THE PROSPECTS AND PRESENT STATE OF PHOTOGRAPHY IN NATURAL COLORS.

IN TWO CHAPTERS.

II.

Of the various processes for producing pictures by photo-mechanical means only one has up to the present time been submitted to the ordeal of commercial application—that of Leon Vidal. Having departed entirely from the first methods proposed by himself when Secretary of the Photographic Society of Marseilles, he now, as director of a photo-chromic company in Paris, effects a happy combination of two previously well known processes, and examples of the results are at present in the office of the SCIENTIFIC AMERICAN, and challenge admiration on account of their technical merit.

Premising that it is now easy to prepare a printing surface similar to that on a lithographic stone, but which possesses a discriminative power of absorbing moisture and assimilating printer's ink in strict proportion to the intensity of the lights and shadows of nature, it follows that half tone may be produced by mechanical agency. Photochromy by Vidal's system consists in an application of this process combined with the essential principles of chromo-lithography. It differs from the latter, inasmuch as not only does it yield the most perfect gradation of tint or tone, but the drawing is effected by photography instead of by the skilled artist.

The principle underlying this method will be best understood by our giving a brief description of the method by which we saw produced a rose tree clad with foliage and adorned with numerous bright red blossoms. From the original negative were obtained three others, in one of which the trunk, branches, and leaves were entirely stopped out, leaving nothing but the flowers. From a second were stopped out all but the leaves, while in the third the trunk and large branches alone were allowed to remain. By methods well known to lithographic printers three printing forms were then prepared, one from each negative. These were made by coating a thick plate of glass with gelatine containing bichromate of potash, which, when dry and exposed to the action of light under a negative, acquires the property of absorbing and rejecting water in certain parts, and thus interpreting the action of the light when an ink roller is applied. The cliche from the leaves was inked with a semi-transparent green ink, and the prints from this showed faultless gradation of tint together with structural detail. When the whole of the greens had been printed, the form containing the flowers, inked with red, was then placed in the press and by means of careful registration the blossoms assumed their proper places among the leaves. A third printing, this time from the tablet containing the brown trunk and larger branches, completed the operation. The picture, the mode of producing which is now described, when shown to several artists evoked much surprise as to the method by which it could possibly have been made, but at that time Vidal's modern method was unknown and the experiment described was only a tentative one.

It will here be recognized that by the system of overlapping, secondary, tertiary, and indeed numerous colors and tints may be produced. The process applies to everything that can be reproduced by photography, including portraits and landscapes as well as rose trees.

But, query, cannot nature herself be made to do the stopping out part when preparing the several negatives for printing each its separate color? This problem was taken in hand recently by M. Ducos Duhauron, who based his experiments on the theory that the primary colors combine to form every known tint. It is enough to interpose between nature and the sensitive plate a transparent colored medium to insure the medium stopping from reaching the sensitive surface rays which cannot be transmitted by it. But the method of M. Duhauron dips deeper beneath the surface than would be imagined by a superficial observer. He employs three colored glass plates or other transparent media the *complementaries* of the primary colors, each of which will transmit two of its constituents and debar access to the remaining unit—three primary colors being assumed for the sake of explanation to be theoretically correct. If for the production of each monochrome a screen were employed of the same color the negative would represent that color by black, and the two remaining ones by transparent glass, there being in the print none of the color in the part where it was desired it should exist, while it would be elsewhere present.

The screens found most useful for effecting the stoppage of certain rays of light are formed by first collodionizing a plate of glass, and then coating it with a lac or sandarac varnish containing one or other of the aniline dyes modified by other transparent pigments. The colors required in the finished masks or screens are green, orange, and violet, and the mask thus tinted is placed either immediately in front of the sensitive plate in the camera or in near juxtaposition to the lens. From three negatives obtained from nature, each under a mask of a different color, are printed by the carbon, or, more properly, the pigment-printing process, proofs, which, executed in pure colors, are then superimposed on each other and detached from the paper on which it was borne. The resulting picture shows every tint of nature. To prepare the three pigmented papers which are thus made to yield up their colors, Prussian blue represents the blues, carmine the reds, the yellow being produced by chrome yellow. Each of these is mixed with gelatine when applied to its special sheet of paper. The method of printing is essentially that employed in the carbon process, bichromate of potash forming the sensitizing compound. After printing, each integral portion of the picture is superposed and set off upon the other, the result being a photograph in the colors of nature.

It is important, of course, that the three negatives be taken not only simultaneously, but from the same standpoint, a condition of things which one at first sight would say cannot be attained. But here the ingenuity of M. Duhauron again steps in to indicate in what manner this seemingly impossible feat is accomplished. Three cameras, each fitted with its respectively colored glass mask, are ranged alongside each other, all in a row, facing a dark mass of velvet or other black material, and side on to the view or object to be photographed. Erected in front of the lens of the outside one is a faultless plate of glass placed at an angle of forty-five degrees. This acts the part of a reflector, throwing enough rays into its camera by which to enable a brilliant picture to be taken. But as the reflecting mirror is a transparent sheet of glass, a large volume of the light is transmitted through it as well as reflected by it; and the second camera, also fitted with a similar transparent reflecting plate of glass, catches up a portion of the rays thus transmitted, and reflects them through its own lens to its interior. What is not reflected by the second plate is received upon a third one attached to the third camera of the series. It, however, is a mirror proper, the glass being silvered, and the remainder of the rays not utilized by the other two cameras are here rendered subservient to the production of the picture. We may here observe that there is more ingenuity displayed in this, as well as more modifications and applications that may arise out of it, than is imagined by its ingenious originator.

Effective colored pictures have been produced by superposing transparent prints, such as those by Woodburytype, upon colored bases; this, however, belongs to the department of the mechanical application of pigments.

NEW INVENTIONS.

A simple and inexpensive combined hame and collar has been patented by Mr. James B. Law, of Darlington Court-House, S. C. It consists in a broad wooden hame strengthened by iron plates at the bottom, and provided with suitable means for protecting the horse's neck from injury.

Mr. Henry Dainty, of Brooklyn, N. Y., has patented an apparatus for burling wool and carbonizing cotton from mixed rags, so constructed that vegetable impurities and fibers can be removed or carbonized from the animal fibers in much less time and without any danger to the operator from the carbonizing gas when emptying and refilling the apparatus. The invention consists of a carbonizing chamber having slides, drawers placed upon the slides to receive the material, doors hinged at their lower edges, a furnace, a gas-generating retort having gas-discharge pipe leading into the carbonizing chamber, and a detached cover for removing the refuse without drawing the fire, a smoke flue surrounding the gas-discharge pipe, a steam jacket for heating and drying the gas, and an exhaust fan blower having its pipe provided with a valve for withdrawing the gas from the carbonizing chamber when opened, to protect the workmen.

An improved washing machine has been patented by Messrs. Henry Ruppert and John Mullerweiss, Sen., of Sebewaing, Mich. This invention consists in a novel arrangement, with a tub, of two curved oscillating and reciprocating rubbing surfaces, and devices for operating them.

An improved machine for boarding and breaking raw hides has been patented by Mr. William Coupe, of South Attleborough, Mass. This is an improvement on the machine for boarding and breaking raw hides for which Patent No. 202,414 was issued to the same inventor April 16, 1878.

Mr. Henry Cull, of Johnstown, Pa., has patented an improvement in stock cars designed to permit the ready feeding and watering of the animals while being transported over long railroad routes. The invention consists in the improved method of arranging the cattle in the car and holding them in their places.

An improvement in devices or apparatus for temporarily connecting the ends of a belt, so that the slack may be taken up without necessitating the detachment of the belt from the pulleys on which it runs, has been patented by Mr. Peter S. Graham, of Cumberland Mills, Maine.

The Manufacture of Cotton Seed Oil.

The census of cotton-seed oil mills discovered fifty-six, the most of them in the Southwest. Louisiana has nine, of which New Orleans has six; Mississippi has nine; Tennessee and Texas each eight; Arkansas four; Missouri and Alabama each two, and Georgia one. The amount of seed used is about 410,000 tons yearly. After being dusted and stripped of lint, the seed goes to a revolving cylinder set with knives, which cut the seed very fine. There the hulls are separated from the meal, and the latter is pressed between rolls and packed in woolen bags, which are placed between horse-hair mats and subjected to a hydraulic pressure of about 200 tons. The expressed oil is either barreled in the crude state or pumped to a refining room, where it is treated with caustic soda obtaining 82 per cent of fine oil.

The first product derived from this process is the lint, which amounts to about 5 per cent of a crop; that is, the country gin takes 95 per cent of the crop, and the seed retains 5 per cent, which the mills secure. The cotton is very white and clean, but very short, and the best of it sells at eight cents per pound. It is used to make cotton batting. The crop of the oil mills amounted to 5,000 bales last year.

Second. The hulls constitute about one half of the seed. They are used for fuel to run the mill, and thus the mills do not need to buy any coal. The ashes make a valuable fertilizer, and they are also leached for the purpose of obtaining lye to make soap.

Third. The oil amounts to about 15,000,000 gallons in the United States, and about 10,000,000 gallons are yearly exported to Europe, where it is used to adulterate olive oil. Three gallons of cotton-seed oil and one of olive oil make four gallons of the average olive oil, and the cotton oil can hardly be detected. The question naturally arises, If we have to eat olive oil which is made from cotton seed, would it not be well for home manufacturers to prepare it, and not allow the consumer to pay two freights across the Atlantic?

Fourth. The oil cake is of a rich yellow color, and is used principally to feed stock, for which use it is ground and fed like corn meal. It is shipped in sacks, each weighing 200 pounds.

Fifth. The deposit left when the oil is refined is used to make soap, and also for making dyes.

Ransom Cook.

Ransom Cook, who died at Saratoga, New York, May 28, was a representative American mechanic. When a young man he used to boast that he was the master of twenty-six trades.

He was born in Wallingford, New Haven County, Conn., November 8, 1794. His parents removed to Saratoga County, New York, in 1801, and in 1813 he began to work at the trade of a chairmaker. He owned the first shop using steam power in the county. His inventive faculty was early developed, and he took out many patents. One of the first, granted in 1842, was for an improvement in the manufacture of wrought iron and steel cannon. This idea was appropriated by Sir William Armstrong, who made both fame and fortune out of it. Other patents were for a lunch case, for a fan blower, for a hydraulic apparatus for producing a blast, for an improved hydraulic blower for furnaces, for an improved electro-magnetic ore separator (a very ingenious machine, made by Mr. Cook when he was 80 years old), an improvement in blast pipes for carrying heated air and gases to furnaces, an improvement in scissors, an improved boring instrument known as the "Cook auger," an improved machine for turning the lips of augers, an improved bit for boring wood, an improvement in ventilating and excluding dust from railway cars, an improved exhaust fan, and an improvement in the mode of straining saws for sawmills. There were several others of more or less importance.

Mr. Cook pursued this branch of mechanics for enjoyment rather than for the money to be derived from it, although some of his inventions, particularly the patent auger, were very profitable. He was making a machine and wanted an auger that would bore at an angle with the grain without starting with a gouge. He hit upon the idea of examining the lips of the worm commonly known as the wood-borer with a microscope, and from this model, furnished by nature, he made his auger, which was very successful. His workshop was a curiosity. He made all his own models, and had engines and machinery well adapted to the purpose. He had also accumulated one of the most complete and valuable collections of scientific and mechanical books in the country. His library contains more than 3,000 volumes, some of them very rare.

Sir Josiah Mason.

Sir Josiah Mason, the founder of the new Science College at Manchester, Eng., has just died. He began life as a street hawker, and, after trying many trades, he succeeded in establishing himself in the manufacture of split rings by machinery. Subsequently he added the manufacture of steel pens. In 1874 his pen works employed over a thousand hands, consuming half a ton of rolled steel a day. In addition to great business capacity Mr. Mason was remarkable for his practical wisdom and benevolence. In 1860 he established an orphanage, upon which he has expended $1,500,000. Nearly as much more was nobly invested in the Mason Science College.

Cod Fishing with Nets.

The Norwegian method of netting cod, which the U. S. Fish Commission have persuaded our New England fishermen to try, has proved of signal advantage over the old way of fishing with bait. Many more fish are caught, the fish are larger, and the cost of bait is saved. The first trial of the gill nets was made last winter in Ipswich Bay, north of Cape Ann, Massachusetts. As reported by Captain Collins, of the Fish Commission, the results were most satisfactory. On a trip ending January 11, 35,000 pounds of cod were taken by a smack, 8,000 pounds of which were caught in a single morning. Two other vessels, absent just the same length of time, but using trawls, only got 4,000 and 8,000 pounds. The same vessel using the nets made another trip, taking in four days 35,000 pounds of fish again, having caught in one single day 18,000 pounds. Now, on this same day another vessel set, quite close to the nets, 10 trawls of 1,000 hooks each, and only caught 2,000 pounds of fish. The total results of Captain Martin's enterprise, who was the first to use the nets, may be stated as follows: In not quite two months, from November to January, he took 111,000 pounds of cod, while no trawler, with the same luck, had landed one-third of the quantity.