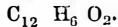




A. of Md.—Carbonic acid is composed of carbon, hydrogen, and oxygen with the formula according to the old atomic weights—



which gives the proportion carbon 62 pounds, to hydrogen 6, and oxygen 16. It is one of the constituents of coal tar, and is separated first by fractional distillation, then by agitating the oil which comes over between 300 deg. and 400 deg. with a solution of potash, and saturating the watery portion with hydrochloric acid.

C. R. J., of N. Y.—The notion that there is any more power in a long screwdriver than in a short one—the handles of the two being of the same size—is the result of careless observation.

E. K. C., of Me.—An index plate for a small gear cutter can be purchased in this city for about \$17.

G., Ind.—Machinists' tools can be had in all tool stores.

H. O., of—Recipes for dressing furs cheaply and quickly, can be found on page 323 Vol. XI.

L. S. B., of S. C.—Your notion that the attraction of the earth is due to magnetism instead of gravitation would be overthrown by a consideration of some obvious facts—for instance of the fact that the earth attracts all bodies alike in proportion to their mass, while magnetism does not attract any two substances with the same force, and some it does not attract at all. If you try the experiment you will find that a coin weighs more than a feather in a vacuum.

A. & G. W., of Pa.—The officers of the Government usually express the amount of the public debt in figures, leaving readers to call the amount thousands of millions or billions, to suit their own fancy.

A. A. R., of Pa.—The picture that you send us is a wood cut printed from three blocks. One block is cut to print the blue, another to print the yellow, and a third the purple; and the paper is pressed successively on each block.

A. G. M., of Min. To get the circumference of a circle multiply its diameter by 3.1416. Multiply the circumference of a reel by its revolutions per minute, and you will have the length of line that it will wind in a minute.

D. R. T., of Va.—The sketch of the governor you send us is novel, but there are others so much better that we do not advise you to proceed with it. You will find directions for making artificial ivory on page 198 Vol. X.

H. B. S., of Pa.—We never heard that the injector had any effect whatever on the slide valve. Your question is so put that no other answer will apply to it.

H. R., of Ohio.—There is no cement that will hold vulcanized rubber to iron so that it will not come off.

G. S., of Pa.—If there is no pressure from below, you must calculate the pressure on the whole upper area of the valve. The address of the party you require is New York City.

W. F. S., of Md.—Your case is that of many others. You have an invention and wish to bring it before the public, but have no friends to whom you could confide the secret of it to introduce for you. Your only course is to take out a patent for it, when if it is really useful you will find plenty of persons who will buy it.

F. Olneyville, Box 129.—We have no idea what the question was that you sent us \$1 for and that you only received "a three cent book for." If you will send your question again we will endeavor to answer it satisfactorily.

B. W. R., says:—"I am the manufacturer of a known chemical combination, but having made several improvements in it lately, have as yet taken no patent. Should I die could my heirs take a patent out for the same?"—Yes.

H. A. G., of N. Y.—The "shiny black paint" used on fancy iron castings, is Japan varnish sold by all wholesale paint dealers. It is applied cold, and baked in an oven at a moderate heat for some hours.

T. R. N. Y.—You require to know whether the recipe for welding cast steel, recently published in the SCIENTIFIC AMERICAN, will unite wrought iron and steel. It seems that you might put a piece of each in your fire and try it, and so find out in the most satisfactory manner. No water must be added to sal ammoniac in melting it. It is the water of crystallization that is to be driven off.

B. & Co., Ohio.—In philosophical terms, a pulley on a vertical shaft rotates in a horizontal plane; in popular language it may be said to run horizontally.

H. C. B., N. H.—Our information in regard to the state of the cabinet business in Iowa, is at present so limited that we could not advise you with any degree of accuracy.

Worcester Rule Co.—We have never had the pleasure of reading your pamphlet, but will give attention to any article you may forward.

C. W., N. Y.—The eccentric on a horizontal engine is nearly at right angles with the crank; whatever the lap and lead is will change the angle that a line through the center of the eccentric forms with a line drawn through the center of the crank. If the engine runs backward, that is, toward the cylinder and the connection is direct from the eccentric to the valve stem, the eccentric will be on the upper side when the crank is on the forward center. Agents who sell our paper have no right to collect postage, they get their papers by express.

E. A. W., Ohio.—Green hide is generally applied as a cushion to receive the edges of knives in straw cutters. On paper cutters a piece of maple wood is used.

### Machine Taps—Steam in Cemented Cisterns.

Messrs. Editors:—In a recent number of the SCIENTIFIC AMERICAN, "Apprentice" asks for some information about the best mode of filing taps. Your answer to him is correct, and agrees with my experience, as far as the filing of the flutes is concerned. I call the attention of your readers, however, to another very important point which is generally overlooked by mechanics making the taps.

Taps for use in machines are now made almost universally straight; that means, the part on which the thread is cut is turned of even diameter, and after the thread is chased, a portion of it is turned off tapering toward the end. To make a tap of this kind to cut free and without much heating, the tail stock of the lathe should be set to one side, enough to turn the tap on the end which enters the nut first, about 0.15 larger, then the required finished size of the other end of the thread; on large taps even .02 is not too much.

Taps, particularly thin ones, will spring considerably in turning, and more so by chasing (unless a steady rest is used), which causes the tap to be of a larger diameter toward the left end of the thread. It is evident from the nature or curve of the thread, that the sides of the same cannot cut and present a smooth surface to the iron in contact with them. It is further evident that the friction on the sides causes the tap to expand, and also the nut; if the tap is larger toward the finishing part, the friction is greatly increased, and heating and breaking of the taps is generally the consequence. On the other hand, a tap made according to the above direction will always cut free and without perceptible heating. The tapered part forms a series of cutters, and none will cut more than its projection above another; the expansion of the nut will always correspond with the diminished size of the tap, so will the strain and power required for cutting as the width of the cutting edge decreases.

The taps in use at the place I have charge of, have all three semicircular flutes, the thread on the tapered-off portion is slightly filed off to the edge, to reduce the friction, and to allow the teeth to cut free, and not to squeeze. Our 1-25 tap is 14 inches long, the thread part 4 inches, the tapered part 3 inches. The machine is not stopped for taking off nuts, the tap is simply taken out of the socket into which the shank is fitted. The shank is turned down to the bottom of the thread the whole length, which gives room for 7 nuts to remain on it. Our 3/4 tap is 7 inches long, thread part 2 inches, tapered part 1.5. These taps have been used for five successive hours, without heating materially, if oil is regularly supplied. Such taps, if dull, can be sharpened up very easily on the grindstone.

In your "Notes and Queries" you express the wish of learning the result of exhausting steam into a cemented cistern. We have one at this place, into which the steam of a 65 horse-power engine is exhausted during winter only, for the last 10 years, and we never experienced any difficulty. Yet I am of opinion that it will injure the cistern sooner or later. Another very serious objection against this practice is, it keeps the water in constant agitation, and prevents the settling of its impurities, and as we draw our feed water from this cistern, dirt will be deposited in the boilers. There is one reason, however, why we continue to do it; rain water falling on all our large buildings in the yard is conducted through pipes into this cistern, and the hot steam keeps these pipes and conductors all the time open and prevents them from freezing in cold weather. The water gets very hot, particularly when the supply gets low, and under such circumstances we find it very injurious to the packing of the feed-water pump. M. N.

Alleghany, Pa., March 23, 1866.

[We cannot agree with our correspondent about the feasibility of grinding taps. Few grindstones run true enough to do it properly, and few men, especially bolt cutters, have skill enough to grind a tap without some rest. It would pay in all machine

shops to have a solid emery wheel of fine grade to sharpen special tools on, together with rests suited to different work.—Eds.

### Projectiles Used During the Crimean War

Messrs. Editors:—I take great pleasure in communicating to you the following extract from official documents in my possession, and which may be read with interest by your numerous readers:—

Number of projectiles used:—French, 29,460,363; English, 15,000,000; Piedmontese, 50,000; Turks, 50,000; Naval Forces (Allied), 35,000; Russian, 45,000,000. Total, 89,595,363.

Killed and wounded by these projectiles:—French, 50,836; English, 91,038; Piedmontese, 183; Turks, 1,000; Naval Forces (Allied), 2,000; Russian, 100,000. Total, 175,057.

LIONEL D'EPINEUIL.

Philadelphia, March 21, 1866.  
[It will be seen that only one projectile in 512 did any execution.—Eds.]

### A Crystalline Car Axle.

Messrs. Editors:—The accompanying metal, just as it is, was taken off a broken axle of a freight car on the Pittsburg and Erie R. R. on March 20, 1866. The axle was broken near the hub of the wheel and both parts had the same appearance. The yellow is not rust as there is no crack in the axle to let moisture in, and it is in the same condition as when I broke it off. Being a passenger train and being detained by this break is the manner in which I got it. Sizer & Co. was on the wheel, but nothing else, no location or any thing to know where it was made.

I may not be a judge of iron for car axles, but it seems to me this is very poor material.

G. M. M.

Oil City, Pa., March 26, 1866.

[The specimen is a mixture, in about equal proportions, of peroxide of iron and bright crystals of iron. It is manifestly very brittle, and wholly unfit for use as a car axle.—Eds.]

### The Cascade of Light in Boston, Mass.

Messrs. Editors:—In remarking upon an article in your paper of the 24th inst., entitled "Light in a Bowl of Water," you say, "One of the most brilliant experiments ever exhibited in a lecture room, is the throwing of the electric light upon a column of falling water." Never was a remark more true, as all can testify who were so fortunate as to be present at Prof. Lovering's lecture in this city last Friday evening, before the Lowell Institute.

With the aid of a very powerful Rumkoff coil, a stream of falling water was made to produce, as you say, "precisely the effect of a cascade of light."

The object of this note is, with your permission, to say that, "this dazzling experiment has been exhibited" most successfully in this country as well as in England.

Boston, March 26, 1866.

### Electricity from Combing the Hair.

Messrs. Editors:—I would like very much to see explained in your interesting paper, the following fact that occurred to me some nights ago. While I was combing my hair, using an india-rubber comb, I remarked that every time that I passed the comb through my hair, there was a crackling noise like the explosion of sparks of electricity. Rather astonished at this, I put out the gas light, and effectively I perceived in the looking glass before me, the bright sparks shining and disappearing in the obscurity.

As I am not acquainted with the mysterious ways of electricity, I would feel obliged to you for an explanation.

New York, March 30, 1866.

[A common phenomenon. Electricity is produced by friction, and one of the very best electrics is hard india rubber.—Eds.]

### Strength of Ice.

Messrs. Editors:—Your statement in your last number, as to the strength of ice, is calculated to mislead, and any officer trusting to it in moving a body of men would be very apt to give them a cold bath. Two inches of good ice will bear a man, but not a number of men. In deep water it will always crack a little even with one man's weight, and would very soon be weakened. Four inches will scarcely bear a horse. You could not invent a more perfect ice breaker than a horse's sharp shoe. All his weight