The Art of Dyeing—No. 9.

THE PASTEL VAT—The following is taken from Dumas' lecture on dyeing, describing the pastel vat. Various substances are employed for dyeing blue in vats, but, after all, indigo is the main one.

"The first care of the dyer in preparing the vat should be to furnish the bath with matters capable of combining with the oxygen, whether directly or indirectly, and of giving hydrogen to the indigo. We must, however, be careful to employ those substances only which are incapable of imparting to the bath a color which might prove injurious to the indigo. These advantages are found in pastel, woad, and madder. This latter substance furnishes a violet tint when brought in contact with analkali, and by the addition of indigo it yields a still deeper shade.

The pastel vat, when prepared on a large scale, ordinarily contains from 18 to 22 lbs. of indigo; 11 lbs. of madder would suffice for this proportion, but we must also bear in mind the large quantity of water which we have to charge with oxydizable matters. I have invariably seen the best results from employing 22 lbs. to a vat of this size. Bran is apt to excite the lactic fermentation in the bath, and should therefore not be employed in too large a quantity; 7 to 9 lbs. will be found amply sufficient.

Weld is rich in oxydizable principles; it turns sour, and passes into the putrid fermentation with facility. Some dyers use it very freely; but ordinarily we employ in this bath an equal quantity of it to that of the bran. Sometimes weld is not added at all.

In most dye-houses the pastel is pounded before introducing it into the vat. Some practical men, however, maintain that this operation is injurious, and that it interferes with its durability. This is an opinion which deserves attention. The effect of the pastel, when reduced to a coarse powder, is more uniform; but this state of division must render its alterations more rapid. When the bath has undergone the necessary ebullition, the pastel should be introduced into the vat, the liquor decanted, and, at the same time, 7 or 8 lbs. of lime added, so as to form an alkaline lye which shall hold the indigo in solution. Some thick coverings are to be spread over the vat, soas to preserve it from contact with the atmosphere. After this lapse of time, it is to be again stirred. The bath at this moment presents no decided character; it has the peculiar odor of the vegetables which it holds in digestion; its color is of a yellowish-brown.

Ordinarily, at the end of twenty-four hours, sometimes even after fifteen or sixteen, the fermentative process is well marked.

The odor becomes ammoniacal, at the same time that it retains the peculiar smell of the pastel. The bath, hitherto of a brown color, now assumes a decided yellowish-red tint. A blue froth, which results from the newly liberated indigo of the pastel, floats on the liquor as a thick scum, being composed of small blue bubbles, which are closely agglomerated together. A brilliant pellicle covers the bath, and beneath some blue or almost black veins, owing to the indigo of the pastel which rises towards the surface. If the liquor be now agitated with a switch, the small quantity of indigo which is evolved floats to the top of the bath. On exposing a few drops of this mixture to the air, the golden yellow color quickly di appears, and is replaced by the blue tint of the indigo. This phenomenon is due to the absorption of the oxygen of the air by the indigogen from the pastel; in this state we might even dye wool with it without any further addition of indigo; but the colors which it furnishes are devoid of brilliancy and vivacity of tone, at the same time the bath becomes quickly exhausted.

The signs above described, announce, in a most indubitable manner, that fermentation is established, and that the vat has now the power of furnishing to the indigo the hydrogen which is required to render it soluble—that contained in the pastel having been already taken up; this, then, is the proper moment for adding the indigo, which should be previously ground in a mill.

The ordinary guide of the dyer is the odor, which, acoording to circumstances, becomes more or less ammoniacal. The vat is said to be either soft or harsh; if soft, a little more lime should be added to it. The fresh vat is always soft; it exhales a feeble ammoniacal odor, accompanied with the peculiar smell of the pastel; we must, therefore, add lime to it along with the indigo; we usually employ from five to six pounds, and, after having stirred the vat, it is to be covered over. The indigo, being incapable of solution except by its combination with hydrogen, gives no sign of being dissolved until it has remained a certain time in the bath.—The hard indigoes, as those of Java, require at least eight or nine hours, whilst those of Bengal do not need more than six hours, for their solution. The vat should be examined three hours after adding the indigo; the odor is by this time weakened; we must now add a further quantity of lime, sometimes less, but generally about equal in amount to the first portion; it is then to be covered over again, and set aside for three hours.

After this lapse of time, the bath will be found covered with an abundant froth and a very marked copper-colored pellicle; the veins which float upon its surface are larger and more marked than they were previously; the liquor becomes of a deep yellowish-red color. On dipping the rake into the bath, and allowing the liquid to run off at the edge, its color, if viewed against the light, is of a strongly-marked emerald green, which gradually disappears, in proportion as the indigo absorbs oxygen, and leaves in its place a mere drop rendered opaque by the blue color of the indigo. The odor of the vat at this instant is strongly ammoniacal; we find in it, also, the peculiar scent of the pastel. When we discover a marked character of this kind in the newly formed vat, we may without fear plunge in the stuff intended to be dyed; but the tints given during the first working of the vat are never so brilliant as those subsequently formed; this is owing to the yellow coloring matters of the pastel, which, aided by the heat, become fixed on the wool at the same time as the indigo, and thus give to it a greenish tint.—This accident is common both with the pastel and the woad vats; it is, however, less marked in the latter.

When the stuff or cloth has been immersed for an hour in the vat it should be withdrawn; it would, in fact, be useless to leave it there for a longer time, inasmuch as it could absorb no more of the coloring principle. It is, therefore, to be taken from the bath and hung up to dry, when the indigo, by attracting oxygen, will become insoluble and acquire a blue color. Then we may replunge the stuff in the vat, and the shade will immediately assume a deeper tint, owing to renewed absorption of indigo by the wool. By repeating these operations, we succeed in giving very deep shades. We must not, however, imagine that the cloth seizes only on that portion of indigo contained in the liquor required to soak it. Far from such being the case, experience shows that, during its stay in the bath, it appropriates to itself, within certain limits, a gradually increasing quantity of indigo. We have here, then, an action of affinity, or, perhaps, a consequence of porosity on the part of the wool itself."

A New Method of Extracting Bullets.

The frightful list of wounded soldiers at the battle of Inkerman, and the difficulty of extracting bullets, has suggested to Izra Miles, of Stoke Hammond, England, the application of the same principle in extracting bullets that has been applied in sinking hollow piles, as illustrated on page 1, Vol. 8, SCIENTIFIC AMERICAN. The contrivance is very simple, consisting of a small air-pump and cylinder, to which a tap is affixed. To this tap is attached a suitable length of flexible tubing, about a quarter of an inch in diameter, lined inside with silver wire to prevent its collapsing. At the other end of this tube there is a small globe, from which a tube sufficiently minute to pass into a bullet wound is fixed, the end terminating with an india-rubber collar. On the top of the globe there is a small tap in order to admit a probe to pass down the tube to sound when on the bullet. The mode of operation is this:—A vacuum is created in the cylinder, the tube before alluded to is passed into the wound, and when it is ascertained to be on the ball, the tap in the cylinder is opened, when the bullet becomes fixed to the tube by the vacuum thus created, and is withdrawn. The great merit of this invention consists in its obviating the necessity for the painful and dangerous operation of cutting out bullets, and by its means a medical man, with the aid of an assistant to work the air-pump, would be able to accomplish the work which now occupies many surgeons. When the cylinder is once exhausted, it would extract several bullets without the necessity of again working the air-pump. The Medical Board of the Army has given directions to an eminent instrument-maker to fit up the apparatus.

Ballanced Steam Valve.

In our list of claims on another page is the name of John Tremper, of Philadelphia, who has obtained a patent for an improved ballanced valve. The nature of the invention consists in a ring valve without an opening through its sides, which is employed in a casing in connection with a suitable arrangement of passages and a fixed cup having a passage or passages leading from one side to the other of it. The steam being admitted through the center of the ring valve, presses equally on all sides, and ballances it perfectly. When the ring valve is down it rests upon the cup named, and closes the passages for steam around the sides, and when it is lifted up, the steam passes through the ring valve, past the sides of the cup and into the cylinder. A guard ring is also employed above the valve ring, in order to keep the valve steady during the rush and intermission of the steam by the successive strokes of the engine. The ring valve is raised and lowered—to open and close the passages around the fixed cup, by means of a toggle joint, one arm of which is connected with the valve, and the other with a spindle passing transversely through the casing, and connected to the machinery that controls the valve. The toggle joint is so arranged that it is fully extended when the valve is closed, so that it limits its movement, and lets the valve drop steam tight into its seat. It also opens and closes the valve by such a nice motion as to prevent jamming, giving a slower motion at the closing, and a quicker one the further it is from its seat. This is a most beautiful and simple valve. Mr. Tremper—to our knowledge—has devoted his attention, for the past nine years, to improvements in steam engines, and has obtained a number of patents during that period. His very unique and ingenious governor for steam engines was illustrated on page 244 Vol. 8, SCIENTIFIC AMERICAN.

New Life Boat.

The improved life-boat, for which a patent has been granted to H. Berdan, whose claim will be found on another page, is of a very novel construction of frame to support and sustain in its proper shape a covering of india rubber or water-proof cloth. The frame to which the cloth is secured consists of a keel, stem, stern post, ribs, and gunwale bars. The ribs are jointed to the keel and gunwale bars, and the gunwale bars are hinged to the upper part of the stem and stern post. This frame, therefore, can be folded up—collapsed as it were—when the boat is not required and extended rapidly when required, and can be packed into a very small space. It can also be transported so easily as to form an excellent army boat for crossing rivers, as well as a convenient life-boat, a great number of which might be easily carried on every ship.

Plow Standards.

The improvement in plows, for which Geo. Esterly, of Heart Prairie, Wis., has just obtained a patent, and whose claim is in this week's list of claims, consists in the peculiar construction of the standard which is so constructed that mold boards of different sizes may be secured to it, likewise shares of different thicknesses, to adapt it for plowing different soils. The improvement is therefore designed to make one plow more universal in its application to different kinds of work.

Felting Hats.

The improvement in machinery for felting hat bodies, for which a patent has just been issued to Wm. Fuzzard, of Newark, N. J., consists in the employment of a pair of corrugated rollers, placed in a swinging frame, combined with an endless apron working over a driving drum between the corrugated rollers. Corrugated rollers have been used before in hat felting machines, but not arranged in the same manner. The advantage claimed for the improvement, is a nice graduation of the pressure of the rollers upon the hat bodies, which is very important at first, when the hat bodies are put in the machine, as they are then very tender, and liable to be ruptured. In this new machine, a very light pressure, like that of hand pressing, is first given to the hat bodies, until they are partly felted, and have acquired more strength, when the pressure is increased by further depressing the swinging frame.

Notice to Engineers and Pilots.

Circumstances render it necessary, owing to various reports injurious to the character and good standing of engineers and pilots licensed at this Board, that before renewal of licenses can be obtained, they (the applicants) will be required to furnish testimonials; and be qualified, too, should it be found necessary, from the officers of the several steamboats on which the applicants were engaged during the last twelve months, setting forth their entire sobriety and steady habits, as well as strict attention to their relative duties. Testimonials from those of the same profession, unless he or they be in command of the steamboat at the time of the employment of the applicant, cannot be received. (Signed) JAS. H. M'CORD,
H. SINGLETON.

St. Louis, Mo., Jan. 4th, 1855.

[The above rule, established by the Inspectors for the St. Louis District under the new Steamboat Law, is an excellent one, and should be adopted by the Inspectors in all the other districts.

Power of Locomotives in Overcoming Steep Grades.

In completing the railways between Turin and Genoa, some important experiments have been made as to the ascent that could be accomplished by peculiarly constructed locomotives. The following result is given by a correspondent of the London *Times*:

"The experiments already made on the incline near Gleni, where there is an ascent of 1 in 28 1-2, have been most satisfactory.—With two locomotives attached together, drawing a train of six carriages loaded with sand, which weighed altogether about 56 tuns, and each locomotive weighing about 22 tuns, including the coal and water, a speed of 19 English miles an hour was easily accomplished, although, from the length of the tunnel and the dampness of the atmosphere, the rails were excessively greasy and slippery, The engines used were built by Messrs. Stephenson, after plans sent by the Piedmontese engineers, and as this is at present the steepest ascent on any railroad in Europe, the result reflects in the highest praise on all concerned, particularly considering the signal failure of the former engine, "la Bavaria," for which the Austrian government paid so highly for crossing the Simmering, and which can hardly force its own weight of 60 tuns up an incline of 1 in 40."

We do not know whether the Piedmontese engineers were Italians or French; if the former, they deserve double praise, because they have not had any experience whatever in the construction of locomotives.

Anthracite Coal or Steamships.

Anthracite coal is now being used by some of the British steamships The *Great Britain* used it with success on her last trip to Australia.