Steam Department.

WATER TUBES vs. FIRE TUBES.

By Geo. C. Robb

THE ordinary tubular boiler is of the fire tube class, so called because the fire or products of combustion pass through the tubes which are surrounded by the water to be heated.

When this arrangement is reversed, and the water is put inside the tube and the fire acts on the outside, the boiler belongs to the water tube class It is a matter of dispute which of these kinds makes the best boiler

Under certain circumstances, as to quality of water used, kind of fuel to be had, and pressure of steam to be carried, each is claimed to be better than the other. Change the fuel, or the water, or the pressure and quantity of steam required, and the boiler should be changed also, to get best results.

The ordinary horizontal tubular boiler needs but little description: it is well known. One of the most successful water tube boilers is the Babcock & Wilcox boiler.

It consists of a number of water tubes with a cylindrical shell above them, which is about half filled with water and forms a steam drum.

The water tubes are not level, but all slope the same way, the high end being to the front or above the furnace.

Suitable connection is made between the tubes and the shell above, and with a drum at the back end, so that circulation of the water may take place. If water tubes are placed level, there is danger of steam forming in the middle and by its expansive force driving the water out at both ends. With the tubes placed sloping, there is danger of steam forming in the low end and driving the water out at the high end. This caused the failure of many of the early forms of water tube boilers.

In the arrangement now adopted, there is good provision made both for the ascent of the steam and highly heated water, and for a return current to the drum connected at the low end of the tubes. In this way the water flows in at the low end as fast as it is forced out at the high end, and consequently the tubes are kept always full of water.

The boiler is similar in many respects to the Root boiler and several others. The furnace has brick sides, and the brick setting for the boiler is higher and more expensive than for an ordinary horizontal fire tube boiler.

The furnace and bridge walls and baffle plates are so arranged that the flame and products of combustion pass up across and between the tubes, and then down and in some cases up again before reaching the flue leading to the chimney. The heat is also allowed to play upon the under side of the upper shell. This arrangement of heating surface is very good, as the current of water inside the tubes moves in the opposite direction to the current of hot gases and flame on the outside.

There is a hand hole at each end of each tube so that facilities are provided for cleaning out.

The difficulties in the use of these boilers are chiefly caused by deposit forming in the inside of the tubes, and by soot, ashes, etc., gathering on the outside.

But the same amount of labour as has to be expended in cleaning an ordinary tubular boiler would keep one of this class in proper condition.

It is probably a more expensive boiler if first cost alone be taken into account; but the first cost of a boiler is a small item compared with a year's fuel; and the additional outlay of a few dollars per horse-power should not be allowed to out-weigh increased safety and greater economy.

A water tube boiler with a cylindrical shell above and another below, has many advantages from a manufacturer's point of view. Being made up in sections, it can be conveniently altered as to size, by increasing or diminishing the number of tubes. It is also more easily handled and shipped, and the several parts can be kept in stock and put together to suit orders received.

Other advantages are that a high pressure can be safely carried, and that liability to injury from over heating is not so great as in the ordinary tubular boiler.

From these considerations it would appear, that where much steam is required, and that of a high pressure, the water tube boiler described is preferable to the ordinary horizontal tubular boiler.

Regularity in cleaning is of very great importance in point of economy, whichever kind of boiler be used. Some have claimed that the high velocity of the water passing constantly through the tubes in water tube boilers will keep them free from deposit. This may be true so far as some kinds of deposit are concerned, but it is not true in every case.

A certain large boiler of this kind required about five cords of wood per day. It was regularly cleaned and kept in good order. A change of engineers took place. The new man was one who believed that the water tubes were self cleansing and did not need scraping out. In a few months the consumption of fuel rose to over twelve cords per day. Another change of engineers took place, and the water tubes were found to be nearly full of hard scale.

WATER IN STEAM PIPES

WE who live in a country where heating houses by steam is so common are more or less familiar with the noise and disturbance caused when water in the pipes interferes with the natural flow of the steam.

In small pipes, or rather pipes of small diameter, there may be much noise without any great danger, but when the pipes are of large diameter and the steam of high pressure, there is very great danger.

At a mill near Bradford in England, on the 25th October last, water had been allowed to accumulate in a large steam pipe connected with the boilers, through a drain cock having become choked. When the engineer in charge opened the shut off valve, the water was driven forward by the steam with such violence as to blow off the upper part of the valve, and scald the engineer so severely that he died in a few hours.

Such cases are not uncommon, and the only sure preventive for them is either to have the pipes so arranged that water cannot by any possibility accumulate, or to have means to draw the water off before admitting the steam pressure.

In September last, while the S. S. Elbe was being tested, the copper steam pipe from the boiler to the engine burst and caused the death of ten men. The pipe was about 9¾ inches in diameter, and the steam pressure was 150 lbs. per square inch.

A very full investigation has been made, and a number of theories, some of them very fanciful, have been advanced to explain the cause of the rupture.

One suggested that it was due to water brought over from the boilers, and that as the velocity of the steam through the pipe was suddenly stopped and again started each time the engine valve closed and opened, the water became separated into different parts and were again thrown violently at each other, and thus ruptured the pipe.

The unfortunate pipe has been cut to pieces and the various parts thoroughly tested, and the conclusion reached by those most competent to judge is, that the copper sheet of which the pipe was made had been by some means overheated during the brazing of the joint, and thus seriously injured the tenacity and ductility of the metal. One peculiarity of this case is that the identical pipe which gave way under 150 lbs. steam, had been twice tested by hydrostatic pressure, once to 300 lbs., and again to 350 lbs. per square inch.

It is possible that it then sustained an injury which hastened, if not directly caused the accident.

Other parts of the same range of pipe were burst by hydrostatic pressure during the inquiry, and were ruptured at pressures varying from 600 lbs. to 1,140 lbs. per square inch.

One lesson which might be drawn from this serious accident is that too much reliance should not be placed in the strength of a pipe or boiler merely because it did not burst under a certain hydrostatic test.

The testing by water pressure is a useful and valuable method, but it should always be accompanied with a careful examination of the behaviour of the pipe or boiler while under the strain.

PUBLICATIONS.

The first number of a new English journal, *The Confectioners' Union*, published at 171 Queen Victoria Street, London, E. C., has been received. It presents a creditable appearance, and gives promise of filling in a useful manner the field it is designed to occupy.

Our contemporary, the *Canada Lumberman*, has donned a new dress, and now presents a very handsome appearance.

The first number of the *Canadian Grocer*, printed in this city, is to hand, and is creditable in every way to the publishers. Mr. J. B. McLean, formerly one of the commercial editors of the *Mail*, is the editor. The *Grocer* starts out with a good advertising patronage, and we hope and expect to see it succeed.

It is stated that for a number of years the weather has not been so favorable for shanty work. Already a great quantity of logs are piled up.

USEFUL INFORMATION

The average weight allowed in calculating the strength of bridges is 1000 pounds per man.

Blasting paper is an Austrian invention. It is merely a kind of blotting paper, coated with an explosive mixture, cut into strips, rolled into cartridge form, and fired like gunpowder.

Brass may be colored black by repeatedly coating the cleansed metal with a moderately warm solution of nitrate of copper. Heating over a charcoal fire follows. Finally, the tone is heightened by rubbing with olive oil.

Manganese in appreciable quantity has been found by M. E. J. Maumene in thirty-four samples of wine. Tests also revealed its presence in various cereals. As it can be detected also in nearly every description of rock, the above facts go to prove the wide diffusion of this metal throughout nature.

A blackish-brown bronzing can be applied to vases, figures, busts, etc., or cast iron zinc, by the application of a solution of sulphate of copper. If the projecting portions are then well rubbed with a woolen rag, they assume a coppery red brilliancy, which increases the resemblance to genuine bronze. A solution of verdigris in vinegar also produces an effective bronzing.

A steel color on brass is developed by using a boiling solution of arsenic chloride, while a careful application of a concentrated solution of sodium sulphite causes a blue coloration. Black being generally used for optical instruments, is obtained from a solution of platinum chloride, to which tin nitrate has been added. In Japan the brass is bronzed by using a boiling solution of copper sulphate, alum and verdigris.

ARTIFICIAL PUMICE STONE.—An artificial pumice stone is now prepared by moulding and baking a mixture of white sand, feldspar and fire clay. By varying the proportions and quality of the ingredients, any desired degree of fineness may be obtained. The product is thus adapted for use in all industries where natural pumice stone has been employed, and it has superseded the latter in parts of Germany and Austria.

Paper may be stuck on wood by means of the following solution: Gum arabic, half an ounce; powdered gum tragacanth, half an ounce; water, one and a half ounces; acetic acid, twenty drops. It will cause labels to adhere very firmly without staining them, unless the paper is of unusually bad quality. A clear solution of gum arabic applied once or twice is all the varnish required in finishing for most purposes.

STAINING WOOD TO IMITATE CEDAR.—German technical papers recommend the following mixture for the staining of wood in imitation of cedar: Two hundred parts of catechu, 100 parts of caustic potash, and 10,000 parts of water, all by weight. The longer the wood remains in this solution the better the stain penetrates its fibers, and thick veneers can in this way be stained right through the whole thickness, which permits a finishing without injury to the color.

BISMUTH BRONZE.—Mr. Webster, an English metallurgist, manufactures a bismuth bronze, which is said to resist atmospheric influences, by fusing 1 part of bismuth with 25 parts of nickel, 25 parts of copper, and 50 of antimony. The resulting alloy is hard, and is said to be suitable for reflectors for lamps, axle bearings, etc. Another bismuth bronze is produced by fusing 1 part of bismuth with 16 parts of tin, then fusing 6.4 parts of the alloy thus formed with 45 parts of copper, 22.5 of zinc, and 32.5 of nickel. This alloy is claimed to be well adapted for the manufacture of screw propellers, tubes, and materials exposed to the action of sea water. On account of its tenacity, it is recommended for telegraph wires; and on account of its sonorous quality, it is said to be useful for piano forte wires.

For detecting cotton seed oil in olive oil, the following method is recommended as decisive by Prof. Bechi, of Florence: The reagent employed is a one per cent. solution of nitrate of silver in absolute alcohol. He directs the following procedure: Place 5 cubic centimeters of the suspected oil in a glass flask, add to it 25 c. c. of absolute alcohol and 5 c. c. of the best solution of nitrate of silver of the above named strength. Heat the flask, and contents in a water bath (direct heat must be avoided) to 84° C. (=183° F.) If any cotton seed oil is present, the mixture will begin to darken, the most minute quantity producing a discoloration, the intensity of which will depend upon the quantity of cotton-seed oil present. The rationale of the process appears to depend on the fact that cotton-seed oil will reduce nitrate of silver, while olive oil will not. Rape-seed oil, which is also used as an adulterant of olive oil, will likewise cause the same reduction, but pure olive oil will not be discolored. It is probable that this test may prove useful in detecting the adulteration of other oils besides olive with cotton-seed oil.

PURIFICATION OF OIL DRIPPINGS.—Drop oil is collected in many mills and factories to be cleaned and used again. A little apparatus has been constructed for this purpose, which, it is reasonable to suppose, is patented. It may be described as follows: The apparatus is a box-like concern of several "stories," the interior either lined with or consisting entirely of lead. Above it has a shoulder like a funnel, into which is poured the oil to be cleaned. The purified oil passes off through an escape pipe in the bottom. The different shelves or stories are perforated and covered to a height of about 2 inches with raw, loose cotton, through which the oil must percolate. The cotton serves as a filter and retains all kinds of contaminations. After the oil has in this manner passed through the several shelves, it is nice and clean and drops into a vessel underneath. The dirty cotton is occasionally replaced by clean. It is necessary to add that the apparatus must stand in a warm place. The cleaning of the oil with chemicals is both a tedious and a doubtful process, because even after thorough washing it may still retain traces of acids, rendering it unfit for lubricating purposes.