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Improved Gang Plow.

This machine consists of a frame supported upon three wheels—two in the front and one in the rear. The front wheels are attached to a swing or hinged axle, A, Fig. 1. It will be observed that one of these wheels is attached to the front side of the axle, A, and the other to the back, in such a manner that when the axle is turned down in a horizontal position, to lower the plows to the ground, the wheel that runs in the furrow will be as much lower than the other as the depth of the furrow may require. This axle swings upon the hinge, B, Fig. 1, and is connected with the hind wheel by means of a lever (not shown) and connecting rods, to the end of which are attached a chain, C, which passes under the wheel, D, and is made fast to the vertical shaft, E, by an eye-bolt. The depth to which the plows penetrate the ground is regulated by the small side lever, G, fitted with a roller, upon which rests the long lever, H; the lever, G, is secured in the required position by a notched quadrant, I. By these details the driver has entire control of the depth of the furrow without moving from his seat or stopping the machine. The caster wheel, J, supports the plows by means of the connecting chain, C, Fig. 1, and allows them to swing round at the ends of the furrow. By means of the handle, K, the plows may be guided to the required position for starting or backing.

Fig. 2 is a front view of the axle when the plows are in operation. The tongue is perfectly free to work up or down, which prevents all possibility of up or down draft on the horse's neck; it is adjusted sidewise by a bar furnished with holes in the front end, to give the required land to the plows. The front axle is secured in its vertical position by the pawl or catch, M (as shown in Fig. 1). To liberate the axle the pawl may be raised by placing the foot on the back part of it.

In reference to the caster wheel, it will be seen that it runs upon the bottom of the furrow, and its connection with the front axle is shortened or lengthened by a turn buckle, which is fitted with a right and left-handed thread attached to the chain, C, for that purpose.

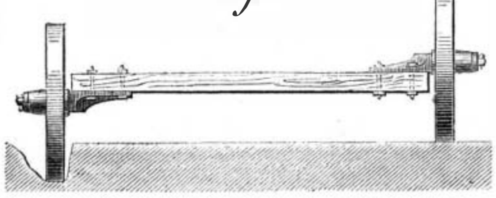
Every experienced plowman knows that when the ground is hard, weight is required to keep the plow to its work. With this machine part of the driver's weight is used for that purpose, and when the soil is in such a condition as not to require it, the weight can be transferred to the caster wheel by screwing up the tightener until the caster wheel relieves the plows of the unnecessary weight. The front chains, N, are to prevent the axle swinging too far back.

Some of the main advantages claimed for this machine are, that the plows lift point first, which greatly facilitates the operation of raising them out of the ground when in motion. The driver can control the depth of cut without stopping or moving from his seat. The tongue being perfectly limber the plows will yield freely to any unevenness of the ground. Its general accessibility in all parts is such as to recommend it to agriculturists.

This plow was patented through the Scientific American Patent Agency, by F. S. Davenport, on February 9, 1864. For further information address Goodrich & Newton, Agricultural Machine Manufacturers, Jerseyville, Ill.

DAVENPORT'S GANG PLOW.

Fig. 2



New Mineral.

A new mineral of lead has been discovered in Chili, containing 10 per cent of iodine. Iodine has lately become very valuable, on account of its extensive use in photography, and of the discovery, by Dr. Hoffman, of a new dye, having this element among its constituents. It is said that one cargo of the new mineral will represent a fortune. As a further illustration of the progress that mining adventure is making in South America, a mine of bismuth ore has recently been opened in Bolivia, about two-thirds up the highest of all the peaks of the Andes—the Iljampu Mountain. Bismuth also, has lately increased in value; and 15,000 feet above the level of the ocean, only slightly beneath the line of perpetual snow, men are setting to work to obtain it.

A COMPANY proposes erecting a factory at Norwalk, Conn., for the manufacture of ginghams; 500 ooms will be run, employing 300 hands.

Patent Zinc Smelting.

An invention has been provisionally specified by Mr. A. Reynolds, of Bagillt, Flintshire, which consists in the arrangement of a furnace (such as a blast furnace), a flue, and condenser, as hereafter described, so that zinc, otherwise called spelter, can be smelted from its ores in it, instead of in the retorts that are ordinarily employed. The zinc passes off in vapor with the smoke, at the top of the blast furnace, and in order to retain the zinc in the metallic form air must be carefully excluded at the top of the furnace, or, preferably, coke must be placed in the flue, or charcoal may be employed instead. The coke may be heated by the smoke, or it may be heated otherwise, so as to reduce the zinc to the metallic form. The inventor leads the flue into a chamber, or series of chambers, for condensing the zinc from the smoke. This condensing chamber may be either a large room or a series of spaces, or of pipes, or otherwise, and may be cooled externally by water. The smoke, after leaving the condenser, may still carry some zinc with it, which should be removed by passing the smoke through a condenser with water in it, or otherwise. The blast furnace may be of the same construction as that generally used for smelting lead slags. The coke in the flue would be placed near the part where it leaves the blast furnace, and the flue would be a little larger in this part than in others, to prevent stopping the draught. It would be better to throw in the zinc ore at stated intervals through a door at the top of the furnace, and to moderate the blast while the zinc is passing off.—*London Mining Journal.*

[This is essentially the same plan as that now pursued in this country.—EDS. SCI. AM.

Economic Magnesium Light.

In a communication to the Paris Academy of Sciences, Prof. Carlevaris, of Mondovi, Italy, stated that when magnesium wire was ignited in atmospheric air, or in pure oxygen, the most luminous effects were not manifest till a certain quantity of oxide had been formed, and was raised by the heat produced to an excessively high temperature. The light in this case, as in the combustion of carbureted hydrogen, as in that of hydrogen in contact with platinum, and as in the Drummond arrangement, is derived from the solid particles raised by the flame to a great heat—a heat which dissolves and volatilizes platinum, but leaves the oxide of magnesium solid, fixed and intact. To raise this oxide to the temperature necessary to give the greatest light, it should be presented to the flame in as small a quantity and in as large a volume as possible, which is done by employing a spongy oxide thus obtained:—A piece of chloride of magnesium is exposed to the flame of the oxyhydrogen blowpipe, in contact with a piece of carbon. The chloride of magnesium is rapidly decomposed, leaving the spongy oxide, which gives the light in question; or, by simply replacing the chloride with the carbonate of commerce, the same effect can be produced.

MANUFACTURE OF ULTRAMARINE.

We take the following extracts from a long article in the last Smithsonian Report, translated from *Aus Der Natur*. The translation was evidently made by a German, as instead of "soda" he gives us the original "natron." His "sulphuric acetical natron" we take to be sulphate of soda, and "sulphuric natrium" the sulphide of sodium. The acid that escapes in roasting we suppose must be sulphurous, and not sulphuric acid, as translated:—

THE ANCIENT LAPIS LAZULI.

The idolatry of classical antiquity finds its chief antagonism in the natural sciences. It would be easy to show how many illusions, nestling in the heads of the admirers of the olden time, have been dispelled by modern chemistry alone; and, although our present purpose is to deal with two objects of subordinate importance, yet these also serve to show how very broad is the line of separation between our own times and the remote ages, to whose languages and ideas so much of the time and training of our youth are commonly devoted.

The colors of *azure* and *purple* were among the most highly priced as well as the most highly prized productions of antiquity. The former was sold for its weight in gold, and the latter was especially reserved for the noble and the powerful; its use was, in some ages, even forbidden to all beneath those of the highest rank on pain of death. Science and art have wrought here a striking change; being no longer limited to the direct gifts of nature, we are able, from the most apparently unpromising raw material, to furnish for the use of the whole community what could then be but scantily produced for the ruling few. The contrast is certainly suggestive.

As early as three hundred and fifteen years before the Christian era, Theophrastus drew a distinction between natural and artificial azure, the latter of which, he tells us, was manufactured in Egypt. It seems most probable, however, that the terms natural and artificial indicate in this case only the greater or the less degree of care with which the color was prepared from the beautiful stone which we call *lapis lazuli*, to which the ancients gave the name of sapphire. While in some cases the stone was merely reduced to a fine powder, in others, probably, the coloring matter was more carefully separated, as is done in our own day.

The lapis lazuli, or sapphire, is found in the least accessible parts of Little Bucharest, Thibet, China and Siberia, in layers or strata of granite or limestone. Of old, as at the present day, it was polished and wrought as a gem, and it is almost the only member of the large family of gems that has an intrinsic value. This distinction it owes to the fact that, in combination to its great beauty, it yields for the use of the painter one of his most beautiful colors, which, moreover, is unaffected by air or heat; that color is ultramarine.

DISCOVERY OF THE MODERN PROCESS.

As lately as the commencement of the present century, ultramarine, or azure blue, was not simply a fine powder of the gem, but the result of a long and troublesome process. The stone was first broken into small pieces, and even this first step in the process was no easy one, the stone being exceedingly hard. The pieces, of the size of a hazlenut, were cleaned by means of lukewarm water, then made red-hot, and afterward slaked in a mixture of water and acetic acid. The cohesion of the particles is so great that this process must be repeated from six to ten times before the mineral can be transformed into a fine powder. It is afterward rendered still finer by trituration with the muller stone of the painter, having been first mixed with water, honey and dragon's blood, then treated with the lye of the ashes of the grapevine, and finally dried. The powder is next compounded into a mass with turpentine, rosin, wax and linseed oil, melted together, and kneaded under water. By this process the fine powder is washed out, and in time sinks as a sediment in the liquid. The mineral yields not more than one-fourth of its weight of coloring material.

Up to a very recent time Italy continued to be the chief, as it had been the original, manufactory of ultramarine, and thence the finest shades were derived. The tediousness, the difficulty, and, consequently, the costliness in both time and money of the old process of producing ultramarine from the lapis lazuli, naturally excited great desire among scientific chemists to find some cheaper and readier artificial means of producing that color, doubly precious to the painter for its beauty and its permanency; but so invariable, from different causes, were the failures of all attempts in that direction, that the solution of the problem was well nigh despaired of, when hope was as suddenly as accidentally revived. In 1818 it happened that in France a sandstone furnace for the melting of soda was taken down, and a beautiful colored substance, never seen there before, was discovered. It was remarked that formerly the furnace for the melting of soda had been constructed, not of sandstone, but of brick. The mass of matter thus discovered was examined by Vauquelin, who observed in its appearance and composition points of great resemblance with ultramarine; but still no clue offered itself to guide him through the perplexities of the investigation. Similar observations were made in the soda manufactories, as, for instance, by Hermann, in Schoubeck, who had thrown away above a hundred weight of the colored mass, found in a similar furnace when the latter was pulled down; and by Kuhlmann, at Lille. We shall not venture to decide whether or not the "blue material" mentioned by Goethe in his "Italian Travels" (1781), as being taken from limekilns in Sicily and used for the adornment of altars and other objects, was homogeneous with this product of the soda furnace, and whether both were, in fact, an artificially and accidentally produced ultramarine.

The question still remained unanswered, how was this substance in the case of each furnace produced? In what did it originate? At length, in 1828, the solution of this important question was found and published by Professor C. Gmelin, of Tuebingin. During eighteen years he had been occupied with researches on the lapis lazuli and its kindred minerals, the products of the volcanic eruptions of Vesuvius. Reflecting on the recent circumstance, he was led to believe that, notwithstanding there had been so many unsuccessful attempts, the production of an artificial ultramarine was not an impossibility. Further study of the natural coloring substance disclosed to him the sulphurous portion of the compo nents, and, holding that clue, he at length succeeded in producing a most brilliant ultramarine.

While at Paris, in 1827, and previous to the publication of his discovery, he unreservedly communicated his ideas on the artificial production of ultramarine to several chemists, especially to Gay Lussac. And, behold! on the 4th day of February, 1828, Gay Lussac made a report to the French Academy that Guimet, at Toulouse, had succeeded in manufacturing ultramarine of all kinds. Did the discovery originate in the open and disinterested communication of Gmelin, or did it not? Who shall decide? Guimet, it is but just to say, warmly defended himself against such a suspicion; he affirms that he was prompted to his experiments by the examinations of lapis lazuli, made by Desormes and Clement, and claims that he had produced artificial ultramarine before Gmelin's visit to Paris.

Whether the method of Guimet is essentially different from that of Gmelin cannot be determined, for, while the latter published his discoveries with every particular, Guimet, on the contrary, has kept his method a secret to the present day. In so far as profit is concerned, Guimet, it must be confessed, has maintained the advantage over Gmelin, and France over Germany; for Guimet forthwith made his discovery lucrative to himself and others. As early, even, as the same year, 1828, he had erected a manufactory at Paris for the production of artificial ultramarine, which he sold at two dollars and sixty-six and a half cents per pound, while the natural article was a little more than double that price. Guimet succeeded in having his product adopted for the painting of the beautiful ceiling of the museum of Charles X., and thenceforth his fortune was made. In 1834 the price had risen to from four to five and one-third dollars per pound, but in 1844 had again fallen, and ranged from two and one-sixth to two and one-third per pound, though the best quality for oil painting was still sold at six dollars and forty cents. The cheapness of the ordinary article enhanced the demand, and the product of Guimet's factory speedily rose from twenty thousand to one hundred and twenty thousand pounds, of which twenty thousand pounds were exported to foreign countries. Not only did Guimet amass immense wealth; he was the recipient also of many public honors. From the French "Society for the Encouragement of Industry" he received a premium of five thousand francs, and medals from various French industrial exhibitions; and this as early as 1834, when the real importance of this eminent discovery could have been scarcely appreciated. In 1851, at the London exhibition, Guimet received the large gold medal.

In 1842, the celebrated French chemist, Dumas, in his "Manual of Chemistry," had expressed the opinion that chemical purity of materials might very well be dispensed with in the manufacture of artificial ultramarine, and that common clay might be used, provided it did not contain too much iron Professor Engelhardt, of the Polytechnic School, Nuremberg, while translating the work of Dumas into German, was especially impressed by that statement, and was induced thereby to make new experiments, but his labors were terminated by death before he had obtained any positive and satisfactory results. His assistant and successor, Leykauf, continued the deceased professor's experiments, and was fortunate enough to succeed, where all previously had failed. By means of potter's clay, Glauber's salt, and coal, he manufactured the most beautiful ultramarine, in the renowned manufactory of Ley Rauf, Heine & Co., at Nuremberg; and in a very few years the firm counted its wealth by millions. Nowhere else has this branch of industry acquired such an extension—being conspicuous even among the diversified activities of Nuremberg, and justifying, therefore, a brief description in this article.

THE NUREMBERG MANUFACTORY.

In the vicinity of the Nuremberg railroad depot the attention of the observant traveler is pretty sure to be attracted by a stately and spacious mass of buildings of white and red sandstone. The long rows of structures, with their streets and yards, cover a space of some eighteen acres. Surrounded as the whole is by a rampart, one might at first fancy himself to be looking upon a fortress. But the smoke from numerous tall chimneys would speedily correct this error and betray the abode of ingenious and successful industry. It is to be regretted that visitors are rigidly excluded from the interior of this industrial hive; a useless exclusion, as the manufacture of ultramarine can no longer by any possibility be considered a secret. The visit of the King of Bavaria, in 1855, to this equally interesting and important factory, so far lifted the vail that we possess something like a reliable description, instead of the strange surmises which were previously in circulation with respect to it. On a first glance at the exterior we perceive that the vast erection has been built piece-meal, additions having been made from time to time to meet the necessities of the increasing business. It required the long period of seventeen years to render the whole what it now is—a structure heterogeneous, indeed, in appearance, but really possessing the highest conceivable adaptation to the purposes for which it was designed.

Three rows of the buildings are devoted solely to the preparation of the raw material, the motive power consisting of two steam engines conjointly possessing a 38 horse-power. So various and well contrived are the stampers, crushing and sifting machines, etc., which are set in motion by these various works, that a small amount only of human labor is required to furnish abundant raw material to employ elsewhere a vast number of hands.

Groups of buildings surrounding those just mentioned contain water-works, and consist of five divisions of vaulted galleries, supported by iron pillars. Near these are the drying stoves. Close by these three principal divisions are the buildings for storing, packing and weighing, and the clerks' offices and repairing shops. Here is a scene of continual activity, the human labor being greatly aided by a high-pressure steam engine of 20 horse-power. The communication between these various and extensive buildings is facilitated by a railroad 6,000 feet, or considerably above an English mile in length, crossing from east to west, and from north to south, and