Grinding Edge Tools.

The *American Builder* thinks that in finishing the grinding of cutting tools, the stone should revolve toward the edge of the tool. This is its argument:

Edge tools are fitted up by grinding, very much as a plank would be reduced in thickness, were a large plane employed, in which were set a hundred or more very small gouges, each cutting a narrow groove. The sharp grit of the grindstone being harder than the iron or steel, cuts very small channels in the surface of the metal, and the revolving disk carries away all the minute particles that are detached by the grit. If we were to examine the surface of a tool that has just been removed from a grindstone, under the lenses of a powerful microscope, it would appear as it were like the rough surface of a field which has recently been scarified with some implement which formed alternate ridges and furrows. Hence, as these ridges and furrows run together from both sides, at the cutting edge, the newly ground edge seems to be formed of a a system of minute teeth, rather than to consist of a smooth edge. For this reason, a tool is first ground on a coarse stone, so as to wear the surface of the steel away rapidly. Then, it is polished on a wheel of much finer grit. And finally, in order to reduce the serrature as much as possible, a whetstone of the finest grit must be employed. This gives a cutting edge having the smallest possible serration. A razor, for example, does not have a perfect cutting edge, as one may perceive by viewing it through a microscope. And yet, the serrations are actually so much smaller than a human hair, that the minute teeth cut the hair in twain. But, when the serrations on the edge of the razor become so battered up and dull that they will not sever a hair, or cut a man's beard off, the edge must be honed and strapped until the system of minute teeth will be so much smaller than a hair, that several of them will take hold of the smallest hair at once. These suggestions will furnish something of an idea of the operation in grinding and whetting edge tools.

Beginners are sometimes instructed, when grinding edge tools, to have the stone revolve toward the cutting edge, and sometimes from it. When the first grinding is being done, it is a matter of indifference whether this is done or not. But, when the finishing touches are applied near, and at the very edge, a grinder can always complete his task with more accuracy, if the periphery of the grindstone revolves toward the cutting edge, as the steel that is worn away will be removed more easily. Whereas, when a stone runs in the opposite direction, the grinder can not always tell exactly when the side of the tool is fully ground up to the edge. This is more especially true, when the steel has a rather low or soft temper. The stone, when running from the edge, will not sweep away every particle of the metal that hangs as a "feather." But, when the stone revolves toward the edge, there will be no "feather edge" to deceive the eye of the grinder.

Chinese Vehicles.

A contributor to the *Coach-Makers' Monthly* describes in a humorous manner the vehicles used by the Chinese. He says: "The vehicles used for the journey are carts, one to each man; and each cart drawn by two mules. The hubs of the carts, although designed to carry but one man and the driver, are as large as those of our strongest drays in the United States, and the wheels as strong and full of rivets as the wheels in Ezekiel's vision were of eyes. Through these ponderous hubs the axles project for a distance of seven inches, being three inches in diameter where they come through. What good this projection of the axle does, except to hit against everything in the way, belongs to Chinese civilization to determine. On to these axles, which are very heavy and strong, are attached heavy frames, made of two scantlings running from the mules' heads across the axle, to which the frame is made fast by strong bands and bolts of iron. There is nothing in the shape of a spring, or thorough-brace, or any such thing. The Chinese have not got along to these things yet in their civilization. On to this frame is fastened the thing to which you are to be imprisoned during your trip to the capital of the Celestial Empire. It is only large enough for one person, who is expected to sit with crossed legs on the bottom of the machine.

"This strange cage is a kind of a cross between a hen coop and a dog kennel. It is made of hard wood, and very strong, the sides being made to resemble the windows in a penitentiary, the checkered bars being of hard, strong wood instead of iron. There is no seat of any kind, nor anything on which you can lay hold to steady yourself, as a protection against the terrible jerks you suddenly get from side to side as your cart drops into the ruts of ages, and is jerked out again by mule power. Your prison somewhat resembles an old-fashioned Pennsylvania or Kentucky freight wagon, bating the size, only the ribs of your inclosure are much nearer together and stronger. Then over all is placed a covering of strong, blue cotton muslin, to prevent the rain or dust from coming in, or you from seeing out except in front. This cover is made to come down in front of you, so that you must crouch to see out even in front, like a dog looking out of his kennel, or a chicken looking out from under the old hen on a rainy day. You must first get on to the shaft, and then crawl backward through this hole to your quarters.

"Bed and bed-clothes, carpet-sacks and shawls are packed away in this little cramped concern, and you endeavor to adjust them so that your bones may escape being broken against the rough sides of your narrow cage. But the roof is so low that if you put in enough to make anything like a comfortable seat, your head will hit against the top, and if your head barely escapes the top of the roof in the middle, it will be sure to hit the sloping sides as soon as the lateral motion begins, and that is the moment the cart gets under way."

Mosaic and Enamel.

Mosaic is a kind of inlay, producing a picture or pattern by the due selection of colors in the pieces employed. The substance may be wood, stone, marble, porcelain, terra-cotta, enamel, or colored glass; and it may be cut into cubes, hexagons, triangles, or various other forms; the chief conditions being that the pieces should be small in size, variously colored, and placed in such juxtaposition as to bring the proper tints into the proper places. The marble pavement under the dome of St. Paul's, the wooden flooring and paneling done in marquetry, the inlaying of cabinet work known by the names of marquetry and buhl work, the intricate patterns of Tunbridgeware toys, the nicely fitting lids of Scotch snuff boxes—all are examples of mosaic so far as the principle is concerned; but it is generally meant, in art, that a mosaic is a picture, which must have the mind of an artist thrown into it before the mechanical working begins.

Enamel is really nothing more than opaque glass, the opacity being produced by the addition of some one or more among many metallic oxides to the other ingredients. According to the color required, so is the metallic element chosen—lead or antimony to produce yellow, iron to produce red, gold for a more intense and beautiful red, copper for green, cobalt for blue, and various combinations for other colors. Enamel paintings are plates of copper, silver, or gold, on which the picture is produced by using the enamel in the form of paint, and then vitrifying it by the heat of an oven. Enameled watch dials have a thin coating of white enamel on a copper disk or plate, while the figures and spots are painted in black enamel, vitrified by heat.

Now the use of enamel for mosaic is simply the substitution of cubes or small pieces of colored enamel for pieces of other substances. They are occasionally employed, like colored glass, with a part of the effect due to semi-transparency; but more frequently they are quite opaque, only to be looked at by reflected light. The beautiful Pompeiian mosaic of the "Battle of Issus" is of enamel. The mosaics of St. Peter's are also of enamel. So numerous are the gradations of tint necessary to produce all the lights and shades of an elaborate picture, that the mosaic workshops at the Vatican are said to contain no less than twenty thousand varieties, all methodically sorted and arranged. Some of the larger and more ambitious works have taken ten, fifteen, or even twenty years to execute. The durability of the material is fully as great as that of stone itself; insomuch that the mosaic pictures of St. Peter's, so far as atmospheric or climatic influences are concerned, may possibly last as long as the structures which they adorn. The mode of proceeding is pretty much as follows: A ground or support is prepared, either a metal plate or a slab of travertine, the proper size and shape of the picture; and this is surrounded with a raised rim of iron. Into the recess thus formed is introduced a cement or stucco mixed to a pasty state, and consisting of pounded travertine, carbonate of lime, mastic, and linseed oil. The tesseræ, cubes, or small pieces of enamel (some barely larger than a pin's head) are selected of the proper colors, tints, and shades, and imbedded one by one in the cement. Only so much cement is laid in as can be filled with tesseræ in one day, in order that it may retain sufficient softness. It eventually hardens to the consistence of stone. When the whole picture is finished, the surface is rubbed smooth and made dull or polished according to the kind of effect intended to be produced.

The Gloss on Silk.

"The method of giving an artificial gloss to the woven pieces of silk," says the *Druggists' Circular*, "was invented in 1663. The discovery of the method was purely accidental. Octavio Mey, a merchant of Lyons, being one day deep in meditation, mechanically put a small bunch of silk threads into his mouth and began to chew them. On taking them out again in his hand he was struck by the peculiar luster which they had acquired, and was not a little astonished to find that this luster continued to adhere to the threads even after they had become dry. He at once saw that in this fact there was a secret worth unraveling, and being a man of ingenuity, he applied himself to the study of the question. The result of his experiments was the *procédé de lustrage*, or 'glossing method.' The manner of imparting the artificial gloss has, like all other details of the weaving art, undergone certain changes in the course of years. At present, it is done in this wise: Two rollers revolving on their axes are set up a few feet from the ground, and at about ten yards, in a straight line, from each other. Round the first of these rollers is wound the piece of silk, of twenty, forty, or one hundred yards in length, as the case may be. Ten yards of the silk are then unwound, and fixed by means of a brass rod in a groove on the second roller, care being taken to stretch the silk between the two cylinders as tightly as possible. A workman with a thin blade of metal in his hand daintily covers the uppermost side of the silk (that which will form the inside of the piece) with a coating of gum. On the floor under the outstretched silk is a small tramway, upon which runs a sort of tender filled with glowing coals. As fast as one man covers the silk with gum, another works the tender up and down, so as to dry the mucilage before it has had time to permeate the texture. This is a very delicate operation; for if, on the one hand, the gum is allowed to run through the silk, or if, on the other, the coals are kept too long under one place, the piece is spoiled. In the first instance, it would be stained beyond all power of cleaning, and in the second, it would be burned. None but trusty workmen are confided with this task; and even with the most proved hands there is sometimes damage. When ten yards of the piece have been gummed and dried, they are rolled around the second cylinder and ten more are unwound. This is repeated till the end. But the silk, with its coating of dry gum, is then stiff to the touch and crackles like cream-laid note-paper when folded. To make it soft and pliant again, it is rolled anew, some six or seven times, under two different cylinders, one of which has been warmed by the introduction of hot coals inside, and this is sufficient to give it that bright new look which we all so much admire in fresh silk."

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

We give opinions free, and all we require is a rough sketch and description of the invention.

Inventions patented through this Agency receive notice in the SCIENTIFIC AMERICAN.

MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row, New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

American and English Mowing Machines.

Reaping and mowing machines have now become standard implements on English farms, but in France they are still regarded somewhat as innovations; the lower rate of wages across the Channel having hitherto acted as a barrier to the introduction of labor-saving machines in agriculture. Wages, however, are rising in France, as in most other countries, and the attention, therefore, of agriculturists is directed to the best form of reaping and mowing machines. Several international trials of these machines are announced for the coming summer. The first came off last week at Bourges, 123 miles south of Paris, at which there was a very sharp contest between the English and American machines. The *Ironmonger* states that after a long and careful trial the award was given in favor of the English machine of Messrs. Howard, of Bedford, which in mowing an acre beat the far-famed American machines of Mr. W. A. Wood and Mr. M'Cormick by eighteen minutes. American manufacturers must look to their laurels.

Flies on Horses.

The *Journal of Chemistry* gives the following as a preventitive of horses being teased by flies: Take two or three small handfuls of walnut leaves, upon which pour two or three quarts of cold water; let it infuse one night, and pour the whole next morning into a kettle, and let it boil for a quarter of an hour. When cold it will be fit for use. No more is required than to moisten a sponge, and before the horse goes out of the stable, let those parts which are most irritable be smeared over with the liquor, namely, between and upon the ears, the neck, the flanks, etc. Not only the gentleman or lady who rides out for pleasure will derive pleasure from the walnut leaves thus prepared, but the coachman, the wagoner, and all others who use horses during the hot months.

THE MANUFACTURE OF CHLOROFORM.—According to the late Jas. Y. Simpson, there is a single manufactory of chloroform, located in Edinburgh, which makes as many as eight thousand doses a day, or between two millions and three millions of doses every year—evidence to what an extent the practice is now carried of wrapping men, women, and children in a painless sleep during some of the most trying moments and hours of human existence.

Improved Sectional Mills.

We might fill more space than can be allotted to the present description, with comments upon the importance of mills for the pulverization of hard substances, and with even the briefest allusion to the various improvements by which the rude appliances of the ancients have been superseded, but we shall not attempt to discuss this fertile topic. Suffice it to say that the employment of iron and steel as a substitute for stone grinding surfaces is one of the most modern improvements in this field.

The earliest of these were made with a dress of straight fillets or grooves. The disadvantages of this style of dress, and the advantage of the sectional system, are so well set forth by the inventor in the general description of the mill, furnished by him as the basis of the present article, that we cannot do better than to use his own language upon this point. He says:

"It will be somewhat difficult to indicate all the peculiar advantages to be derived from the use of sectional grinding surfaces, without a personal examination of the machine.

"In nearly every form of iron mills heretofore in use, the grinding surfaces have been confined to a system of straight fillets or grooves. This form of dress was adopted and continued in use, not because it was the best form of grinding surface, but from the impossibility of casting a cylindrical grinder with corrugations and indentations, without making it too expensive for practical use. With such mills, having the old system of grinding surfaces, no matter what the nature of the substance to be ground, whether it was hard, greasy, and tough bones, grain, plaster, or brittle minerals—all was done with the same description of surface, or at least the variance was so slight that practically the operation was the same with all. With ordinary discernment, the merest observer may see that this common way was entirely wrong. Business demands, practical and imperative in their nature soon pointed the inventor of the sectional mills to the fact that changes in the system were necessary; certain results were desired, and they could only be obtained by the most thorough experiment. For grinding substances of given character, a definite configuration of surface was demanded; and as the substance to be ground varied in character and condition, so also must the appropriate surface be supplied. This general advantage was attained by having the grinding surfaces cast in sections. By this means any pattern of tooth suitable to the material to be ground could be furnished. The concave or shell in which the *outer* surface is placed, or the cone upon which the *inner* surface is placed, being turned upon a lathe to perfect truth of circle, insures the running of the machine with an exactness impossible to exceed by any other system.

"Another great advantage in the sectional system lies in the facility with which changes can be made—no part of the body of the mill having to be removed, but merely raised sufficiently by a screw to allow the sections to be slipped to or from their places. A change made thus in a few minutes, renders very obvious the advantage over the old system. Were the inner and outer surfaces each cast in one piece, it would involve the lifting of the heavy parts of the mill, so as to allow them to be placed in the inside, taking the work of several men and a delay of several hours to accomplish. In the sectional mills the work can be easily done by one man.

"A great advantage claimed for the sectional mills lies in the fact, that should a piece of iron (which in grinding bones is very probable) accidentally get into the mill, and the grinding surface be broken, the broken section or sections may be removed, and sound ones replaced, without the necessity of renewing the whole. Practical men will see that this is a saving of time and expense not easily over-estimated."

Perhaps no material tries a mill so much as raw bones. These are not only hard, but they also possess a toughness that renders them peculiarly intractable. The machines we are about to describe are in successful operation in the manufactories of the proprietors, in Philadelphia and Chicago, upon raw bones, where their great capacity and strength are demonstrated. The mills are also working upon guano, plaster, fire brick, sumac, bark, dye-woods, ores, fish scraps, etc., in other manufactories in Philadelphia, Chicago, and other cities. Their efficiency in grinding ores has been, we are informed, well tested.

Fig. 2 is a sectional view of the mill, by the inspection of which its construction will be clearly perceived, in connection with the following description.

In the larger sizes the lower grinding surface of the crusher is curved, in order that iron or other foreign substances than that which the mill is working on may be quickly discharged without injuring the dress when the pressure is made upon them; while in the smaller sizes the grinding surfaces are in a straight line, or at least not curved.

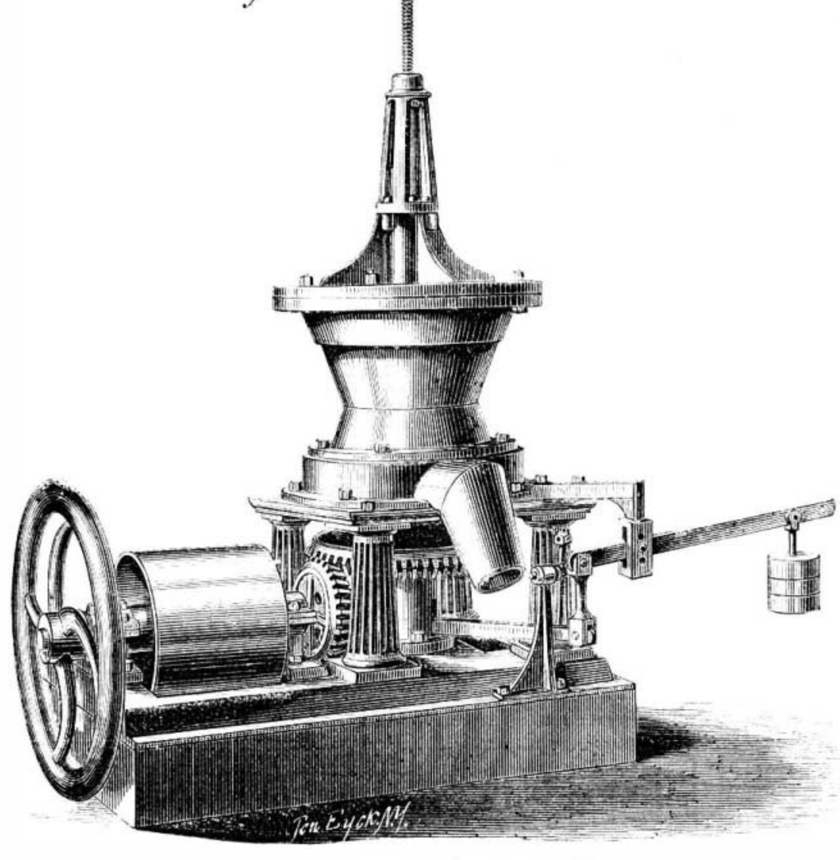
A, is the top breaker, with a projecting arm. This arm is varied in shape to suit different material. It is made to slip easily over a sleeve which fits snugly on the shaft, so as to protect the shaft from abrasion from the continued jar of the breaker, and it also obviates the need of renewing that much iron with every breaker.

The large screw-nut, B, is used to hold the breaker down to its place. This is a left hand screw and tightens itself in working.

C is the circular grinder, with holes for stud-bolts (only one of which is shown) used to tighten the grinding sections, D.

E is the stationary sectional dress in the upper part of the shell, eight of which form a circle. The corrugations in these sections are made very deep, so as to admit of a great amount of wear. The lower or full sections, D, are eight in number, and are held in place by stud bolts, one of which is shown passing through C.

Fig. 1



E. P. BAUGH'S SECTIONAL MILLS.

The outside or stationary sections, G, are held in place by the nuts, H. The circular shape of the bottom of the dresses marked D and G, admits of a great amount of wear at the bottom, where they come first in contact, and, should iron get into the mill, gives greater space on raising the lever to allow it to get out.

I is the cone to which the dress castings, D, are attached.

Fig. 2

It has a heavy wrought-iron band around the base to support the dress, and is held in place by two feathers, L, in the shaft, and a tight collar below. Wipers, J, carry the ground material to the spout.

K is the perpendicular or main shaft, made of wrought-iron, the lower end of which, that works in the step, being made of solid steel. There are two feathers, L, let into it to hold the cone and breakers in place.

A steel, conical anti-friction disk is placed under the shaft, which effectually prevents heating. The step-box, which has a steel lining, is movable. The step moves up and down in a hollow column, M, in closing and opening the mill to adjust the grinding; the shaft working freely through the bevel cog-wheel, N, which is supported by M. Levers for adjusting the mill with weights are shown at O; or screws may be used in their place. P is the driving cogwheel, which being half the size of the other wheel, doubles the power of the belt.

Q is a wrought-iron counter shaft, to which are attached the fixed and loose pulleys, R.

S is the fly-wheel, which, with its shaft, is supported by pedestal boxes fitted with anti-friction metal.

The large screw at the top of the mill is used for raising the different parts to change the dress. In order to change the upper sections of the dress the bolts, T, are loosened, allowing the mill to be opened at U. To change the lower grinding surface, the bolts, H, are unscrewed, allowing the mill to be opened at V. Then the large nut, B, is loosened, and the breaker and sleeve are raised. Next the stud-bolts passing through C are unscrewed, when all the dress can be removed

The perpendicular or main shaft of the No. 1 mill is of wrought-iron, four feet six inches long and five inches in diameter. The counter shaft is also of wrought-iron, three and one-half inches in diameter. The fly-wheel weighs nine hundred pounds. The fixed and loose pulleys are twenty-two inches in diameter and ten inches face.

It will be seen that the proportions are such as to give great power and strength. This sized mill is intended to prepare all hard substances for smaller mills, although it is claimed that a large percentage of its product does not ordinarily require another operation. It weighs four tuns and is constructed sufficiently strong to crush rough raw bones, logwood (cut in lengths of 18 inches), the hardest quartz rock and all minerals, hard guanos, slag from furnaces, and, indeed, all substances which industrial science demands to be reduced. It is claimed that the hardest substance susceptible at all of grinding or breaking, can be crushed without risk of breakage to the mill. The power required to run the machine to its full capacity, is from *ten to twelve horses*; yet, its main shaft being *solid wrought-iron five inches in diameter*, it can be attached and run safely with power of twenty-five horses. It is stated by the manufacturers that the amount of work capable of being performed in a day of ten hours is, for raw bones, twenty tuns and upwards, varying with the condition of dryness; hard guanos, quartz, and other mineral substances, thirty to forty tuns; plaster, fifty or sixty tuns. The mill is especially adapted to the pulverization of the South Carolina deposit of guano; the grinding surface upon this may be run closely together, and a large proportion reduced to powder by the first process. Of this latter substance 25 tuns may be reduced in ten hours.

This mill has been secured by patents in Great Britain, France, and the United States, and is manufactured by Baugh & Sons, No. 20 South Delaware avenue, Philadelphia, Pa.

Influence of Colored Lights on Insects.

The discussion of the change produced in animal and vegetable forms by the influence of varying conditions of temperature, moisture, light, locality, etc., especially as connected with the Darwinian hypothesis, has induced a great variety of experiments, from which some interesting results have been derived. In some of these experiments, lately published, a brood of caterpillars of the tortoise-shell butterfly of Europe was divided into three lots. One third were placed in a photographic room lighted through orange colored glass, one third in a room lighted through blue glass, and the remainder kept in an ordinary cage in natural light. All were fed with their proper food, and the third lot developed into butterflies in the usual time. Those in the blue light were not healthy, a large number dying before changing; those raised in the orange light, however, were nearly as healthy as those first mentioned. The perfect insect reared in the blue light differed from the average form in being much smaller, the orange brown color lighter, and the yellow and orange running into each other instead of remaining distinct. Those raised in the yellow light were also smaller, but the orange brown was replaced by salmon color; and the blue edges of the wings seen in the ordinary form were of a dull slate. If changes so great as these can be produced in the course of a single experiment, it is probable that a continuance of the same upon a succession of individuals will develop some striking results.

Grand Fair of Western Texas.—The Second Grand Fair of Western Texas will be held in October of the present year, commencing on Wednesday the 5th, at the Fair Grounds, near San Antonio, and will continue four days. A large list of premiums is offered, consisting of money and diplomas. Further information can be obtained of the Secretary, Mr. Robert Clark, of San Antonio.

Gas was first used for lighting streets in Birmingham, England, about the year 1816.