Correspondence.

The Giffard Gun.

To the Editor of the Scientific American:

I was glad to see the description of the Giffard gun published in the *Revue Industrielle*, for July 10, reproduced in your paper of August 16, but I wish to call your attention to an error which should be corrected.

The pressure of the carbonic acid at 30 deg. is 70 atmospheres, not 10 atmospheres, and it is with this pressure of 70 atmospheres that the calculation is made which gives about "30 kilogrammeters" (as mentioned in my description) as the maximum theoretical work of the expansion of a gramme of liquid carbonic acid. It should be "about 30 kilogrammeters," and not, as translated, "one-thirtieth of a kilogramme." J. R.

Cutting Glass Bottles.

To the Editor of the Scientific American:

From the question, how to cut glass bottles, and the two answers, I infer that neither of these gentlemen is acquainted with a very easy method which I practiced thirty or forty years ago many and many times.

This method consists in the use of what in German is called "sprengkohle," cracking coal.

The "sprengkohle" is made of finely ground lime-wood charcoal. The coal powder is transformed by means of sufficient gum tragacanth and water into a dough or paste, out of which small cylinders of the size of a pencil are made by rolling between two small pieces of board. Such a cylinder of "sprengkohle," ignited at one end, glows slowly. Such "sprengkohle" may be bought at stores for chemical and physical necessities.

Now as for the use of the "sprengkohle." It is as follows:

Put a drop of water on the spot where the crack is to begin. Make a short incision with a three-edged file. Wipe the water away. Touch the incision with the glowing "sprengkohle," blowing on it if required. After a few seconds the glass will crack for a length of ¼ to 1 inch. If now you move slowly the "sprengkohle," the crack follows it wherever you please.

By that means I made a great many pneumatic bells, by cutting off the bottom of great bottles, from 6 to 8 liters, and closing the neck by plaster of Paris.

For joke's sake I once cut or cracked a medicine bottle, of half a liter, spirally in such a way. If that bottle was lifted by the neck, it prolonged itself by its weight for about half an inch. If it was filled with water, and somebody caused to lift it by the neck, instantly its contents overflowed the table. WERDMULLER.

Vienna.

A Belt Problem.

To the Editor of the Scientific American:

A practical man has recently criticised a "theorist" who says a double belt will do most work when not cemented or riveted together.

This reminds us of an experience we had with a double belt several years ago. We ran a lathe which had a single leather belt. It lacked driving power, and we laced another belt of same width on top of this. The pulling power was increased, and was all we desired; but the two belts were hard to shift from one pulley to another. In doing this the bottom belt would often get on top, so we riveted them together, placing copper rivets about a foot apart. The lathe was started, and when stopped a short time afterward we were greatly surprised to find that all the rivets were pulled through the holes in the under belt and hung loosely in the outer one. They were not near the holes in which they had been placed. The fact was clear that the outer belt had been *creeping* on the inner one, and that, too, with tremendous power. We examined, and found the distance traveled by the outer belt in excess of that by the inner one was less than an eighth of an inch for each complete circuit.

Query: Do all double belts, whether cemented and riveted or not, have the same tendency to creep? and if so, does a futile effort to do so absorb power? Then again, what is the cause of this creeping?

There may not be much of importance in these questions. Yet some of your many readers may feel an interest in the subject. QUIRK.

To Destroy Stumps.

1. Bore a hole 1 inch in diameter, 18 inches deep, into the center of the stump, and put in 1 ounce of saltpeter, filling up with water and plugging up the hole. This should be done in the fall. In the spring the plug is to be taken out, a half a gill of kerosene poured into the hole and set on fire. It will burn out the stump to the farthest root.

2. In the fall bore a hole 1 inch in diameter, 10 inches deep, into the center of the stump, and put in a half pound of vitriol and plug very tight. In the spring the whole stump and roots through all their ramifications will be so rotted as to be easily removed.

[SAW-MILL GAZETTE.]

How to Manage a Steam Engine.

A PRIZE ARTICLE.

BY ECCENTRIC ROD.

(*Continued from page* 200.)

THE GOVERNOR.

The governor I watch closely, and pack as loose as I possibly can, so that the balls will have no more resistance to overcome than necessary. Keep the stem through the stuffing box well oiled, belt just taut, everything clean, and it will work if it is a good one. The joints must not be worn any to insure perfect working.

About lubricating cylinder, I prefer a pump to anything I have seen, this to be attached to steam pipe between the throttle and governor, and then the governor valve, slide valve and piston get the benefit. With the small hand pump you are sure of getting oil just when you want it, and just the amount required. I don't like tallow for cylinder. It has an acid which will attack iron and eat it. There is a difference in opinion about oiling cylinders at all. I have run two fine-working engines that never had any oil on any part of cylinder.

If the new engine can be used carefully until the lathe tool marks can be changed to lengthwise marks, without cutting, I think it will run easily without much oil, but new iron is like blotting paper—if it gets oil before the polish gets on the cylinder, it will spread all over and through the iron, and the polish comes slow.

I have named many things that are found only in part on the majority of engines and boilers, but if I intended to run an engine any length of time, I would try to have them, as I know, handling carefully as you may, there is always some danger, and when I know that water will expand about one thousand seven hundred times by heat, I will use every precaution to prevent it coming in contact with overheated tubes by low water, or by allowing scale or dirt to settle on tubes or shell, so water will be separated from the iron. The iron has to be heated much more, as the scale is a poor conductor of heat, and when it gets thick it may be lifted off by intense heat, and of course let water down on the too hot iron.

THE BOILER.

The boiler I started out with, forty-two inches in diameter, exposes about one thousand three hundred and eighty-four inches of surface, minus the amount of the tubes; and with sixty pounds steam pressing on every inch, I can realize that it must have care to make it hold this safely, and if I find anything around the boiler in the way of leak, blister, or anything that I know to be in any way dangerous, I will notify the owner, and it will have to be fixed immediately, or he will be compelled to get another engineer. I saw recently what was left of a boiler which exploded, caused, as per inspector's report, by low water. The engineer said that he knew the boiler was unsafe and the tubes were leaking. I may have had unusually good rigs to handle, or I may know something about taking charge. However, I have been running and handling every kind of boiler, excepting locomotive, for eighteen years, and I have never had a leaky boiler from my management, leaky tubes, or other trouble with engine that ever occasioned stoppage thirty minutes at a time. Attention to business and a love of the science (which caused me to study up points) has had something to do with my success; but at the same time, my success is not proof against accidents which happen; but all I can say is that if a man tries to keep posted, and will learn when he has a chance, and keep his eyes open to do the best and take no chances, he ought not to be blamed if accident should overtake him.

Now, Mr. Editor, this is my maiden effort as a writer, but as you called for simple points, that are usually omitted by book writers, I have tried to give them step by step, as I use them in practice, and if this article will be of benefit to any young runner, I shall be glad. I know when I first commenced, I grabbed at everything pertaining to steam; although many things I knew, I thought of them more when I found some one recommending them.

Paraguay Tea.

Paraguay tea, also called maté or yerba maté, from the name of the cup in which it is infused, consists of the dried leaves of the Brazilian holly (*Ilex paraguensis*). This plant is most extensively used in South America, and is said to possess many of the good qualities of tea, though a long indulgence in its use has been stated to induce diseases similar to those following the abuse of alcoholic drinks. In South America the tea is first placed in a maté, in which it is well shaken, a little warm water is then added, and the leaves stirred up; the gourd is then filled up with boiling water, and in a short time the liquid is ready for drinking, being stirred from time to time and more hot water added as necessary. On account of the slowness with which exhaustion occurs, care is taken to prevent the loss of the aroma by never letting the infusion cool down.

In the *British Medical Journal* for July 26, 1890, Dr. T. Cranstoun Charles writes that he has lately made several chemical examinations of this body, as he finds that the analyses published of it varied very greatly. The alkaloid present is caffeine, identical with the caffeine found in tea and coffee; there is also a tannic acid present in large amount. Comparing the analysis of maté with tea and roasted coffee, the following results were obtained:

	Caffeine. Percentage.	Tannic Acid. Percentage.	Ash. Percentage.
Tea	3·1	22·7	5·8
Roasted coffee	1·2	5·8	4·6
Maté	0·79	21·9	4·1

Both the active principles of these bodies appear to be the same, yet they seem to act somewhat differently on the system, and it should be remembered that their action is not dependent alone upon their proportion of alkaloid, but also on the presence of other bodies in small amount, such as volatile aromatic oils, empyreumatic products, and the like.

Dr. Charles made a number of experiments upon himself and a friend with the alkaloid, which he separated from the maté, the results of which we omit.

Mate appears to act as a cerebral stimulant, and also to have a special action on the sympathetic system, the contractions of the cardiac muscle being increased as well as those of the unstriped muscle of the bladder and intestine; and the whole muscular system seems to be stimulated by it to increased labor and wakefulness.

As regards the therapeutics of maté, but little has yet been determined, although Dr. Charles states that in the instance of two old ladies who were great tea drinkers, and who used to suffer much from sleeplessness, headache, and constipation, the use of maté had after a week produced great improvement. They slept well, passed more urine, their bowels became regular, and they suffered no more from headaches. It is also stated by Dr. Charles to have been serviceable in relieving patients who suffered from severe nervous headaches generally associated with constipation, and with whom tea and coffee appeared to disagree.

Hints Worth Heeding.

When a man has his business in perfect working order, and knows that, just then, a little more or a little less effort on his part will be answered by increased or decreased profits, it is hard for him to believe it wise for him to leave his duties for an hour, even though he is overworked. But one of the highest duties a man owes himself is to give his brain an occasional rest. There is a good deal more in life than simply adding to one's bank account. There is more honor in being a good citizen than in simply growing rich. It is poor policy to be thoroughly posted in all that concerns your business and be out of all knowledge of the great world. A man wants to forget his business occasionally—ought never to carry his cares beyond his store door. A night's respite from business cares will send you back to them with renewed strength and a clearer head.

Do not imagine that your business will go to the dogs if you leave it for a day or two. If you have been thorough with your men—if you have faithful and interested employes—the machine will jog along smoothly enough until you return. We are all apt to flatter ourselves that we are doing what no other person could do; but, not infrequently, something happens to show us that we are not nearly as indispensable as we imagined—in fact, that a division of labor in our business would be vastly to its advantage. Our subordinates, if left in charge, occasionally will have a chance to carry out some ideas of their own, and these, in a majority of cases, are decided improvements. The man who repulses suggestions from those under him—gives his men no credit for knowing anything beyond the steady routine of their employment—loses much that would be of assistance to him, falls into a rut and stays there, much to his detriment. The man who cannot learn something from contact with other men, whether employes or outsiders, is not a healthy man.

Business is a master that soon makes abject slaves of us if we will; but, with a well established trade, one should be master of his business. With probity, industry, and economy, almost any man, by well directed effort, may be prosperous. Whatever progress is made without this foundation is deceptive.—*Adapted from Maher's "Practical Hints."*

Modern Light and Heat estimates the capital invested in electric lighting plants in the United States has reached the enormous aggregate of $118,758,500, and there are at the present time in use 1,590,667 incandescent lights, 127,441 arc lights, and 1,379 stations. These figures tend in a measure to show the importance to which electricity has advanced within a few years. This does not consider the thousand and one applications of the element other than lighting.