THE ARTIFICIAL COLORING OF PLANTS.

A simple and well known chemical experiment, showing the action of sulphurous acid on vegetable coloring matter, consists in placing in that gas violets, which become almost instantly bleached. Sulphurous acid, by its deoxidizing properties, destroys the color of a large number of other flowers, such as roses, periwinkles, etc., and its effects may easily be noted by the little apparatus shown in Fig. 1. This consists of a capsule in which sulphur is ignited to generate the acid, covered by a conical metal chimney, at the orifice of which the flowers to be bleached are placed.

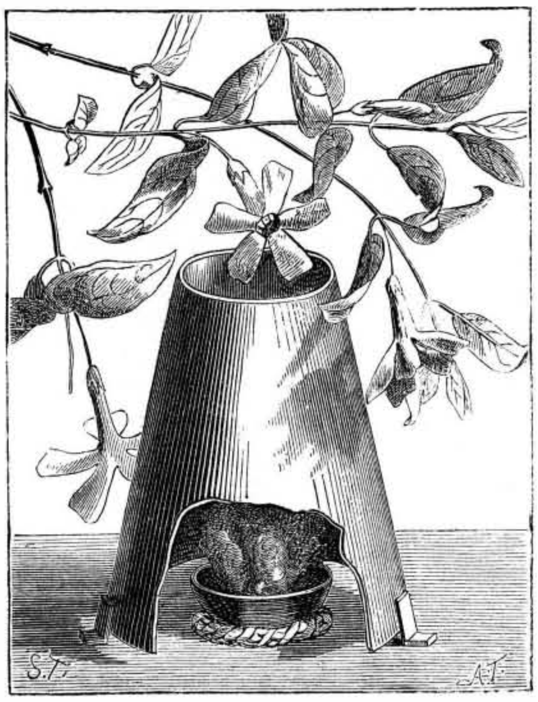


Fig. 1.—Discoloration of flower petals by sulphurous acid.

Quite recently M. Filhol has exhibited, before the members of the French Scientific Association, new results, obtained through the action of a mixture of sulphuric ether and a few drops of ammonia upon flowers, from which it seems that a large number of the latter, normally of a violet or pink color, become, when immersed in the mixture, an intense green. The editor of *La Nature*, from which journal we extract the engravings herewith given, has continued the investigations of M. Filhol, and deduces an interesting series of experiments, the description of which we present below.

Into a wine glass, Fig. 2, pour a quantity of ordinary ether, and add about one tenth its volume of liquid ammonia. Into this the flowers are to be plunged. The purple and pink tinted

Fig. 2.—Turning blossoms green by ammoniacal ether.

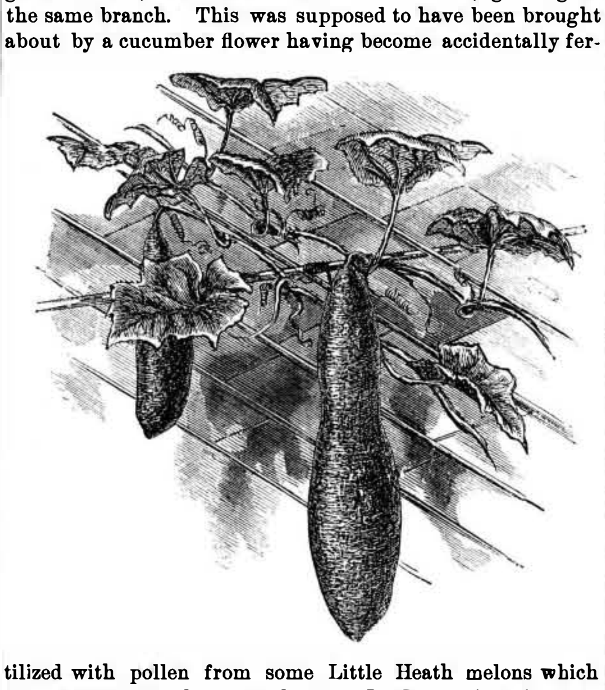
flowers, which become bright green, appearing as if dyed by a copper salt, are the red geranium, the violet periwinkle, lilacs, roses (red and pink), gillyflowers, thyme blossoms, blue bells, heliotropes, and myosotis Other flowers of different shaded colors acquire different tints. The upper petal of the violet sweet pea becomes a dark blue, while the lower petal turns to a light green. Sweet William changes to brown and light green. White flowers usually become yellow, this being the case with the white poppy, the snapdragon, which turns yellow and dark violet, the white rose, which changes to a straw tint, the white columbine, the chamomile, the syringa, the white daisy, and the white rocket, the honeysuckle, the bean, the white potato blossoms, the meadowsweet, and the white foxglove. In the pink sweet pea, the upper petal becomes blue, and the lower one a soft green. The pink geranium turns blue in a remarkable manner. The red snapdragon becomes of a fine metallic brown, the valerian of a grayish color, and the red wild poppy of a fine violet. Yellow flowers in the ammoniacal ether remain unaltered. Red turns green in a very curious way when put in the mixture. The action of the chemical is so rapid that the merest sprinkling of it on the leaf is sufficient to cover the latter instantly with green spots. In the same way flowers may be spotted with white, even while they are growing.

The most interesting changes of color are those which take place in flowers which are variegated. Thus particolored fuchsias become yellow, green, and blue. All flowers which have taken a new hue may be kept from changing back again for several hours by plunging them in pure water. Eventually, however, they regain their natural colors.

Another curious fact to be noted in the present connection is that the flowers of asters, which are naturally inodorous, acquire an agreeable perfume under the influence of the ammonia. The same flowers, when violet, become red when wet with nitric acid diluted with water.

MELON CUCUMBERS.

Considerable interest has recently been manifested in the fruiting of a cross effected between *cucumis melo* and the Telegraph cucumber, a well known variety of *c. sativus*. This presumed cross or hybrid was lately seen at Kew, London, fruiting in a house, and the following are our notes on them, made at the time, together with the accompanying reduced representation of the plant: Stems slender, scabrous; leaves and flowers like those of the cucumber in size, as well as in other respects; fruit from 6 to 10 inches in length, and from 2 to 3 inches in diameter, of a dull brown russet color, or profusely dotted with whitish lines; but we observed no spines. In fact the growth and flower resemble those of a cucumber, and the fruit that of a melon. The female parent is the *concombre de Sikkim*, of Naudin, described in the *Annales des Sciences Naturelles* as a variety of *c. sativus*, so that, if the pollen from the Telegraph cucumber has taken effect (which now seems doubtful), the cross is simply one between two extreme forms of the common cucumber, and not a cross between the cucumber and melon, as the Kew label would lead one to believe. Cucumbers and melons are extremely variable in size, color, habit, and flavor; we have seen, indeed, a figure of a cucumber of the ordinary form and a globular fruit, half cucumber and half melon, growing on the same branch. This was supposed to have been brought about by a cucumber flower having become accidentally fer-



tilized with pollen from some Little Heath melons which were growing in the same house. In Darwin's "Animals and Plants under Domestication," we read that there is a race of melons of which the fruit is so like that of the cucumber, both externally and internally, that it is scarcely possible to distinguish the one from the other except by the leaves.

Major Trevor Clarke, by whom the seeds of the supposed hybrid under notice were sent to Kew, says: "This curious plant was sent to me from India as a cucumber. The remarkable scabrous coating of the ripe fruit attracted my attention, and induced me to send it to Kew, where it was at first thought to be a melon. It is now, however, thought to be a true cucumber. From the appearance of the figure the Kew plant hardly looks as if the cross with the Telegraph cucumber had taken effect. I have now growing here two plants from the (supposed) crossed and uncrossed seed. They have set fruit, but were late plants, and are not yet in a condition to be described. Many years ago I raised a cross between a melon and the Snake cucumber (*cucumis flexuosis*); but the latter, I believe, ranks among the melons. A cross, real or supposed, between a cucumber and a melon, was shown at South Kensington, some years ago. A neighbor of mine has a plant from the big pumpkin crossed by a cucumber. It was fertile, and is now growing for the second generation."

Analysis of the Human Breath.

An account published in *Nature* of some experiments, made with a view to determine the organic matter of the human breath in health and disease, presents some facts of a peculiarly interesting nature. The breath of eleven healthy persons and of seventeen affected by disorders was examined, the persons being of different sexes and ages, and the time of day at which the breath was condensed varying. The vapor of the breath was condensed in a large glass flask surrounded by ice and salt, at a temperature of several degrees below zero, the fluid thus collected being then analyzed for free ammonia, urea, and kindred substances, also for organic ammonia. Among the various results of this examination may be mentioned the fact that, in both health and disease, the free ammonia varied considerably; the variation, however, could not be connected with the time of day, the fasting, or the full condition. Urea was sought for in fifteen instances—three healthy persons and twelve cases of disease—but it was only found in two cases of kidney disease and in one case of diphtheria; and a faint indication of its presence occurred in a female suffering from catarrh. The quantity of ammonia arising from the destruction of organic matter also varied, possibly from the oxidation of albuminous particles by the process of respiration; but in healthy persons there was a remarkably uniformity in the total quantity of ammonia obtained by the process.

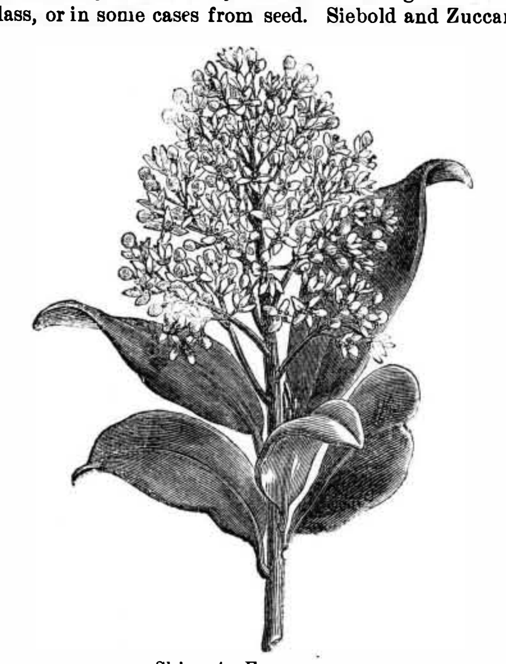
THE SKIMMIAS.

Skimmia japonica was for a long time the only variety known to Europe and America. Now, however, we have five recognized species, namely *skimmia japonica, ablata, Veitchii, laureola,* and *fragrans,* of the first and last of which

Skimmia Japonica.

we furnish illustrations. *S. japonica* is valuable on account of its brilliant red fruit, about the size of a pea, which, growing in profusion, remains on the bush all the year round, thus giving it a very ornamental appearance, especially in winter, and perhaps not less so in the following spring when, through this strange tenacity of adhesion, it is not unusual for the plant to be seen, as in our illustration, laden with both fruit and flowers at the same time.

Skimmia fragrans, which bears a sweet smelling white flower tinged with yellow, possesses this peculiarity—that though its buds appear before winter sets in, the flowers do not open till the following April. With the exception of *laureola,* which is indigenous to Nepaul, India, all the varieties of skimmia come from Japan; they are well worthy of extended cultivation, being very hardy and adapting themselves readily, when young, to almost any soil or climate. They may easily increased by means of cuttings struck under glass, or in some cases from seed. Siebold and Zuccarini



Skimmia Fragrans.

state, says *La Revue Horticole,* that the Japanese and Chinese class *s. japonica* among poisonous fruits.

L. W. Pond.

The mystery attending the disappearance of Mr. L. W. Pond has been to all appearances cleared up in a manner which few could have suspected. When we penned the few lines which we intended as a brief tribute to a character regarding which no blame had ever reached us, we believed that we did but scanty justice to their unfortunate subject. It is excessively sad for us now to learn that we, in common with his other friends, have been grievously mistaken in our estimate, and that in lieu of the model of integrity we find the forger and defaulter. A careful examination of the missing man's papers has brought to light forged evidences of indebtedness, reaching as high as $100,000. The plan adopted was to take an old note, already paid and bearing on its back several indorsements, erase the figures and date with a chemical preparation, fill in new date, etc., and obtain cash for it. The microscope, which showed the effects of the chemical on the paper, and a solution of nut galls which restored the erased ink to its original blackness, were the means of detection. The loss falls on those who have cashed the notes.

The Chinese Oil Tree.

Elæococca vernicia, the oil tree of China and Cochin China, is a plant of the family of the *euphorbiaceæ*. Its seeds, when submitted to strong pressure in the cold, yield about 35 per cent of a liquid oil, colorless, inodorous, and almost insipid. Its specific gravity at 59°Fah. is 0·9362. At —32° it thickens, without losing its transparency or crystallizing. By treatment with ether, 41 per cent of oil can be extracted from the seed, slightly colored, but presenting otherwise all the character of the oil obtained by pressure. If, instead of ether, purified bisulphide of carbon is employed, the fatty matter remaining after the solvent has been evaporated off at 212° solidifies on cooling, forming a number of small reniform masses, which present under the lens a decided crystalline texture. This solidified fat has the same elementary composition as the liquid oil obtained by pressure, and melts at 93°. The oil extracted by pressure in the cold is rapidly solidified by light in the absence of air, an effect which, on further experiment, was found due to the more refrangible rays of the spectrum alone. The oil of *elæococca* is the most drying of all oils. If spread on a plate of glass or metal, it dries in a few hours, on exposure to the air.—*M. S. Cloëz.*

ENGINEERING STRUCTURES.

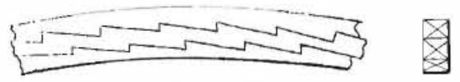
Under the above heading we classify the following descriptions of caissons and arched edifices, extracted from the pages of Knight's "New Mechanical Dictionary."*

The modern or pneumatic caisson, sunk through quicksands or submerged earth or rock, is the invention of M. Triger, who contrived, by the aid of air pumps, to keep the water expelled from the sheet iron cylinders, which he sunk through quicksands in reaching the coal measures in the vicinity of the river Loire, in France.

ARCHED ROOFS.

The largest roof of one span in its day was that of the Imperial Riding House, at Moscow, built in 1790. The span is 235 feet. The members of the arched beam are notched together, as shown in Fig. 1, so as to prevent their slipping upon each other. The ends of the arched beam are held

Fig. 1.

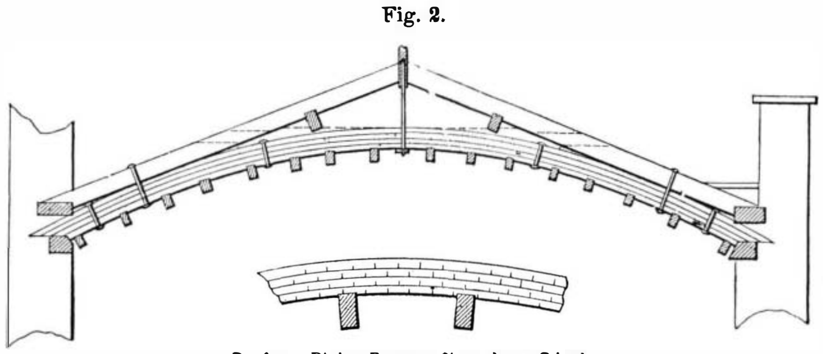


Notched Arch-Beam

from spreading by a tie beam, and the arch and tie are connected together by vertical suspension rods and diagonal braces. Emy's arched beam roof, which is represented in Fig. 3, is constructed on a different principle. The ribs in this roof are formed of planks bent round on templates to the proper curve, and kept from separating by iron straps, and also by the radiating struts, which are in pairs, notched out so as to clip the rib between them. The principals, wall posts, and arched ribs form two triangles, firmly braced together, and exert no thrust on the walls; the weight of the roof, being thrown on the walls at the feet of the ribs and not at the pole plate, permits the upper portion of the walls to be comparatively light. This principle has been extensively adopted in wooden bridges in the United States and Europe.

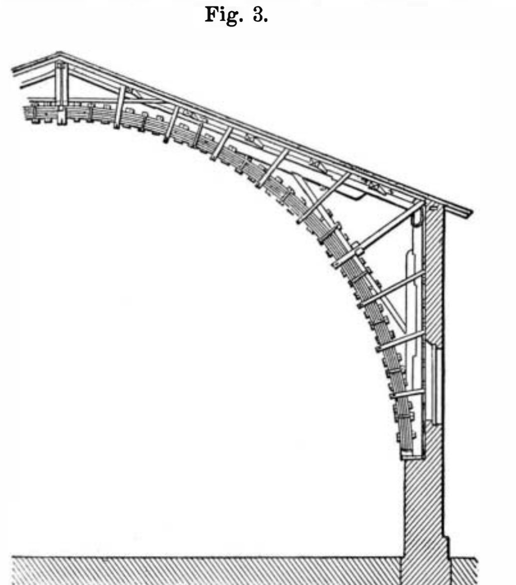
Another form of arched beam is exemplified in the roof of the dining room of the Charter House School, London, England, shown in Fig. 2. The roof is formed with circular ribs in four thicknesses of inch and a half deal, four inches wide, with saw cuts half an inch in depth on the under sides, and put together with marine glue on a cradle center. The dotted lines show the collars, which are dovetailed one inch into the sides of the principal rafters. The latter, being five

Fig. 2.



Roof over Dining-Room at Charterhouse School.

Fig. 3.



Emy's Arched-Beam Roof.

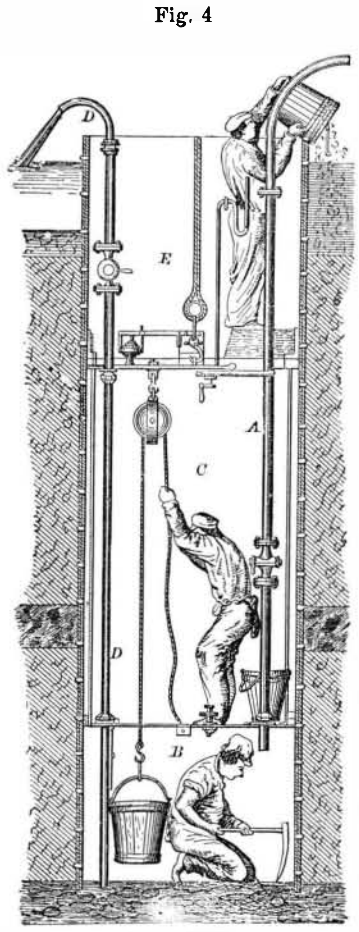
inches wide, project on one side, an inch before the face of the circular ribs, which are only four inches wide. On the collars rest the purlins supporting the rafters. The ceiling joists are spiked up to the circular ribs.

Fig. 4 illustrates

TRIGER'S CAISSON,

and shows the comparatively simple form which the apparatus assumed when sinking a shaft. Air is forced in through the pipe, A, to the working chamber, B, which has a manhole in the floor above. C is the middle chamber, which has also a manhole in its ceiling. D is a pipe by which sand and water are ejected from the chamber, B, under the pressure of the compressed air in the latter. The said air pressure being such as to exclude the water, the workman descends through the manhole in the floor of the chamber, E, and closes the door behind him. Admitting air in the chamber, B, until the pressure is equal in the two, he opens the door in the floor of the chamber, C, and descends to his work. The buckets are similarly managed, the middle chamber, C, acting as the means of communication, being filled with air at normal pressure, or with compressed air, according as it is in communication with the open air of chamber, E, or the compressed air of chamber, B. The device, which thus acts as an intermediate, is termed an air lock, and is the notable point of invention in the apparatus.

Fig. 4



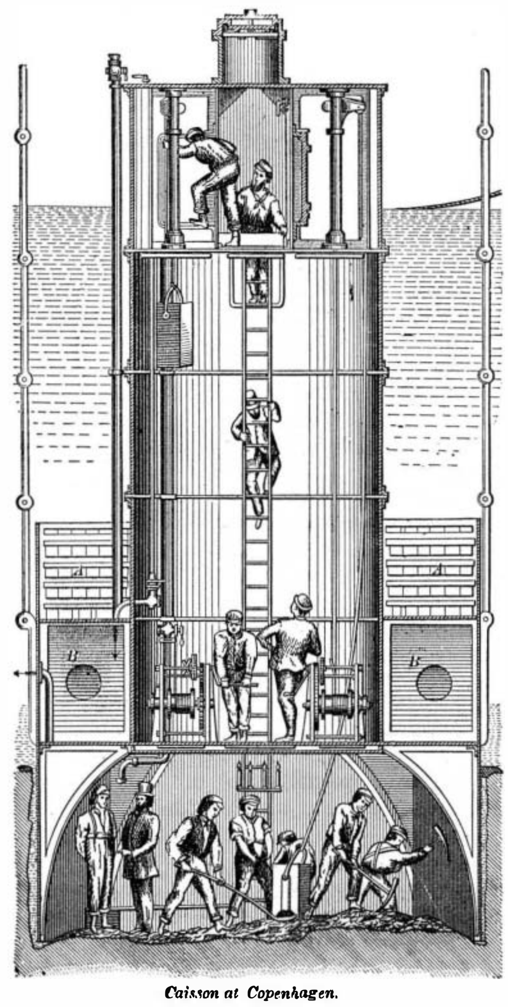
Triger Caisson.

In Fig. 5 is given a section of a

MOVABLE IRON CAISSON

used in building the piers of a bridge at Copenhagen, Denmark. It comprises an upper chamber communicating with the air, an intermediate or air chamber, both equal and cylindrical in section, and a lower working chamber, of larger section than the foregoing and adapted to the shape of the pier: the whole raised or lowered by suspension chains, and

Fig. 5.



Caisson at Copenhagen.

ballasted with iron and water contained in two annular chambers, A and B, surrounding the lower part of the air lock. In working, the apparatus was lowered to the bottom, and an excavation made until a stratum capable of forming a solid foundation was reached; upon this a layer of concrete was laid, and then the structure completed with brickwork and faced with granite. The caisson was gradually raised as this progressed; and when it was finished up to the water line, the caisson, with its suspending stage and tackling, was removed to the site designed for another pier, where a similar operation was performed. Caissons of this kind, having an open bottom and provided with air locks, act upon the principle of the diving bell, the pressure of air in the working chamber and air locks being equal to that of the depth of water in which they are submerged. This renders the use of the air lock necessary. The piers of the bridge across the Mississippi river, at St. Louis, Mo., were constructed by means of an analogous device.

* Published in numbers by J. B. Ford & Co., New York city.

Iron and Steel Rails.

The *Bulletin* of the American Iron and Steel Association reports the following as the rail production of the United States for 1874, in net tuns:

New iron and Bessemer steel rails over 40 lbs.......	349,978
New iron rails over 40 lbs..........................	32,480
Rerolled iron rails of all sizes.....................	323,035
Steel and steel-headed rails other than Bessemer....	17,181
Steel rails..	6,739
Total..	729,413

Of this, 259,288 tuns were made in Pennsylvania, including 55,488 tuns unrolled; 125,103 in Illinois, including 51,234 unrolled; 82,561 in Ohio, and the residue distributed among 16 States.

The whole number of rail-rolling mills in the United States, in 1874, was 91, of which 57 make heavy rails mainly, and 34 make only light or street rails. Of the whole 91 mills, 22 made no rails in 1874. The product of the year was therefore rolled by 69 mills, and many of these ran only a part of the time. The capacity of all the rail-rolling mills of the country is at least double the product of 1874, which was 729,413 net tuns. Of the 67 mills which made rails in 1874, 7 made both iron and Bessemer steel rails, 1 made Bessemer steel rails exclusively, 2 made steel-headed rails exclusively, 2 made steel-headed rails and iron rails, and 1 made solid cast steel rails and iron rails.

It will be observed that almost one half of the total rail product of 1874 was composed of old rails re-rolled.

Bleaching Cotton Yarn in the Hanks.

No 1. Bleaching liquor stock tub.—Pound together 20 lbs chloride of lime and 40 gallons water in a tub; allow to settle five hours, when it is ready for use.

No. 2. To bleach white 60 lbs. of cotton yarn.—Boil six bundles yarn with 6 lbs. soda ash for six hours, not less. Stir them and wash in one cold water, and wring. Add to warm water 10 gallons of stock liquor; work yarn half an hour, ten turns; wash from this into a cold water for safety, but this is not absolutely necessary. Sour in a cold water with two quarts vitriol. Wash in a cold water from sour; also in a hot water containing 2 lbs. of soap (white preferred). If necessary to be blued, it should be done in soap water, with a little China blue. Wash in cold water from soap, and dry in stove.

No. 3. To bleach 60 lbs. for dyeing.—Boil as above, only dispense with the soda ash, and take a little less time in working, but it is very necessary to wash well off before dyeing.

No. 4. To set a stock tub of red liquor for dyeing aniline and other colors.—Add to each gallon water 1 gill of red liquor. This tub should be kept for further use, and takes about one quart to each 10 lbs. to keep it up to working order.

No. 5. To dye 60 lbs. light lilac.—Bleach as for dyeing, then steep a quarter of an hour in red liquor stock tub, or give five turns. Wash twice in cold water, and wring out; dissolve 1 oz. logwood extract; add this to a milk-warm water; give ten turns, lift, and add 2 ozs. dissolved alum; give three turns more; wash in cold water; dry in stove.

Finer and brighter colors can be got with aniline and many other shades of color by increasing the logwood, etc.

No. 6. To dye 60 lbs. silver drab.—Bleach as for dyeing, then dissolve 2 ozs. logwood extract; add this to warm water; give ten turns with yarns; lift and add 1 gill of black iron liquor; four turns more. Wash in cold water; dry in stove. This color will look uneven in the logwood liquor, but will come up right when black iron is added.

The Education of the Mechanical Engineer.

We continue our extracts from Professor R. H. Thurston's address, recently delivered to his graduating class at the Stevens Institute:

"Never lose an opportunity. Men rarely succeed in life who are neglectful of opportunities, and, in nearly all cases, those who are successful can count upon their fingers the several occasions which formed the turning points at which, seizing an opportunity that other men might have overlooked or neglected, they chose the path which led to their final success. Many men possess ability, intellectual and physical but yet the number who may achieve high positions is small It is the taking advantage of these rare opportunities, which, unobserved by the careless or the obtuse, are seized upon at the right moment and in the right manner by the watchful and the acute, that usually secures most rapid advancement.