The Art of Dyeing.—No. 20.

Buff Color on Cotton—This is a binary color composed of the yellow and red rays, the former predominating; it is, therefore a yellow tinged with red; but the dark buff of commerce is not a binary, for it is composed of the three rays, yellow, red, and blue. There is great confusion of names in works on dyeing—fashionable names they might be called—such as "fancy bloom," &c., which have nothing to do with an understanding of the nature of colors.

Nitrate of Iron Buff—The buff of curtains employed for windows is a fast color, and stands exposure to the sun and air, and is capable of being washed with soap. It is generally dyed with a salt of iron, the nirtate being the one commonly employed. The goods being bleached and well washed, are first run through a tub containing a solution of the nitrate of iron, about 1°, and handled smartly for ten minutes. They are then taken out, aired, and run through a tub of clean lime water, after which if they are not dark enough, they get another dip in the iron liquor, another in the lime water, then run through a strong solution of soap suds, washed and dried.

The nitrate of iron is prepared by dissolving clean iron hoops in nitric acid. The acid should be fresh, and the iron fed in slowly. Some care is necessary to do this. The vessel in which it is killed, as the operation is called, should be of stone ware, and not filled above half full of acid, as it is liable to boil over. The iron should be added as long as the acid boils, and should be carefully watched, so as not to feed in any longer, or the contents of the vessel will become pasty, a conclusion which should always be guarded against. The nitric acid dissolves iron rapidly, and a thick orange smoke passes off, which is the binoxyd of nitrogen, very dangerous to inhale. By repeated dips, as described, any depth of shade may be given to cotton goods. This is the simplest method of dyeing buff excepting that produced by the sulphate of iron.

Copperas Buff—The sulphate of iron and lime makes a very good buff color, and very cheap. It is dyed in the same manner as nitrate of iron buff, excepting that the goods are generally run through the lime water at the commencement, and not the iron.—About one pound of copperas (sulphate of iron) will dye ten pounds of cotton a deep buff. It is best to give the goods a number of dips. A dark buff cannot be produced by giving the full strength of the iron at one dip. The color is an oxyd of iron. The goods are of a green color when they come out of the copperas liquor, but become yellowish as they absorb oxygen from the air. They have therefore to be aired well every dip. The lime and copperas impart a harshness to the goods, and they therefore require to be run through strong soap suds, to soften their fiber.

By adding about two ounces of sugar of lead to every pound of copperas, a color little inferior to that produced by the nitrate of iron is the result.

Annatto Buff—This color is produced on cotton at one dip, by running the goods through a weak solution of annatto, boiled in the carbonate of potash. This color will not stand exposure to the sun, neither does it wash well, and should never be dyed on cotton. A greater quantity of annatto makes a salmon color.

Madder Buff—This is a beautiful buff, and will stand exposure to the sun, as well as iron buff. The goods must be first boiled in lime water, then thoroughly bleached and washed before they can be dyed this color. They are prepared first in a weak mordant of alum for ten hours; then well washed and dyed in a bath of madder, brought up to a a scalding heat. A pound of madder will dye a light shade on 10 lbs. of cotton. The madder is scalded with boiling water, and the clear poured off into the dye kettle, and the goods entered. About half an hour's handling will be sufficient. The goods when brought up to the shade, are washed and dried.

Madder Salmon—By adding more madder a salmon color will be the result.

All the different shades of buff can be imparted to goods by the quantity of dye stuffs used; but for delicate shades the goods must invariably be bleached. The iron buffs should be dyed in cold liquors.

Buff curtains can easily be washed in a strong solution of soap suds, the soap must never be rubbed upon them, nor should they be boiled.

On Steam and Steam Boilers.

The following is a report from the Manchester *Guardian* of a recent lecture delivered before the Mechanics Institution of that city, by Mr. Fairbairn, C. E., F. R. S., a thoroughly scientific and practical man, whose fame is not confined to his own country. It relates to a most important subject, and demands the attention of all our engineers. We have seen abstracts of this lecture published in some of our foreign scientific cotemporaries, but it is too valuable to curtail. We will therefore give part of it this week, and finish it the next.

"At one time copper, earthenware, and other substances, were used for boiling vessels. It was discovered in 1686, by Dr Hook, that the temperature of boiling water remained fixed, and subsequently Dr. Pepin made the elastic force of confined steam more familiar. Combining this with condensation, Captain Savery applied the power to an engine for raising water; and his boiler (the first, properly speaking) was made of and riveted with copper, which, though a better conductor of heat than iron, was more expensive, rendering it probable that iron plates were used before the introduction of Newcomen's improvements. Cast iron plates were superseded by those of malleable iron; but copper continued to be used, particularly for the fire boxes of locomotives, for which it was preferable to iron. Almost from the first, Mr. Watt used wrought iron; and he discovered that the longitudinal or wagon-shaped boiler was preferable to that of the "hay cock" shape, used by Newcomen and Beighton. Hornblower Woolf, and others, adopted the cylindrical form, similar to those so long used in Cornwall and elsewhere, where steam of greater density and pressure was employed. A boiler was subjected to two strains—tension, which tended to tear or rip up the outer shell; and compression, which would cut or collapse the internal flues or tubes. These were to be resisted, and that with a maximun effect; and there was a great difference between the resistance to each strain of the metals whose strength per square inch compared as follows, the figures representing tuns:—

	Tension.	Compression.
Wrought-iron Plates	23	12
Copper Plates	16	3
Cast-iron Plates	3	51

Hence, it was important, in construction, to employ that metal which was the most eligible, when the nature of the strain was considered. Watt's discoveries rendered steam of high density unnecessary, when the required forces could be obtained without risk to the boiler; but now, increased power being required, it was obtained by increased pressure, with boilers of improved form and strength. Before the use of high steam, strength was not so important as form.—Watt's wagon-shaped boiler had reference to a large heating surface, and those parts liable to bulge outward were held together by iron stay rods. The advantages of high steam, worked expansively, were early dis cussed; and both high and low steam were used in the mining districts; but it was only within the last ten or twelve years that manufacturers in this country had appreciated high steam, owing to the increase of manufactures, and the unequal increase in the price of coal. It was used earlier on the continent and in America. In combatting the objections against it many years ago, he demonstrated its saving of fuel and increase of power. With it the double cylinder engine was preferable for regularity of motion, but it did not save more fuel. The irregularity of the single engine was of less importance than many imagined, and was easily remedied by increasing the weight of the fly wheel, and neutralizing the irregularities of the stroke of the piston by velocity. Two engines might be worked together at right angles without these irregularities, and with perfect safety, through the whole range of expansive action. Therefore, he recommended the single engine. It was less expensive, equally efficacious, and, perhaps, more economical than a machine of greater complexity. Considering the facts already stated, we must look forward to the use of a greatly increased, instead of a reduced, pressure of steam. So convinced was he of the advantages of high steam, worked expansively, that he urged preparation for greatly increased progress. It must be obvious that steam generated under pressure, compressed into one-fifth or one sixth the space it formerly occupied, and again applied to an engine of little more than one-tenth the bulk, must be a desideratum in the appliance of steam. The force applied to one of the largest of locomotive engines, traveling with a train at the rate of 45 miles an hour, exceeded 700 horse power; and there was no reason why factories should not be driven, and the largest ships propelled, by such engines, with greatly increased economy, by well-directed condensation. Soon, this would be more extensively accomplished than might now be considered possible or safe, and space would be lessened and power doubled with greatly increased economy and effect. He and another gentleman had been in communication with the Admiralty respecting the introduction of high-pressure steam upon the same principle as used on the railways; and he was satisfied that, if properly applied, it would effect an important saving in steam navigation. The cylindrical or spherical was the most eligible and the strongest form in which iron plates would resist internal pressure. The deduction for loss of strength on account of riveted joints, and the position of the plates, was about 30 per cent. for the double riveted joints, and 44 per cent. for the single ones; the strengths (calling the plates 100) being in the ratio of 100, 70, and 56. He found that 34,000 lbs. to the square inch was the ultimate strength of boilers having their joints crossed and soundly riveted. Flat surfaces, frequently essential, were not so objectionable with respect to strength as they appeared to be at first sight, but when properly stayed, were the strongest part of the construction. This was proved by the result of experiments made on the occasion of the bursting of a boiler at Longsight.—Two thin boxes, 22 inches square and 3 inches deep, were constructed. One corresponded in every respect to the sides of the fire-box of the exploded boiler, the stays being in squares, 5 inches asunder, and the side containing 16 squares of 25 in. area. The other contained 25 squares of 6 in. area, the stays being four inches asunder. One side of both boxes was a copper plate 1-2 inch thick, and the other side of both an iron plate 3-8 inch thick. To these the same valve, lever, and weight, were attached, and the pumps of an hydraulic press applied. That divided into squares of 25 inches area were swelled ·03 inch with the 8th experiment, at a pressure of 455 lbs. to the square inch. At the 19th experiment, with a pressure of 785 lbs. to the square inch, the sides swelled ·08 inch; and at a pressure of 815 lbs. the box burst by the drawing of the head of one of the stays through the copper, which, from its ductility, offered less resistance to pressure in that part where the stay was inserted.—The 10th experiment with the other box of 16 inch areas resulted in a swelling of ·04 inch, the pressure being 515 lbs. to the square inch. At 965 lbs. the swelling was ·08 inch, and from that point up to 1,265 lbs. the bulging was inappreciable. With the 47th experiment, at a pressure of 1,625 lbs., one of the stays was drawn through the iron plate, after sustaining the pressure upwards of 1 1-2 minutes, the swelling at 1,595 lbs. having been ·34 inch. The first series of experiments proved the superior strength of the flat surfaces of a locomotive fire box, as compared with the top or even the cylindrical part of the boiler. The latter evidenced an enormous resisting power, much greater than could be attained in any other part of the boiler, however good the construction; and they showed that the weakest part of the box was not in the copper but in the iron plates, which gave way by stripping or tearing asunder the threads or screws in part of the iron plate. According to the mathematical theory, the strength of the second plate would have been 1,273 lbs.; but it sustained 1,625 lb., showing an excess of one-fourth above that indicated by the law, and that strength decreased in a higher ratio than the increase of space between the stays. The experiments show a close analogy as respects the strengths of the stays when screwed into the plates, whether of copper or iron; and riveting added nearly 14 per cent. to the strength which the simple screw afforded. These experiments were conducted at a temperature not exceeding 50° Fah. His experiments on the effect of temperature on cast-iron did not indicate much loss of strength up to a temperature of 600°, and he concluded that the resisting stays and plates of locomotive boilers were not seriously affected by the increased temperature to which they were subjected in a regular course of working. The subject was entitled to further consideration. In boilers it was necessary to preserve a large margin strength as regarded the working pressure and the ultimate power of resistance. Six or seven times the working power was not too much to provide for contingencies.

[Concluded next week.]

Recent News from Europe.

The *Atlantic* arrived in this city on Friday last week, at noon, making a splendid run of less than ten days from Liverpool, which place she left on the 23rd April.

It brought news of the bombardment of Sevastopol by the Allies for nine days, without doing much apparent damage, as the place was still impracticable for an assault.

The Emperor of France had been in England for a week, with his wife, and had been feasted and feated in great style.

The Vienna Conference of European Diplomatists had broken up, without coming to terms. Russia refused to accede to the terms of France and England, to reduce her power in the Black Sea.

Sounding the Niagara River.

John A. Roebling, C. E., has been trying to sound the Niagara river below the Falls. A 40 lb. weight atttached to a No. 11 wire was dropped from a hight of 225 feet from the bridge, but was only out of sight for a second, when it was thrown up to the surface about 100 feet down the stream. The weight had a velocity of 124 feet per second when it struck the water. He believes that no metal has the specific gravity to pierce the current and descend to the bottom.

The Shipping of the World.

The London *News* of the 12th of April, has an elaborate article on the Shipping of the World, which shows that the floating tunnage of the civilized world, excluding only China and the East, consists of 146,000 vessels, of 15,500,000 tuns. The number of seamen it sets down at 800,000, and including the Eastern and other States, of the maritime population of which we have no accounts, there must be at the least a million of persons engaged at sea, and generally on the ocean.

California Coal.

At Los Angelos, California, some Cornish miners are engaged in digging for coal. At various stages of the descent, fissures have been encountered, through which pitch, oil, tar, and gas have issued from the mighty cauldron boiling below. The coal, however. is not yet reached.

Aluminum.

This metal is said to be obtained so easily from clay, by the improved process of M. Deville, of Paris, that it is about to be employed as a substitute for brass helmets in the French army.