salts can only be employed in very small doses, as recent experiments of Monsieur Marme have shown them to be violent poisons. The best antitode is the carbonate of soda and the white of an egg.

The following mixture burns with a brilliant white flame, surrounded by a magnificent blue border: Salpeter, 20 parts; sulphur, 5 parts; sulphide of cadmium, 4 parts; lamp black, 1 part.

This can be moistened and made up into balls or candles, and ignited after the manner of a fuse.

We have thus given the history and prominent applications of the rare metal, cadmium.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Improved Apparatus for Extinguishing Fire Wanted.

MESSRS. EDITORS:—I have read with interest your recent article regarding losses by fire from steam heating apparatus. Last winter we had a hot house, the property of Denn s Bowen, Esq., of this city, destroyed by fire. I gave it my opinion that the cause of it was from their heating pipes, which were directly under the wooden platform where the fire first appeared, but those who claim to be competent judges scouted the idea.

It seems to me that the sprinkler apparatus used in the woolen mills, alluded to in your paper, week before last, would be an excellent thing to use in our elevators in this city, which invariably burn up, when they catch fire, owing to the combustible material of which they are made, and the draft caused by the bins running from the top to the bottom of the elevator. I wish you would wake up some of the scientific men to making improvements in the manner and machinery of extinguishing fires, it seems to be the most neglected of all the branches of business. To be sure there has been considerable improvement made, such as the steam fire engines, fire alarm, telegraph, etc., etc. But don't you think that there is still further improvement to be made? It seems to me that a fire engine can be made which does not weigh over three thousand pounds, and still be as effective as the ones which are now used that weigh seven thousand pounds.

I have taken great pleasure in reading your valuable paper, and I hope it may long continue in its field of usefulness.

PETER C. DOYLE.

Buffalo, N. Y.

Purifying Drinking Water.

MESSRS. EDITORS:—Your correspondent in No. 9, present volume, suggests a very good remedy for keeping water pure; but it is at the cost of extra care, and manual labor, and expense of an air pump which requires close attention to operate successfully for any length of time.

My remedy is to use a pump that will give a slight agitation to the water every time the pump is used. I used in a large cistern a Joyce submerged pump, which consists of a semicircular cylinder, with arms extending out each side, and operating on a pivot to force the two plungers back and forth in the cylinder. These arms were connected by rods to a double handle at the top to give motion. This plunger with the two rods produced an agitation that kept the cistern water sweet for years. The pump was located a few inches from the bottom, and it never produced roiling.

As the pump was used from twenty to fifty times a day, I think it was more efficient than would be an air pump, with the great liability of neglect. There are similar pumps in use, but I can speak from experience of this one only.

Omaha, Nebraska. J. M. G.

Boiler Test Proposed.

MESSRS. EDITORS:—I would suggest through your valuable paper that at the coming exhibition of the American Institute this fall, a test of steam boilers should be made to ascertain what boiler will produce the most steam power with a given consumption of fuel.

The proper way to test them would be to have a tank full of water in which a propeller wheel of coarse pitch connected to a 40-horse power engine is arranged to work. The boiler that gets the greatest number of turns out of the wheel with least consumption of fuel should be pronounced the champion boiler.

If a test of this kind takes place, I, for one, will furnish a 40-horse power boiler of my patent.

HUGH LESLIE.

Jersey City, N. J.

[Our correspondent is perfectly safe in this challenge. The American Institute will not commit themselves, we understand, to any test of boilers this year; but if they would do so, they would scarcely permit so unscientific and unsatisfactory a method as our correspondent proposes. We have asserted and reasserted over and over again that the only reliable test of a boiler is its evaporative power compared with the fuel it consumes, and yet our readers will persist in complicating the problem by saddling some other condition upon it. As well might it be proposed to test a boiler by running an engine and a cotton mill with it as an engine and propeller wheel. Believe us, friends, an engine and boiler are two distinct animals. They don't belong even to the same genus, let alone species. To test the speed of a horse we do not tie an elephant to his tail and run the two together.—EDS.

AS FAR as man can go back in time, says Dumas, as far as man can reach by observation in space, the concrete elements of matter present the same character as Lavoisier's elements.

POOR TIME.---HOW TO DOCTOR DISABLED CLOCKS.

WRITTEN FOR THE SCIENTIFIC AMERICAN BY F. P. WARREN.

As the worm is to fruit, making it deformed and one-sided, so are poor timepieces to our lives, making them unsteady and irregular. We can plainly see that there is much loss of time in being too early, or too late for meals, for trains, and for engagements, or that the broken rest, taxing the mind with the rising hour, and standing in the cold waiting for the train, will affect the health; but we little realize the unconscious influence that living by a poor timepiece has in forming unsteady and irregular habits in a family. It is a secret enemy, and as such, should be conquered, and trained a trusty servant, or destroyed like the vermin of the house, or the weeds of the garden. And on every mantle, be it palace or mansion, cottage or hovel, should stand a clock that can be depended upon.

WHAT IS THE MATTER WITH THE OLD CLOCKS?

Resinous dust mixes with the oil on clock pivots and forms a wax, which, when thick enough, will stop the clock. As a grinding tool can be made with diamond dust embedded in brass, which will continue to cut till no brass remains to hold the dust; so sand and gritty dust is caught by oiled clock pivots and ground into the brass, where it remains embedded, even after the most thorough cleaning. The particles of grit, together with bits of steel, ground from the pivots, can be plainly seen with a good microscope. Grit grinds the pivots of clocks rough, and often grains of sand are embedded in flaws and rough places. Such pivots will soon cut out new bushing.

THE REMEDY.

Scrape the bearings and polish the pivots.

PIVOT POLISHING.

This may be done by means of a very simple lathe made of a piece of board, cut something like a boot-jack, the hole about two inches square, with a wood center or plug in one ear, holding one pivot, the other ear cut off even with the plug and notched to receive the pivot to be polished; a small bow, with a violin string, running on the pinion or arbor, turns the wheel, while a few strokes of the pivot file on the pivot, will polish like glass. It requires a little practice to get used to working the bow, and the pivot file, in opposite directions, at the same time, but, when familiar with the operation, pivots are easily and speedily polished. There should be two holes in the end of the plug, and two corresponding notches in the end of the short ear, to receive both large and small pivots. The plug should be held with a thumb screw so that it can be easily varied to suit the different lengthed arbors. A common wood screw, with the head altered, will answer.

This "board lathe" can be held upright in a vise, or otherwise conveniently fastened. The common "verge lathe," with wood centers, will work well with small wheels, but there is not swing enough for the large ones, which often need polishing the most.

TO MAKE A PIVOT FILE.

Grind a common flat file perfectly smooth, roughen with emery paper, and always use with oil.

TO BUSH.

Bend sheet brass into a tube with the hole the size of the pivot; ream the unworn side of the hole in the clock plate till the hole is round, then ream equally to the size of the tube, beveling the edges; swedge the tube in, and dress to the proper size.

The common way of bushing is to close the hole with a punch, but this, closing only near the edge, leaves a poor bearing. A better way is to cut a hole through the plate about one-eighth of an inch from the pivot hole, with a narrow chisel. The pivot hole will close as the chisel hole is enlarged, and can be reamed out to make a good bearing. The chisel should be about one-twelfth of an inch wide, gradually enlarging back from the edge.

CLEANING CLOCKS—HOW NOT TO CLEAN A CLOCK.

Forget to let the springs down; bend the escape wheel points awkwardly, working at the pin underneath; raise the upper plate a little, and the clock will come to pieces itself. Go around the room and pick up the wheels, not noticing the bent cogs and pivots, and lay them together, where the boys can play with them while you are cleaning. Wipe the plates with an old, greasy, sticky chamois skin or rag, clean the holes with a dirty string, and, if the boys' fingers are quite dirty (and what boys are not who are always handling things?) let them hold and hand you the wheels, when you find a place for them. If the clock does not go together good, loose your temper and make it; if the wires are in the way, bend them out, and when the clock is together, bend them again to make it strike right. After handling the verge and touching the escape wheel points with your sticky fingers, oil the whole clock profusely—get your pay—and then, if it don't run till "taken home," or till you get "around the corner," tell the owner it is worn out and advise him to buy a new one.

HOW TO CLEAN A CLOCK.

Touch watch oil to the pivots, and run the wheels to loosen the dirt; too deep and too shallow gear notice, and mark the holes that need bushing; tie the springs with strong cord, loosen the click spring, and let them down steadily by the key turning in the palm of the hand. If the two largest wheels of the trains are alike, mark the strike side, that there may be no mistake in putting together. Wipe thoroughly every part of the works with a clean rag. Clean the cogs with a pack of cards riveted together. If the clock is old, scrape them with a sharp knife; polish the pivots if at all rough or worn, and clean with a fresh rag pressed well against the shoulder with the thumb nail. The pivot holes, if the pivots are worn rough, should be lightly scraped with a sharp reamer, and cleaned with a pine stick till they no longer blacken it.

PUTTING UP CLOCKS.

Always work slow, and pin as you go, using shoemakers zinc nails.

Time train wheels are always plain; the wheels of the striking train have something attached to them, either plates, pins, or wires.

If you bear in mind that larger wheels gear into the pinions of smaller, you can hardly place them wrong; but the strike wheels must so gear, that the wire with a poker crook will drop into its notch at the same instant of the bell hammer stroke, and the crank of the fly wheel, when at rest, should be opposite to the wire which catches it before striking. The drop of the escape wheel on the verge being lost power, they should be as near together as possible, and allow the sure escape of the teeth; but, as the escape wheel is held from the verge by the power, it should be pressed toward it during a trial of one revolution, or the teeth will catch whenever the power is slack, as on cold nights.

Oil freely, with the best watch oil, the different bearing parts of the verge; other parts will run longer and wear less without.

Wooden clocks can be made as good as new by returning the pivots and bushing the bearings with brass. The balance pivots of marine levers, when worn, should be re-turned and re-tempered.

A clock cannot be well regulated with the pendulum loose at the point of suspension.

Chemical Discovery in the Past Year.

In the inaugural address of Professor Stokes, President of the British Association, made at the opening of the annual meeting, held this year, at Exeter, England, he made the following remarks on the progress of chemical discoveries: In chemistry I do not believe that any great step has been made within the last year; but perhaps there is no science in which an earnest worker is so sure of being rewarded by making some substantial acquisition to our knowledge, though it may not be of the nature of one of those grand discoveries which from time to time stamp their impress on different branches of science. I may be permitted to refer to one or two discoveries which are exceedingly curious, and some of which may prove of considerable practical importance.

The Turaco, or plantain-eater of the Cape of Good Hope, is celebrated for its beautiful plumage. A portion of the wings is of a fine red color. This red coloring matter has been investigated by Professor Church, who finds it to contain nearly six per cent of copper, which cannot be distinguished by the ordinary tests, nor removed from the coloring matter without destroying it. The coloring matter is, in fact, a natural organic compound, of which copper is one of the essential constituents. Traces of this metal had previously been found in animals, for example, in oysters, to the cost of those who partook of them. But in these cases the presence of the copper was merely accidental; thus oysters that lived near the mouths of streams which came down from copper mines, assimilated a portion of the copper salt, without apparently its doing them either good or harm. But in the Turaco, the existence of the red coloring matter which belongs to their normal plumage, is dependent upon copper, which, obtained in minute quantities with the food, is stored up in this strange manner in the system of the animal. Thus in the very same feather, partly red and partly black, copper was found in abundance in the red parts, but none or only the merest trace in the black.

This example warns us against taking too utilitarian a view of the plan of creation. Here we have a chemical substance elaborated which is perfectly unique in its nature, and contains a metal the salts of which are ordinarily regarded as poisonous to animals; and the sole purpose to which, so far as we know, it is subservient in the animal economy is one of pure decoration. Thus a pair of the birds which were kept in captivity lost their fine red color in the course of a few days, in consequence of washing in the water which was left them to drink, the red coloring matter, which is soluble in water, being thus washed out; but except as to the loss of their beauty it does not appear that the birds were the worse for it.

A large part of the calicoes which are produced in this country in such enormous quantities are sent out into the market in the printed form. Although other substances are employed, the place which madder occupies among dye stuffs with the calico printer, is compared by Mr. Schunck, to that which iron occupies among metals with the engineer. It appears from the public returns that upwards of 10,000 tuns of madder are imported annually into the United Kingdom. The colors which madder yields to mordanted cloth, are due to two substances, alizarine, and purpurine, derived from the root. of these alizarine is deemed the more important, as producing faster colors, and yielding finer violets. In studying the transformations of alizarine under the action of chemical reagents, MM. Graebe and Liebermann were led to connect it with anthracene, one of the coal tar series of bodies, and to devise a mode of forming it artificially. The discovery is still too recent to allow us to judge of the cost with which it can be obtained by artificial formation, which must decide the question of its commercial employment. But assuming it to be thus obtained at a sufficiently cheap rate, what a remarkable example does the discovery afford of the way in which the philosopher quietly working in his laboratory may obtain results which revolutionize the industry of nations! To the calico printer, indeed, it may make no very important difference whether he continues to use madder, or replaces it by the artificial substance; but what a sweeping change is made in the madder-growing interest! What hundreds of acres hitherto employed in the madder cultivation are set free for