, but the time came at last, with the distressing result already mentioned. Therefore it would be only prudent to take all possible care to prevent monkey wrenches, or anything else except water, getting into the chamber.—*National Laundry Journal.*

Croton Water, New York.

The Croton water contains in 1 U. S. gallon of 231 cubic inches the following normal impurities:

GRAINS IN ONE U. S. GALLON.

Soda	0·326
Potassa	0·097
Lime	0·988
Magnesia	0·524
Chlorine	0·243
Sulphuric acid (SO_3)	0 322
Silica	0·621
Carbonic acid	2·604
Organic and volatile matter	0·670
Total	6·395

One hundred million gallons of this water are used daily in New York, in which are contained the following quantities of the above mentioned substances in pounds and in tons of 2,000 pounds:

IMPURITIES IN 100,000,000 GALLONS OF CROTON WATER.

Impurities.	Pounds.	Tons.
Soda	4,657	2·319
Potassa	1,385	0·692
Lime	14,114	7·038
Magnesia	7,485	3·742
Chlorine	3,471	1·735
Sulphuric acid	4,600	2·300
Silica	8,858	4·429
Carbonic acid	37,200	18·600
Organic and volatile matter	9,571	4·785
	91,341	45·640

As the average flow of the Croton River is 400,000,000 gallons daily, there are 365,428 pounds, or nearly 183 tons, of impurities carried to the ocean daily by a stream which does not receive any refuse from factories.

Densities of Liquids.

Many determinations of the densities of the liquids which so short a time back were only known as permanent gases have been made, but until very lately it has been impossible to compare them, on account of the various conditions under which the experiments were made. But very recently Dr. Olszewski, to whose elaborate researches on this subject we are already greatly indebted, has succeeded in overcoming the difficulties of comparison. Taking advantage of the very low temperature produced by the evaporation of liquid ethylene, he succeeded in finding not only the boiling point of the liquefied gases at the normal atmospheric pressure, or very near to it, but also its specific gravity at this pressure. It is of course of particular importance to know the specific gravity at the boiling point, because this fixes the specific volume. Working in this way, Olszewski found for the three important liquids methane, oxygen, and nitrogen the following numbers: Methane: pressure, 736 mm.; boiling point, —164° C.; density, 0·415. Oxygen: pressure, 742·1 mm.; boiling point, —181·4°; density, 1·124. Nitrogen: pressure, 742·1 mm.; boiling point, —194·4°; density, 0·885. Scarcely inferior to the above research in interest is that of M. Amagat on the influence of pressure on the point of maximum density of water. It is well known that this liquid, remarkable in so many respects, occupies a less volume at 4° C. than at higher or lower temperatures. Hence the expansion of water is irregular, and is unlike that of any other liquid. But we now learn that this peculiarity only exists under ordinary pressures. When the pressure is increased, the point of maximum density falls, and at 200 atmospheres it is almost identical with zero; with greater pressure the irregularity of expansion lessens, and at 3,000 atmospheres it disappears and water behaves like any other liquid.—*Lancet.*