HISTORY OF THE HELIOGRAPHIC ART IN EUROPE AND AMERICA.

BY M. A. ROOT.

In entering upon this history, it may not be irrelevant to speak very briefly of the benefits which this art has bestowed, is bestowing, and will hereafter still more abundantly bestow upon the world.

And, first, it will serve to cherish and strengthen the social sentiments, from the fact that, at cheapest rates, kindred and acquaintances may have life-like portraits of each other perpetually by them. Upon this point I have dilated in another place.

Second, It is securing for us many of the results of various travel, and this at slight expense, without fatigue, trouble or peril, and even without crossing our threshold. The beauties and grandeur of our own and foreign lands; the most celebrated structures, secular and religious, in all quarters of the globe, and the far-famed ruins and relics of days long gone by; the portraits of heroes, saints and sages, ancient and modern, of distant countries and of our native land; all these, at a trifling outlay, we may have always present in our homes, thus possessing an inexhaustible source both of instruction and entertainment, as well as an efficient means of self-culture and refinement; while the speaking effigies of the great and good, who have heroically dared and done, and patiently and meekly endured, are constantly appealing to the higher and better elements of our nature with the whole mysterious potency of example.

Third, this art is working toward the grand result of universal peace and concord, the fraternal union and associative action of the race, by making men and women, however widely sundered by distance, to some extent acquainted with each other. We look upon the pictured fac-similes of all classes of the denizens of the frigid, the tropical and the temperate zones; and we look, too, upon vivid representations of their surroundings and their ways of life, and we thus learn as much of who and what they are, and how they live and act, as well nigh supplies the place of personal association. It is even found that the more thoroughly human beings understand each other and each other's mode of life, together with the reasons for the same, the more closely are they drawn together by reciprocal esteem and tolerance. In heliography, therefore, and its cotemporary discoveries, steam locomotion and the electro-magnetic telegraph, we behold three of the principal material agencies, whereby the hitherto jarring nationalities are to be brought into relations of fraternity and coöperative effort for mutual improvement and elevation.

Among the most extraordinary phenomena of modern days may be counted the rapidity with which the sun-painting art has been developed, and the great variety of applications, both useful and ornamental, which have already been made of it. But twenty years have elapsed since Daguerre made known his process to the world, and submitted to public inspection pictures which, in comparison with those now produced, would be called quite inferior, and even poor, and yet within this brief interval heliography has become one of the most valuable and generally-prized of existing arts. The beautiful toy, entitled the camera obscura, and the observation of the effects of the sunbeam on certain chemically-prepared surfaces, were the two main agencies to which the discovery of our art was due.

And here the reader will not merely excuse but thank me for introducing the following admirable extract from an unpublished lecture of Prof. John S. Hart, on "The Progress of the Age":—

What would an ancient Greek have thought to see a puny mortal, more daring than Prometheus, making even the thunderbolts of Jupiter his toy? And what would even Franklin have thought to see the subtlest, fleetest, and most powerful of Nature's agents, not only stripped of its terrors, but made the submissive thrall, the obedient slave of man; doing his behests, running his errands, now gilding a child's toy, and now carrying a message to Congress, and exhausting in its flight even the language of metaphor, "as swift as lightning," it being no longer a comparison, now that lightning itself has become the agent of communication. But if Jupiter would have been astonished at the wonders of the telegraph, what would the sun-god have said to the not inferior wonders of the heliographic art? Apollo, indeed, knew himself of old to be the patron of painting; but did he ever dream that he would himself become the limner of half the human race? That those imponderable rays of his should, at man's leasure, be gathered into a brush of light, of inimitable truth and delicacy, wherewith to trace, with microscopic exactness, the lineaments of the human face?

The camera obscura was discovered about two centuries ago by Giovanni Baptiste Porta, a Neapolitan physician.

It seems strange that the ancient philosophers should not have observed and applied to some use the chemical properties of light, which are in many ways so obvious even to casual inspection. If they did so, no record of their proceedings has hitherto reached us. There is a tradition existing that the Oriental jugglers possessed for ages a secret process whereby they could rapidly transcribe a person's profile by the agency of light. Whatever the fact may once have been, this class of individuals are not known to possess any such knowledge now.

The alchemists of the middle ages, in their search for the philosopher's stone and the elixir vitæ, chanced upon a peculiar combination of silver with chlorine, an element with which they were unacquainted, and which they named horn-silver, from the resemblance borne to horn by the white precipitate obtained through fusion. As early as the sixteenth century they noticed that this silver was blackened by light; but as they failed to get gold as they expected from this substance, they merely recorded the blackening, without investigating the phenomenon further. The eighteenth century brought a more thorough examination of this curious fact; and about the same period the effect of light upon the crystallizing of various salts was first observed. In 1722 Petit published his investigations of this latter subject; while Chaptat published his in 1788, and Diezé his in 1789.

Scheele studied closely the phenomenon of the blackening of chloride of silver by light, more especially the influence of the several prismatic rays in producing this effect, and published the results of his studies in 1777. He discovered, among other things, that the violet ray wrought this change much sooner than any of the other colors. In 1790 Sennebier found that fifteen minutes' exposure to the violet ray imparted to chloride of silver the same blackness, which it required twenty minutes' action of the red ray to produce. In 1801 Ritter discovered that the chemical action of light extends beyond the colored rays of the spectrum, there manifesting itself through invisible rays.

In a recent publication of Lord Brougham he states that in 1796 he had published in the "Philosophical Transactions" a paper on light and color, containing remarks on the effects of exposing a plate of ivory, moistened with nitrate of silver, to the sun's rays passing through a narrow aperture in a dark room. The secretary of the Society, for reasons of his own, omitted these remarks, and thus, it may be, delayed the discovery of heliography for nearly half a century.

Scheele's researches, mentioned above, seem to have had a powerful influence upon the scientific world, for he was followed in the same or similar tracks of inquiry by numbers of the leading savans in all parts of Europe. Among these may be mentioned Berard, Seebeek, Berthollet, Wunsch, Sir Wm. Herschel, Sir Henry Englefield, Dr. Wollaston, Count Rumford, Moricbini, Configliachi, Berzelius and that admirable specimen of womanhood, Mrs. Somerville. Sir Humphrey Davy also made some curious discoveries which, with those above named, constituted a mass of material which brought the world to the verge of the great discovery we are recording.

But the following experiment, detailed in sundry old books, is so definite in its forward-pointings, as to cause wonder that more was not made of it:—"Dissolve chalk in aquafortis to the consistence of milk, and add thereto a strong solution of silver. Keep this liquid in a well-stopped glass decanter; then cutting out from a paper the letters you would have appear, paste them on the decanter and lay the latter in the sun's rays, so that the rays may pass through the spaces cut out of the paper and fall on the surface of the liquid. Then will that part of the glass through which the rays pass be turned black, while that beneath the paper remains white. Special care, however, must be taken that the bottle be not moved during the operation."

(To be continued.)

The most distinguished geologists in the world have come to the conclusion that at one period the action of fire was greater on the earth than it is at present. Sir R. Murchison says, "The nature, force and progress of the past condition of the earth cannot be measured by its existing condition."

Sugar.

Sugar is an important article of diet, and an aid to digestion. Though the use of sugar as an article of food seems mainly to supply the carbon used in breathing, yet it undoubtedly contributes also to the production of fat, for during the severe labor of gathering the sugar crop in the West Indies, in spite of the great exertion and fatigue, it is said that every negro on the plantation, every animal, even the very dogs, will fatten.

The conversion of starch into grape sugar, also appears to be the first step in its digestion; and it is probable that the greater difficulty with which cellulose converted into sugar, is the cause of its indigestibility and uselessness as an article of food. Sugar also plays an important part in many processes of the animal system, and appears to be necessary to the production of bile. It has been detected by Lehman and Bernard in the blood of man, and in that of the cat, dog and ox. As an instance of the marvelous processes going forward in the human frame, in the terrible disease called diabetes, all the amylaceous food converted into sugar, instead of being assimilated by the system, as in health, passes away, the sufferer thus deriving no benefit from the food.

Sugar lies under a ban for injuring the teeth; but the negroes employed on sugar plantations, who eat, perhaps, more sugar than any other class of people, have almost proverbially, fine, white, sound teeth, which they retain in old age. But, on the other hand, in England, persons employed in the sugar refineries, who are from their occupation obliged constantly to be tasting sugar, lose their teeth from decay after a few years. Sugar in combination with a small amount of alkali, has the property of dissolving phosphate of lime, which is contained in large quantities in the bone and teeth; a circumstance which may explain in some measure the contradictory nature of the facts. Owing to the present high prices of cane sugar, great efforts will be made this year to extend the culture of the sorghum and perhaps then some parties may try what can be done in the culture of the sugar beet and obtaining sugar from it.

Improved Grain Separator.

When wheat, rye, barley or other grain is first thrashed it is always mixed with other kinds of grain and with chess, the seeds of weeds, and other substances which must be separated from it to fit it for market. The accompanying engravings illustrate an apparatus invented for the purpose of this separation. It consists of a winnowing fan and two sets of sieves of different-sized meshes so arranged that the grain may pass over them in succession and thus be separated according to the size of the kernels into different parcels, each of which is conducted to its own receptacle.

The framing of the machine is constructed in the usual manner, and is closed in front and on two sides with the exception of openings in the latter to allow a current of air to pass into the fan. A is a hopper with downwardly-converging sides and inclined bottom, secured on top of the forward end of the machine and provided at its rear end with a seed aperture and sliding valve, *a*, for varying the size of the aperture and thereby regulating the flow of seed on to the sieves. This valve is moved up and down by a screw bolt, *b*, which has a winch on its upper end; the screw works through a nut, *c*, on the back side of the valve, *a*. A recess formed in the end of the hopper allows the nut to move up and down on the screw. B is a shoe suspended from the top and sides of the framing by four links, two on each side (shown in dotted lines in Fig. 1.) The front end of said shoe is partially closed by a board, *d*, and is entirely open at the bottom. The back end of this shoe has two troughs, A' B', one behind the other and inclining so as to discharge their contents on opposite sides of the machine as hereinafter to be more fully explained. *c f g* are sieves inclining rearwardly and secured equidistant apart in the upper part of the shoe. The back ends of these sieves empty into the inclined troughs, A' B', at the back end of the shoe. The front half only of the sieve, *e*, is punctured, the remaining half being smooth. The sieve, *f*, is offset in the middle and its entire surface is punctured somewhat finer than sieve *e*. The object of the offset is to allow an unperforated plate to be placed so as to cover the openings in the rear half of the sieve, *f*,

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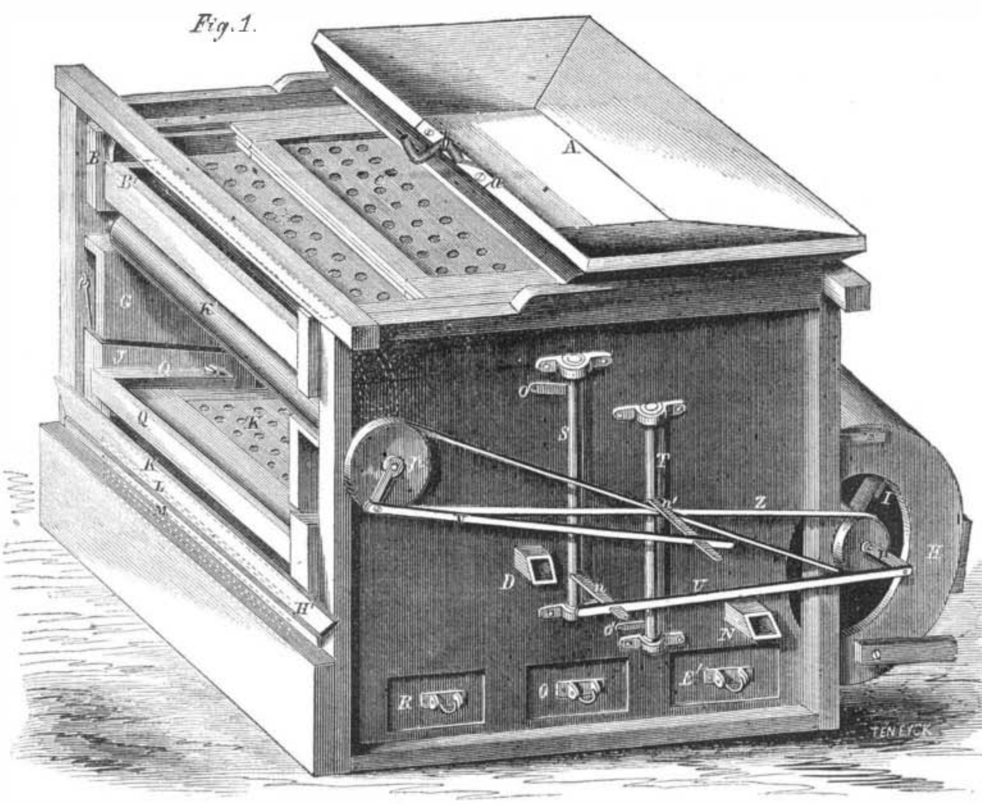
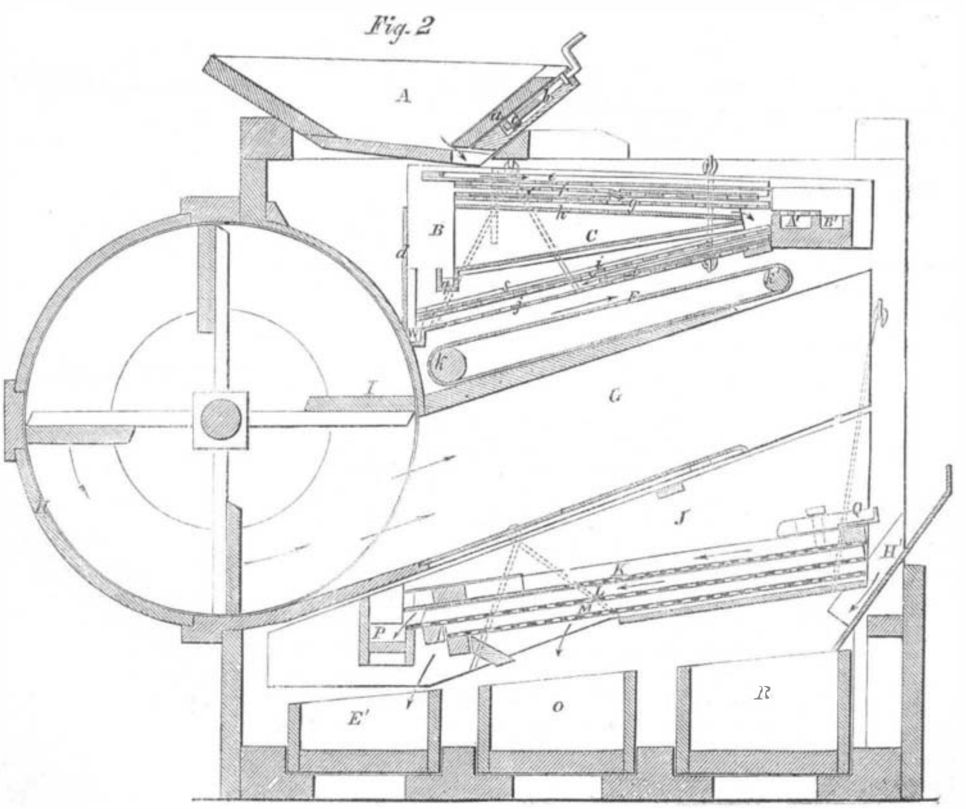
and have the surface flush or level with the front portion of the sieve. Sieve *g* is punctured still finer than the one above it, and the front half of this is also covered with an imperforated plate, *v*. Immediately beneath the sieve, *g*, a fine wire sieve, *h*, is secured at each side upon wedge-shaped pieces, the points of which are toward the back end of the shoe. This fine sieve inclines in the same direction as the sieves above it. C is a the bottom of the shute or incline secured to wedge-shaped pieces and provided at its lower edge with a trough, *q*, inclining transversely to the shoe and discharging through the spout, B, (shown in dotted lines in figure 2.) *i j* are sieves punctured over their entire surface, the under one, *j*, being the finest. The lower half of the upper sieve, *i*, is offset and the openings in it covered by an imperforated plate, *s*, and the upper half of the under sieve is also covered with a similar plate, *t*. Both of these sieves discharge at their lower ends into an inclined trough, W, attached to the lower extremity of the board, *d*, which conducts its contents out at one side of the machine through spout, D. F is an endless apron which passes over rollers, *k k'*, from the latter of which it receives motion from the fan shaft, through the medium of a crossed cord or belt passing around a second pulley on one end of the roller and around a pulley on the fan shaft. G is an inclined trunk connected at its front end with the fan box or casing, H, in which a blast is created by the action of the rotary fan, the latter consisting of four radial arms secured to a shaft which is journaled in boxes attached to its framing outside of the fan casing. These arms are provided with wings having disk rings attached to their outer edges and fitted to revolve within the fan casing. J is a shoe suspended from the sides of the framing by links(shown in dotted lines.) This shoe is provided with three sieves, K L M, one of which, the upper one, is formed of a perforated metal plate, and the others are of wire matting or gauze, the bottom sieve being the finest. The upper sieve, K, discharges the grain at its lower end through a spout, N(shown in perspective in Fig. 1), the cockle and other refuse passing through the meshes of both the sieves under it into the drawer, O, and the small grain which falls on to the sieve, L, with the cockle passes over the lower end into the trough, P, thence it is conducted to one side of the machine. Q is an adjustable guard attached to the back end of the upper sieve so that it can be adjusted to project a greater or less distance over the edge of the sieve to catch the heavier grain falling from the apron, the lighter grain being blown against the inclined board, H', falls into the drawer, R. S T, Fig. 1, are two vertical shafts working in boxes at top and bottom attached to one side of the framing. Each of these shafts is provided with two arms, *n o n' o'*, placed at right angles to each other. The arm, *n*, is connected by a pitman, U, to a crank, *r*, on the fan shaft, and the arm, *o*, is connected to the shoe, B, by a short pitman, by means of which a vibratory shaking motion is imparted to the shoe. The shoe, J, is connected to the arm, *n'*, of the vertical shaft, T, which receives motion from a crank, *p*, through the medium of the pitman, V. The upper shoe being connected directly with the fan shaft, has double the motion of the lower shoe.



HIGLEY'S GRAIN SEPARATOR.

The operation is as follows:—The fan, I, being set in motion, and the grain placed in the hopper, the grain falls upon and through the openings in the upper sieve, *e*, through sieve *f*, on to the imperforated plate, *v*, of sieve *g*, thence it slides on to the wire screen, *h*, which separates the grass seed from it, the grass seed passing through the meshes of the screen on to the inclined bottom, *c'*, thence into the trough, *q*, whereby it is conducted out one side of the machine through the spout, D, the grain and cockle passing over the lower end of the wire screen, falls on to the upper end of sieve *i*, where they are separated from the oats, the latter passing over the imperforated plate, *s*, into the trough, and the seed and cockle passing on to the imperforated plate, *t*, of sieve *j*, thence through on to the endless apron, F. Any oats which chance to fall through on to this sieve are deposited iuto the trough, W, and discharged through the spout, D. The grain and cockle which fall on to the endless apron are carried up to the upper end and precipitated on to the sieve, K, in the lower shoe, at the same time the tailings are blown out by the blast created by the fan, I. The sieve, K, separates the seeds and cockle from the larger or seed grain, the latter passing out at the side of the machine through the spout while the former passes through the sieve and is separated from the cockle and discharged through the spout on the side of the machine opposite from where the seed grain is discharged. The cockle falls into drawer *o*, and any seed that has chanced to work through the cockle on to the sieve, M, passes over the end of the same into the drawer, E. The drawer, R, is to catch any grain that may be blown over the back end of the lower shoe, the grain striking against the deflector, H', is directed into the drawer. The trough, A', is covered with a sieve for the purpose of separating the oats that escape over the sieve, *e*, from straw and other refuse matter, the oats passing out of the same spout with those which pass through the sieves, the straw passing out of the trough.



In cleansing grain for the market the sieve, *k*, is removed and the grain allowed to fall directly on to the sieve, L. The object of the imperforated plates on one half of the sieves in the upper shoe is to have the grain fall from one sieve on to a smooth surface and then gradually slide on to the sieve instead of falling directly thereon. This allows the oats to lie flat in passing over the sieve, and thereby prevents them from passing through the meshes of the same. When it is desired to expedite the cleaning and separating process, these imperforated plates are removed; this allows the grain and refuse matter to pass through the sieves more rapidly, but the process of cleaning and separating it is not so thorough.

A machine constructed as above described is adapted to cleaning and separating all kinds of grain in the most thorough manner, the grain being separated and each kind deposited in its special receptacle.

The patent for this invention was granted through the Scientific American Patent Agency, December 3, 1861, and further information in relation to it may be obtained by addressing the inventor, Aaron Higley, at Sand Creek, Minn.

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