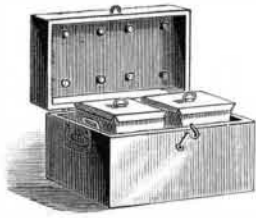


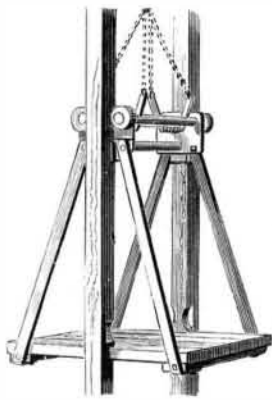
RECENT INVENTIONS. Improved Butter Case.

The engraving shows a butter case provided on two of its opposite sides with vertical sockets for the reception of handles adapted to slide up and down in the sockets. The transportation case is made with one or more partitions separating the interior into cells in which to place the butter tubs or cases. The latter are made of metal, glass, porcelain, stone, or other material that the butter will not destroy. The cover of the outer case is hinged to it, and provided with rubber cushions on the inside to press down on the covers of the butter cases when it is closed and fastened, so as to confine the butter cases and prevent them from shaking about in transit. The butter case covers close over the tops of the cases, and the cases are provided with sliding handles at the sides for lifting them. The butter cases are surrounded by air spaces between them and the walls of the outer case, which protect the butter from the heat while in transit and while the outer case is exposed to the sun. This invention has recently been patented by Messrs. F. Leete and W. C. Wilbur, of Mapleton, Ia.



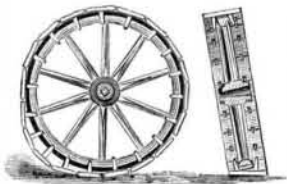
Improved Elevator.

The annexed engraving represents an improvement in elevators recently patented by Mr. William Goddard, of Chester, Ill. The principal feature of the improvement is the arrangement of serrated cams that are arranged to grip the uprights in case of the breakage of the lifting chains or ropes. These cams are fixed to the opposite ends of two shafts extending over the top of the elevator car and on opposite sides of the uprights. The shafts are provided with levers for receiving the lifting chains or ropes, and the levers are placed relative to the cams, so that when the car is being supported by the ropes or chains the cams are held out of contact with the uprights, but when the ropes give out a spring connecting two arms of the shafts brings the cams into engagement with the uprights and arrests the car. This is very simple in its construction, easily applied, and certain in its operation.



Traction Wheel.

The engraving shows a novel endless track wheel rim for application to wagon and traction engine wheels, when being used on soft ground or roads, the object being to prevent the wheels from sinking in the ground. The improvement consists of a series of planks linked together, forming an endless track of greater length than the length of the rim of the wheel, to enable the planks to drop flat on the ground before the wheel passes on to them. The planks have prongs which straddle the rim of the wheel, to keep them on the rim, and at the same time to allow the requisite movement of the planks relatively to the rim for enabling them to so drop on the ground in advance of the rim, and also to allow the planks to lie flat on sloping ground. The inventor connects one of the joints of the endless track by removable or detachable devices of any approved kind, enabling the track to be disconnected for ready application to and removal from the rim of the wheel, as may be required for putting on the track when the ground is soft and taking it off when the ground is dry and hard. This device has been patented by Mr. Oliver F. Gilbert, of New Haven, Mich.



The Relation between Fluorescence and Chemical Constitution of Organic Bodies.

Why do some substances exhibit fluorescence and others not? This is a problem that must remain for a long time unsolved, and we cannot, at present, expect to answer that question any more than we can tell why sodium sulphate is soluble in water while barium sulphate is not.

In order to approach a little nearer to an understanding of the subject, we must decide to proceed in such a way as to find out what may be called the *statistical* reason, as distinguished from the true and actual cause. This can be accomplished by grouping together known facts and cases so as to see what peculiarities of constitution are common to substances having the same physical peculiarities. This method has been pursued in the numerous experiments made to determine the cause of colors in dyes, and it can also be applied

to the study of fluorescent bodies, of which there are already quite a large number to experiment upon.

Liebermann collected the fluorescent derivatives of anthracene, and thereby arrived at a very remarkable result. Anthracene has the formula $C_6H_4(CH_2)_2C_6H_4$, or two groups of C_6H_4 are connected by a pair of carbon atoms, to each of which is attached one of hydrogen; hence these hydrogen atoms (which we have placed in the parenthesis) have an entirely different position from the others. Liebermann found that all anthracene derivatives which contained these hydrogen atoms unchanged, or had them replaced by monad groups, possessed fluorescence. If, however, the CH groups are changed to CO groups, as in anthraquinone, which has the formula $C_6H_4(CO)_2C_6H_4$, and its derivatives, the fluorescence is wanting.

The most beautiful and intense exhibition of fluorescence is shown in a substance discovered by Baeyer, and called *Fluoresceine*. It is made from resorcin, $C_6H_4(OH)_2$, and phthalic acid, $C_6H_4(COOH)_2$, by fusing them together. The new compound may be looked upon as resorcin, in which one of the hydrogen atoms of the C_6H_4 group has been replaced by the residue of the phthalic acid. For brevity we may represent this residue by *Phth*, and write the formula of fluoresceine thus: $C_6H_3(Phth)(OH)_2$. It is a brick red powder, and when dissolved in alkalis forms a red liquid which has such an intensely green fluorescence that, viewed by reflected light, one thinks that he sees a glittering green precipitate in the liquid, which was clear by reflected light and of a red color. This peculiarity enables us to utilize the phthalic acid as a delicate reagent for the detection of resorcin. If the slightest trace of the latter is melted with phthalic acid, and the fusion dissolved in alkali, the liquid will exhibit this magnificent fluorescence in the most intense degree.

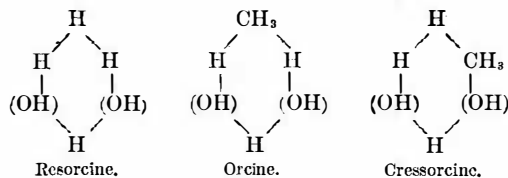
Orcine is a homologue of resorcin. In constitution it is a resorcin with the hydrogen atom replaced by the methyl group, CH_3 , a methylated resorcin having a formula $C_6H_5, CH_3(OH)_2$. This substance is very similar to resorcin in all its properties and reactions, except in its action toward phthalic acid. It does, indeed, unite with the latter, but the resulting compound has no fluorescence at all. In a free state it is colorless, and its alkaline solution is red both in transmitted and in reflected light.

To ascertain why it was that a substance so similar to resorcin should act so differently in that one respect, Knecht adopted an ingenious method of experimentation. He prepared a substance homologous with resorcin, but having the same chemical composition as orcin, a new isomeric body. This substance, which he called *crossorcin*, has the formula $C_6H_5, CH_3(OH)_2$. It was made from cresol, or methyl phenol, the constitution of which is well known.

Crossorcin, this new isomere of orcin, was found to yield a fluorescent body when melted with phthalic acid, although the new substance had the same chemical composition as the colorless one obtained from orcin and phthalic acid.

The fluoresceine prepared from crossorcin is so similar to that obtained from resorcin that Knecht sought for a long time before he could discover any method of distinguishing the one from the other. Both are brick red powders, soluble in alkali with an astonishing green fluorescence, but by the action of acetic anhydride, acetyl ethers of unlike melting points are produced.

The theory proposed to account for this is that in orcin the CH_3 group occupies the position usually designated as No. 1, and that when this is left free the phthalic acid attaches itself there to form fluoresceine, but that is not possible when this is occupied, as it is in orcin, by a methyl group. The following diagrams exhibit the relative position of the groups on Kekule's benzol ring:



Manufacture of Blue Coloring Matters.

R. Meldola's process, according to the *Journal of the Society of Chemical Industry*, is divided into two parts. In the first operation ten parts by weight of the amidonaphthalene sulphonic acid, prepared either by the action of sulphuric acid upon betanaphthylamine, or by reducing the nitro-sulphonic acids obtained by the action of nitric acid upon the betanaphthalene-sulphonic acid, as discovered by Cleve, are suspended in cold water acidulated with muriatic acid, and a solution of nitrite of soda is gradually added in such quantity as shall contain 3.69 parts by weight of pure nitrite. The solutions after being mixed are kept well cooled, and are allowed to stand for some hours, so as to form the diazo-sulphonic acid, or mixture of isomeric acids as mentioned. When the diazotizing operation is complete, which is the case in about two hours, there is added a solution containing 5.4 parts by weight of dimethylaniline, or 6.7 parts by weight of diethylaniline, dissolved in the necessary quantity of muriatic acid, and after standing for some hours the diazo color begins to separate, and is completely thrown out by the addition of ammonia to the mixed solutions.

In the second operation the ammoniacal solution containing the ammonium salt of the diazo color in suspension is mixed with a solution of yellow sulphide of ammonium, and the mixture kept at a temperature of 80° to 90° Centigrade

till the diazo color is completely reduced, as is ascertained by the mixture becoming colorless. The reduction is much hastened by the addition of a small quantity of zinc dust. The solution is now rapidly cooled, and made acid by means of muriatic acid, and the sulphur and amidonaphthalene sulphonic acid thus precipitated is removed by filtration. The solution is then oxidized by ferric chloride, or other suitable oxidizing substances, till the smell of sulphureted hydrogen is destroyed, when the coloring matter at once forms and is precipitated by the addition of chloride of zinc and common salt in the usual way.

The amidonaphthalene-sulphonic acid is freed from sulphur by dissolving it in a weak solution of an alkali, filtering, and precipitating by muriatic acid, and the acid thus recovered can be again used for the manufacture of the blue dye-stuff. The coloring matter precipitated in the manner above described is collected on filters, in order to remove a red coloring matter which remains in the solution, and is purified by dissolving in hot water, filtering, and again precipitating by zinc chloride and common salt. When collected it can be dried, and is then ready for use, or it can be employed in the form of a paste. It is stated to dye silk and wool (from a neutral or ammoniacal bath) of a fine blue shade, and it can be used also for cotton, with or without a mordant, according to the shades required.

Hardening Taps and Dies.

A writer in the *Chicago Journal of Commerce* gives his experience in tempering as follows:

The great difficulty in hardening tools is principally their liability to twist or get out of true; second, cracking (especially if large) after hardening; thirdly, getting the right temper. In our factory we use a great number of small taps and rimers; some of the rimers are 9 inches long and a quarter of an inch in diameter; these we harden very successfully, not more than one out of a dozen being out of true. Our plan is as follows: First, carefully select your steel; let it be of the best cast, with a medium grain (a fine grained steel will break when much less force is applied than a coarser grained, and, although it will take a keener edge, it will not resist the strain required by a tap or rimer). Next center it, and turn off the scale and soften. The object of softening after the scale is removed, is to make the grain of the steel equal throughout; if it be softened with the scale on, it will generally cast. To soften, inclose the articles in a piece of gas tube, filling up with wrought iron turnings and plugging the ends with clay, making the whole red hot and allowing it to cool very slowly—*i. e.*, leaving it in hot ashes all night. This method makes the steel very soft, and equalizes the grain. After softening turn up the work, taking care not to bend it or straighten it, should it have cast, as it probably will in the process of softening. The reason for this is that, if the steel be bent or hammered, the grain will be closer in one place than another, and heat has a great tendency to bring it back to its original position. The next thing after finishing your tool is to harden it; first, slightly heat it over a gas or other flame, and rub it all over with a mixture of Castile soap and lampblack. This is to prevent the edges from being burnt. The next is to get a thick iron paper (the size we use is 2 inches diameter and three-fourths bore). This is well filled up with taps or rimers and charcoal dust, the ends being closed with clay as before. This is placed in the furnace and occasionally turned, until it is one uniform heat of cherry red, or on the outside a trifle hotter. It is then carefully removed from the fire, one end of the clay knocked off, and the contents allowed to drop perpendicularly into a solution of water, chloride of sodium, and nitrate of iron; this is kept at a temperature of 60 degrees. The articles hardened should remain at least a quarter of an hour before being removed. This method of hardening may be summed up thus: Make the steel of one grain throughout, prevent it from oxidizing while being heated, allow every part to heat at the same time, avoid bending while hot, and lastly restore, if possible, by adding to the loss of carbon caused by heating. As I have taken up already too much of your valuable space, I will defer the method of tempering to some future time.

Dried Leaves as Food for Lepidopterous Larvæ.

Lepidopterists engaged in raising larvæ will be interested in a note by Mr. A. H. Mundt, of Fairbury, Ill., published in *Papilio* for January, 1883, giving his experience in feeding caterpillars with dried food. He gathers the leaves in summer, pressing them quite dry like botanical specimens, and before using them as food he soaks them one night in fresh water. This experiment was successfully tried with the larvæ of *Papilio cresphontes* and *Apatura clyton*. Mr. Mundt adds that the dried leaves must be kept in the dark in order to preserve the green color and the flavor. This experience with preserved food may prove equally useful for other species, and promises to be of great advantage in raising larvæ on food to be obtained from distant sections. We have never tried this method of curing leaves, though we have successfully used pressed fresh leaves, mailed and kept in tight tin boxes. In this way we have fed larvæ for weeks, in Washington, on food obtained in Florida. If "hay making" should prove as successful as Mr. Mundt's experience would indicate, we would recommend, as a possible improvement in the curing and retention of the nutritive properties, the chopping of the leaves, which will permit of more rapid curing and more convenient packing.—O. V. R., in *American Naturalist*.