Rust.

At a recent meeting of the Leeds Association of Engineers, Professor Smithells delivered a lecture on "Rust." He remarked that if they were to do anything on the subject of rust, they must begin by studying the conditions under which rust was formed, getting to know as much as possible about the phenomenon itself. The question was, Was it the chemist or engineer that was to tackle the problem? The answer in this case, as in so many others, was that the two must work together, they must combine theory and practice. His object would be mainly to take the chemist's attitude, and to explain to them the chemistry of rust, and to hint at one or two ways in which attempts had been made to obviate its formation.

Rust, of course, was more or less a general phenomenon. It was not restricted to iron, but was most noticeable in the case of iron because iron was the most abundantly used metal, because the rust of iron formed rapidly, because it assumed a scaly character, because of its color, and because of the fact that rust was a thing that appeared to grow in the case of iron, and it did not grow so rapidly, if at all, in the case of other metals. Most metals, of course, did rust. They knew they could not expose the bright surface of copper or zinc without the surface becoming dim. These metals might, therefore, be said to rust in their respective ways, but the rusting was very slight as compared with iron, which was the most susceptible to rust. Iron rust was found to consist of three elements—iron, oxygen, and hydrogen. That rust did contain water could be shown by the simplest experiments. That rusts were oxides they could easily prove, because they could produce rust by burning metals in oxygen alone. Hence there could be no other element present; but the way that might appeal to them would be by getting the metal back again from the rust, and the oxygen as well.

The lecturer demonstrated this by experiments with iron rust. The experiment he had done, he remarked, was a very suggestive one, because in getting the iron back from the rust in that particular operation he had done what had to be done so often in the process of soldering. They knew that before they could unite two pieces of metal by solder they must use a flux. The reason was that the two metals might be covered with a thin film of rust, and the solder would not adhere to these two unclean surfaces. What was the cause of iron rust? They all knew that rusting was favored by the presence of the air, and by the presence of moisture, but they wanted to know which of these two was the active agent, whether both were necessary, and whether anything else took part in the process. They wanted to know why rusting went on so rapidly and at different points, and how it was affected by the different composition and qualities of the metal, and by impurities in the metal, in the air, or in the water. Professor Smithells then showed some specimens of iron in jars, which he had been preparing for some time. One was a piece of iron in dry oxygen, and he explained that that would not cause the iron to rust.

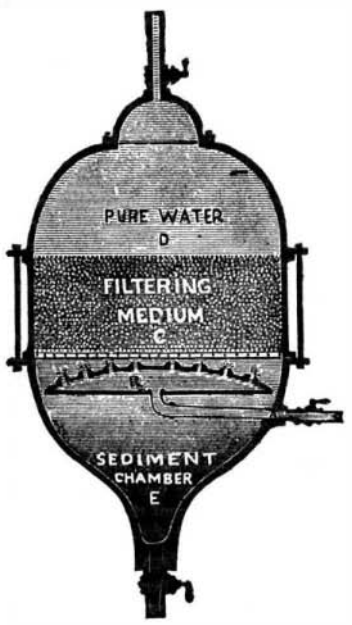
Next he showed a piece of iron which had been sealed up in water for some days, remarking that it was found that when they excluded air and other gases from the water no action took place, and a second conclusion was that water alone would not affect iron. The next question was—Would air and water together affect iron? That experiment had been tried, and it had been shown that, wherever action had taken place at all, the action had been exceedingly insignificant, and the question arose—What was it that was absent and that caused the rust? The one ingredient which was present in one of the jars, and was not present in the cases he had shown, was carbonic acid gas.

Carbonic acid gas existed in the atmosphere to a small extent, and it was this gas in the air that was all important in the operation of rusting. Pure air, pure water, pure carbonic acid, would not act singly upon iron; pure water and pure air would not act together upon iron; carbonic acid and air would not act upon iron, but when they had carbonic acid, water, and air together, they got rust. It was carbonic acid that really set up the rust action, and when it was formed, the carbonic acid was liberated and attacked the layers beneath. That was why rust had got the property of traveling inward. How could they prevent this action of rusting? There were many things which had been tried. They might paint the iron, and if they observed certain precautions, they might have an effective method.

One precaution was that the metal must be perfectly clean. A spot of rust embedded below a coat of paint would often break out of itself. Then there was the method of covering the iron with oils and tarry matters. There was also the process of galvanizing iron, the process of enameling, which was very useful for small articles, but the enamel was apt to chip off, and there was the Bower-Barff process, which was worked at Keighley, and which was an admirable process. Alluding to boilers, he said that by putting soda into them not only did they correct acidity of the water, but they introduced something which would absorb the carbonic acid gas, and prevent it acting in a rusting capacity.

THE DARRAGH WATER FILTER.

Of the many water filters that have from time to time claimed the attention of the public, this, according to the inventor, is the only one that perfectly clears the water of all animal, vegetable and earthy matter, without in the least retarding its flow, and thoroughly filters any quantity that can be passed through the inlet.



THE DARRAGH WATER FILTER.

It may be applied to the main where the water enters the premises, and thus all the water delivered will be filtered.

The water enters the filter through pipe, A, into spreader, B; from there, by a very slow movement, to and through the filtering medium, C, which is four hundred times as large as the supply pipe; thus passing the water, without retarding its force, to space, D, from which the filtered water is drawn.

The space, E (around and below the spreader), is the sediment chamber into which all impurities fall when separated from the water.

To cleanse this filter it is only necessary to partly close the valve on the supply pipe, open the lower outlet valve, and in a few seconds it will be cleaned and ready for use; and this should be done as often as once each month.

Filtered water should be used where it is possible to obtain it, for health depends upon it.

Probably impure water is productive of more sickness and death than any other single cause. In it are hidden the germs of disease not visible to the eye, and seldom detected by the taste. In cities and towns especially, where nearly all the water is collected in reservoirs, tanks, or vessels of some kind, and distributed through pipes, there are accumulations of sediment through months and years, constantly polluting the water passing over it, and taking up the poison lurking in the deposit, and transmitting it for drinking, bathing, and general use.

Those who are familiar with the tank process of storing water, for family and other use, will bear testimony as to the vile matter that accumulates in them; and to the fact that they are seldom cleaned.

Those who use steam boilers, or hot water tanks, know by experience the cost resulting from the use of water for heating purposes, or generating steam, which is supplied direct from the pipes. Many boilers have been destroyed by the accumulation of animal and vegetable matter contained in Croton water (which is claimed to be the best in use), notably the steam plant in the Park Avenue Hotel, New York, where the boilers have recently been replaced by new ones, being entirely destroyed by the flues and tubes being filled by sediment baked to a solid mass, and due to use of unfiltered water. The Darragh Water Filter Company, 1539 Broadway, will give further information.

THE total forest area in the United States is estimated at 481,764,599 acres.

Differential Diagnosis of Dental Pain.

In the *Journal* of the British Dental Association, Mr. H. Baldwin, M.R.C.S., gives the following useful table. For simplicity, the two kinds of pain may be called "nerve pain" and "pericemental pain."

NERVE PAIN.	PERICEMENTAL PAIN.
Arises suddenly.	Arises gradually.
Terminates suddenly.	Terminates gradually.
Is not continuous.	Is continuous.
Is chiefly non-localized.	Is distinctly localized.
*** Much neuralgia.	*** No neuralgia.
Tooth always sensitive to thermal changes.	Tooth not sensitive to thermal changes.
Percussion or pressure does not necessarily cause pain.	Percussion or pressure causes much pain.
Tooth not raised, not loosened.	Tooth raised and loosened.
Tissues around not inflamed, not tender on pressure over root.	Tissues around inflamed, tender on pressure over root; in chronic cases tissues thickened.

In using this table it must always be borne in mind that the two conditions of pulp inflammation and pericemental inflammation may co-exist either in the same tooth or in different teeth; and then the relative importance of the two inflammations will be determined by the relative severity of the two sets of symptoms, and sometimes by the history.

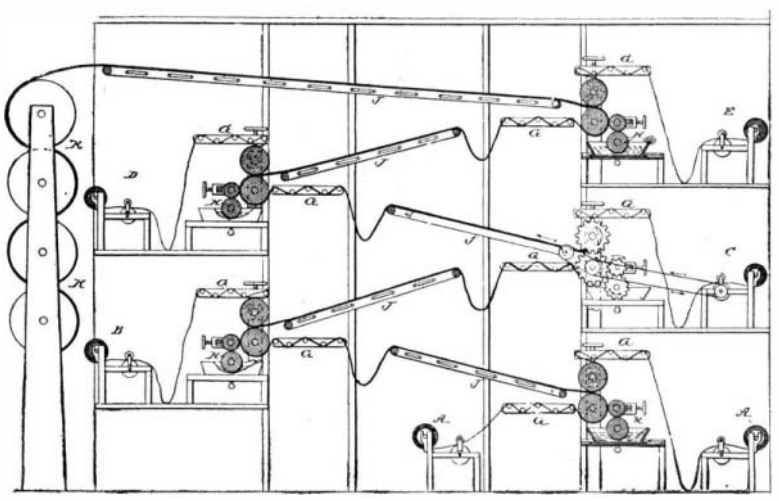
Good Suggestions for Dyspeptics.

A writer, evidently of a practical turn of mind, tells a contemporary how easily the wakeful dyspeptic can be made to slip off into the land of dreams. He says:

"The dyspeptic, of course, eats a light supper, may resort to the use of a towel, wet with tepid water, and covered with a dry cloth, the whole then applied to the pit of the stomach. Before the sufferer knows it she will float into shadow land, such is the sympathy between the organs of digestion and the brain. Owing to the position of the stomach, a light sleeper ought to sleep on the right side instead of the left, never on the back. If there is a tendency to cold feet, a thin woolen blanket may line the lower third of the bed. The limbs ought not to be greatly flexed, a position which prevents free circulation, and they should rest one upon another lightly. The night light, where used, ought to be a tiny taper, and not gas or kerosene, both of which devitalize the air. A darkened room is the best. Nature puts out her light, and draws the curtain of darkness for a purpose. With good habits, physical and mental, and a determination not to deal with anodynes, sleep may be won from its shyest lair to watch over the restless pillow."

A CARD-BOARD MAKING MACHINE.

An easily operated machine for making card or paper boards, by pasting together two or more layers of paper, is shown in the accompanying illustration, and has been patented by Mr. John McCoy, of No. 525 West Philadelphia Street, York, Pa. In the picture, A A represent the starting rolls of paper, and B, C, D, E, successive adding rolls, the number to be increased or decreased according to the thickness of board to be made. The tension device, G, pasting rolls, H, and driers, J, are alike for the several parts. The pasting rolls are each journaled in a paste trough, and apply the paste to the inner face of one of the layers of paper as the paper passes from the tension device and before it passes between the pressure rolls.



McCOY'S MACHINE FOR MAKING CARD-BOARD.

The drier, J, receives the paper immediately after it leaves the pressure rolls, and serves as a support and carrier for it toward the next tension device and pasting roll, where the next sheet of paper is added. The driers are in the form of endless canvas aprons supported on rollers, one of which is driven and the other turns loosely, while steam or other heating pipes are arranged between the inner surfaces of the aprons, whereby the heat may be evenly applied to all parts of the board or card, and the canvas be kept constantly dry. The opposite sides of the web forming the card-board are alternately exposed to the successive driers in its passage through the machine, the board, after passing the last pressure rolls, being conducted over a drier to a set of calendering rolls, K. It will be seen that with this machine, linen, cotton, or other cloth may be readily pasted in with the paper when so desired, or one or both of the last adding rolls may carry a tinted paper with which to form the finished surface of the card-board.

Negro Physicians.

The fifteenth anniversary of the Meharry Medical Department of Central Tennessee College was held February 19th. The Nashville *Journal of Medicine and Surgery* says that more than one-half of the educated colored physicians of the Southern States are graduates from Meharry College. With scarcely an exception, they have been cordially received by the white physicians, who have consulted with them in dangerous cases, and assisted in difficult surgical operations.