Optical Appearance of Cut Lines in Glass.

The use of high powers in delicate investigations renders it necessary that the microscopist should study the character of appearances which arise from optical laws, and which can only be rightly interpreted by referring them to forms and structures to which they bear no real or exact resemblance. A short time since, the writer called attention to the deceptive nature of the appearances presented by the fine cracks in silica films; and further observations show that if the finest or narrowest of such marks are selected for examination, the chances of obtaining perfect illusion are increased by the amount of magnification and the perfection of the objectives employed. Delicate interference bands, pseudo-beading, etc., look more real with well corrected object glasses than with bad; and careful illumination will often add to the structural aspect of mere optical effects. The edges of silica cracks differ from edges of minute furrows cut in glass, being smooth instead of jagged. The latter as well as the former are well worth study. Preparatory to examining such furrows as are cut with diamonds in glass for micrometers or diffraction gratings, it is well to notice the edges of thin glass cut for slide covers. If half a dozen or more thin glass squares are held close together, and viewed, edges upward, as transparent objects, a variety of curious optical effects will be seen, arising from interfering reflections and refractions. The examination should begin with an inch or two thirds, after which half inch, and quarter or one fifth will be advantageously employed. It is easy to focus parts of the glasses' edges, so as to show their true form; but portions a little in or out of focus will show beads, appearances like columns of Egyptian architecture, etc. Most of these optical appearances are sufficiently hazy or confused to give warning of their true nature; but generally some will be found so sharp and clear that, if viewed separately, they may easily mislead a practised observer. In making these experiments, it is best to have handy a box containing at least several dozens of the thin glasses, as some sets will prove much more interesting than others. They should be viewed with their edges parallel to the plane of the objective, and also at various angles. The corners of the squares should also be looked at.

Lines cut in glass for micrometers or diffraction gratings are usually filled up with finely divided black lead, and the same material has been employed in the writings and patterns made with the Peter's machine. This substance of course modifies the appearances. To see them in the simpler form, recourse was had to Mr. Ackland (Horne and Thornthwaite), who ruled several sets of fine lines, each on glass slides, at varying distances 1—2000", 1—3000", and 1—4000", and mounted them with Canada balsam, so that they could be safely used with immersion lenses. One set was not covered or mounted in any way.

Those who have examined very minute writing done by the late Mr. Farrants with the Peter's machine will be aware that even when a very fine diamond point is used, the incision partakes more of the character of a scratch than of a clean cut. It seems impossible to cut glass with a smooth, clear edge, such as certain metals readily give with a sharp tool. A line cut in glass is thus a furrow, more or less rough at the bottom and sides, and when viewed correctly under the microscope, has the appearance of a narrow depression less transparent than the adjacent spaces. It is difficult to get a really correct view. Even under favorable circumstances of illumination and correction, the edges of a cut are apt to appear as two raised lines.

Many instructive optical appearances, which might bewilder the observer if the character of the object were not known, may be easily produced, as the following notes will show. The observations are made with Powell and Lealand's immersion one eighth and Ross's four tenths, condenser aperture 109°. Using central stop, A, and varying inclinations of mirror. Paraffin lamp. (1*a*) Cuts as rounded bands; interspaces flattish furrows. The bands illuminated on right side, shaded on left. Tint of lightest part of furrows bluish. (2*a*) Flattish bands and rounded furrows, the former slightly shaded on left; tint of shading bluish. (3*a*) Oblique rounded furrows with narrow blue ridges; broadish bands with narrower elevated bands up their centers, light on right side, shaded deeply down the furrowed side on left.

Same condenser 109°, two radial slots forming obtuse angle. Angle of mirror varying. (1*b*) Broad, flat spaces, narrow, shaded, and elevated ridges. (2*b*) Ridges four times as wide as No. 1, with rounded tops. (3*b*) Narrowish grooves, something like actual object. (4*b*) False ridges, puzzling to count and hollow.

Same condenser 109°, two rectangular radial slots. Angle of mirror varied. (1*c*) Half round hollows, with rod-like ridges in the middle; rounded interspace elevations somewhat lower than ridges and between them. (2*c*) Narrower ridges; nearly flat spaces. (3*c*) Appearance of additional ridges, strongly shaded on left. (4*c*) Narrow ridges, shaded on right; flattish spaces, and low ridges, with narrower shelving shade spaces down to ridges, etc., etc.

Same condenser, 109°; one radial slot which was rotated to various angles. Angle of mirror varied. (1*d*) Each cut made into a flattish space, with two narrow raised edges, shaded on left. (2*d*) Cuts made into flattish, ribbon-like elevations, with raised edges. (3*d*) Interspaces raised, with rounded edges; cuts made to look flattish, and at lower level. (4*d*) Appearance of additional and imperfect ridges. (5*d*) Series of imbricated and shaded bands.

In the lines cut by Mr. Ackland no attempt was made to produce the narrowest possible furrows. The width of furrows found practically convenient for micrometers was only slightly deviated from, as some cuts were a little deeper than others, and thus caused the wedge-shaped diamond point to open the furrows a little wider. The interspaces of the narrowest were much wider than the cuts. It is obvious that a cut wide enough to be distinctly seen, under given magnification, will present to view two linear edges, and thus be reckoned as two lines, if its true character be not considered.

Cuts very close together may, if the cohesion of the glass and the perfection of the cutting tool permit, be wider than their interspaces.

It will be seen that in the preceding statements only one instance is mentioned of appearances agreeing tolerably well with the real facts. It must not be inferred from this that it is not easy to exhibit moderately fine cuts correctly, or very nearly so. The object of this paper was to select a number of appearances all looking as if they might correspond with the facts, and all differing more or less from them.

Those who study the most vexatious diatoms or Nobert's test lines must, it appears to the writer, not only take into account what they do see, but what they ought to see, provided the object has a certain definite structure, and certain powers of producing optical images under given conditions.

ON A NEW CONNECTION FOR THE INDUCTION COIL.

By Prof. Edwin J. Houston, in the Journal of the Franklin Institute.

The following experiments were made at the Central High School of Philadelphia, with a view of increasing the quantity of the spark of the induction coil without greatly diminishing its length. The instrument used was made by Ritchie, of Boston, and will throw the spark six inches in free air.

One of the poles or ends of the secondary wire was connected with the earth by a copper wire, attached to a gas pipe. The other pole was connected with a wire, which rested on a large lecture table holding the coil. On turning the break piece, the electricity, instead of being lost by passing along the wires to the earth, jumped from the pole connected with the table to that connected with the earth. The thickness of the spark was greatly increased, its length diminished, and its color changed to a silvery white, as when a Leyden jar is placed in the path of the discharge.

While the electricity is flowing between the points, long sparks may be drawn from any part of the table, or from any metallic article within eight or nine feet of the coil. On one occasion, the gas was lighted by a spark drawn from the finger of a person standing on the floor. The gas pipe being in almost perfect connection with the earth, the spark must have been given to it from the body of the person.

On another occasion, one wire was attached to the gas pipe, as before, and the other to a stove, whose pipe connects with that of another stove in an adjoining room. The thickness of the spark was greatly increased. Sparks were drawn from the distant stove, and even from a small steam engine, which latter was fully thirty feet from the coil. In all the experiments it was found necessary to insulate the handle of the break piece, as a slight shock was experienced at every break. The poles being kept at a distance from each other less than the insulating power of the coil, six inches, no danger of injuring the instrument was apprehended. In one instance sparks were drawn, in a room underneath the adjoining room, from a wire which connected with the table on which the coil rested.

These facts showing great loss of the electricity, but indicating the need for a large conductor, probably to allow the rapid discharge of the secondary wire, a large insulated conductor was extemporized, by placing some old tin stills and percolators on large glass jars. On connecting one of the poles with this conductor, and the other with the gas pipe, the quantity of the spark was increased, though there was reason to believe that, with a larger conductor, better results would have been obtained. The conductor was then divided into two, of about equal size, which were connected with the poles. The quantity of the spark was increased, with, however, great diminution in the length. By successively diminishing the size of one of the conductors, and increasing that of the other, the length of the spark was increased, without any sensible diminution in its quantity, until, when one of the conductors was less than one square foot in surface, a fine quantity spark of about five inches was obtained.

It will be noticed that this connection is somewhat similar to that used in the common cylinder or plate machine, in which one of the conductors, generally the negative, is connected with the earth, and the quantity of the electricity thereby increased.

In all the experiments in which one pole was in partial connection with the earth, as when it rested on the table, the loss of electricity must have been very great, for several gas and water pipes were in connection with the table. If, then, the table merely serves as an imperfectly insulated conductor, which allows the rapid induction of electricity in the secondary wire by its rapid discharge, and thereby, notwithstanding the loss, gives so great an increase in the quantity of the spark, it would seem that if, instead of the table, an insulated conductor of very large surface were used, a much greater increase in quantity would be obtained.

It would seem from the above experiments, that the maximum increase will be obtained when one of the poles is connected with an insulated conductor, say several hundred square feet in surface, and the other with the earth.

Cultivation of Rice.

In preparing the land for rice, the ground is cleared, embanked and ditched in a thorough manner, and is often laid out into independent fields, so that a certain number of hands can complete any one operation connected with the culture of the rice, in a single day. The ditches are often five feet wide, and as many deep, and the main one is sometimes large enough to be used as a canal in boating the rice in large flats, from the fields to the place of stacking. The land is plowed or dug over with the hoe early in the winter, and is kept under water during the warm changes in the weather. In March, the ground is left to dry, and made ready for the seeds. Trenches for the same are run at right angles with the drains from thirteen to fifteen inches apart, with a four inch trenching hoe. From April till the middle of May, the seed is scattered in these trenches at the rate of about two and a half bushels to the acre. The seed is sown lightly covered with the soil, and the plan has been to let in the water upon the land for several days after the seed is put in, or until it sprouts. Latterly it is considered better to stir the seed in clayey water the day before sowing, as the clay adheres to the seed so that it remains in the trenches when the water is let on, if not covered by the soil. After the water stands from four to six days on the sprouts, it is let off, and when the plants are about five weeks old, the first hoeing takes place. The plants are again hoed in ten days, and then the "long water" is put on for two weeks, at first deep for four days, afterwards gradually diminishing the depth of water. After two more hoeings, the joint appears in the plant, and the "joint water" is let on to remain a few days before the grain is ready to be cut with the sickle.

Rice grows much like wheat, with stalks from four to six feet high. It is closer jointed than wheat, with leaves resembling those of the leek, and the seed is inclosed in a rough, yellow looking husk. The average yield on the low land is about forty bushels to the acre, a bushel weighing usually forty-five pounds.

South Carolina is the most successful rice growing State in the Union, and her rice commands the highest prices in market. It is said that the seed was first introduced into the State accidentally, from a Madagascar vessel that put into Charleston in 1694

It was formerly customary for the planters to have their slaves separate the rice from the outside husk by pounding in small hand mortars. Each male hand had his task allotted him, of pounding three pecks before breakfast, and the same amount after the day's work was over in the field. It is now done by machinery at the rice mill. The mill is provided with long upright wooden pestles, which pound the rice a certain number of strokes in long wooden mortars. After undergoing this process the rice is cleaned and then passed over wire sieves, so arranged that the small and broken grain falls through the fine meshes in the sieve, the large and perfect grain through the larger ones. In this way the various grades of rice are assorted for market.

WOVEN WIRE MATTRESSES.

In almost every newspaper one takes up, the eye meets a very artistic engraving of a mattress, fabricated in wire, and, accompanying it, an advertisement of the Woven Wire Mattress Company, Geo. C. Perkins, Secretary, Hartford, Conn.

In the SCIENTIFIC AMERICAN about a year and a half ago, when the manufacture of these mattresses was in its infancy, and before some of the improvements since added were made, we published an engraving of the article, which elicited considerable inquiry from managers of hospitals and other public institutions, in various parts of the United States, and from some of the warmer countries in Middle and South America.

From the time of the fall exhibition of the American Institute of 1869, when the energetic secretary of the company first exhibited them, the wire mattress has been gaining favor with the public, until it is now on sale in nearly all cities and large towns in the United States.

The company, we learn, is turning out several hundred beds a week, and the demand for hospitals, steamships and private use is constantly increasing.

The mattresses are durable, cool for warm weather, comfortable to lie upon, and insects avoid them.

A MANUFACTURER of Easthampton has offered an endowment of $500,000 to Amherst College, on condition of the name being changed to "Williston University"

A RAILROAD of 30 inch gage, 11 miles in length, is to be constructed in Green county, Tenn. It will cost $30,000 only

PATENT OFFICE DECISION.

Henry Moule and James Bannehr—Appeal from Examiner-in-Chief, March 31, 1871.—In the matter of the application of Henry Moule and James Bannehr, for letters patent for Improvements in Earth Closets.—Applicants have invented, and in their specification have described, a particular form of mechanism adapted to the earth closet, and which, if new, will entitle them to a patent. The claims set up are in the following language:

1. The application of dry and powdered earth, in closets and commodes, to the excrementitious matters deposited therein.

2. In combination with an excrement chamber and a hopper, or other receptacle, for deodorizing material, a charger or distributer, located between them, and adapted to discharge portions of the contents of the deodorent receptacle into the excrement chamber in the manner set forth.

3. In combination with a commode or closet, in which there is a means provided for deodorizing the excrement, a means for mixing the discharged mass, substantially as set forth.

In conformity with the current practice of the Office, as grounded upon the decision in *ex parte* Charles Rubens & Co. (Commissioner's Decisions, 1869 107), the concluding words of the second and third claims should be ignored in considering the novelty of what is therein claimed; and in fact applicants' attorney has based his whole argument upon the supposition that these words are mere surplusage, and are not to be regarded as in anywise limiting the scope of the claims. It will thus be seen that applicants do not confine themselves to the mechanism described, and of which they are doubtless original, and perhaps the first inventors, but are seeking to secure claims in their nature calculated to lay under contribution every existing form of the useful invention to which their mechanical improvement relates.

The English patent granted to these same parties upon the invention now offered for an American patent bears date May 28, 1860.

All the references, then, which are cited by the examiner of a later date than the date of the English patent are manifestly insufficient, since they neither disprove the novelty of the invention nor establish a public use in the United States for more than two years prior to the pending application. At the time when they were given, May 21, 1870, they were pertinent, as tending to establish the fact of common and public use in the United States prior to the application; but the legislation of 1870 so far changed the law in this regard that public use in the United States for a less time than two years prior to an application upon an invention previously patented in a foreign country, cannot constitute a bar to the grant of a patent here; and by the second proviso of section 111, of the act of July 8, 1870, the applicants are entitled to the benefit of this more liberal legislation. Going back, however, to the English patent of Legras, No. 12,869, of 1849, there are found, minutely described, various forms of commodes, port-

able and otherwise, having mechanical devices for applying a disinfectant to the fecal substances deposited therein. By the arrangement of parts shown in Figs. 6 and 7, the deodorizing compound in the form of a powder is placed in a hopper, and from this it is taken in determinate quantities, as needed, and thrown into the receptacle provided below for holding the excreta. Different devices are shown for effecting the discharge of the disinfectants from the hopper into the general receptacle, but the location of them all is between the two. The reference is so complete an answer to the second claim of the pending application that the wonder is that the claim should ever have been carried beyond the first rejection by the primary examiner.

As to the first claim, it is to be considered that commodes were not new at the time when the invention of the present parties was made, as is to be seen by reference to the Legras patent; that it was a part of the plan of prior inventors to employ in their commodes any disinfectants which might be suited to the purpose, as is also to be seen by reference to the same patent; and that the disinfectant properties of earth were previously well known, as is abundantly shown in "Ure's Dictionary," vol. 2, p. 29, cited by the examiner, as also in the twenty-third chapter of Deuteronomy, to which reference is made by the examiners-in-chief. Under such circumstances there certainly can be no foundation for the claim which applicants now assert. To apply this well known disinfectant to an old purpose, and in so doing to employ an old apparatus specially designed for effecting the application of any disinfectant to the same purpose, contains no element of invention. Applicants lay great stress upon the fact that they bring the earth into a *dry and powdered* condition prior to its use, of the advantage of which they claim that they were the first discoverers. In this, too, they mistake. The whole inference from the passage referred to in "Ure's Dictionary" is, that the deodorizing properties of earth depend upon its dryness and its porosity, or, which is the same thing, its fineness. From the note upon page 154 of the "Bulletin de la Société d'Encouragement pour l'Industrie Nationale, 1848," it appears also that earth has been artificially dried in furnaces in order to perfect its action as a disinfectant. The claim must be rejected.

The third claim relates to a stirrer or mixer, placed in the receiving chamber of the commode, and moved by any appropriate means, for the purpose of thoroughly mixing the earth with the other contents of the chamber. There is no evidence to show that the applicants were not the first to conceive of the advantage of thus mixing the contents of the general receptacle, and the first to invent a mechanism therefor. The idea once reduced to practice, it is plain that various forms of mechanism might be found useful for this purpose. It would seem, therefore, that the protection afforded to the inventors should not be confined to the specific device shown, since their real invention consists, not so much in this particular device, as in the discovery that any device mechanically capable of performing the work can be advantageously applied in the direction indicated. With proper amendments of the body of the specification, and the abandonment of the first and second claims, no good reason appears why the last claim should not be allowed.

As the case now stands, however, the decision of the examiners-in-chief is confirmed, and the application refused.

DUNCAN, Acting Commissioner.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—EXPLANATION WANTED.—I am running an engine lathe, twenty-four inch swing; and a short time ago, I tried to bore a pair of sixteen inch cylinders, and could not do it, as the gearing gave way at every trial. I first used wood (as "steadies" in my boring head, using a 4½ boring bar of wrought iron); and thinking the wood created too much friction, I took them out and took a single cut (not over one sixteenth cut), and still the lathe would not drive it, and I finally had to give it up. I substituted a brass pinion for one gear, and lost a tooth out of it. The lathe is all right again, and today I am turning off a twenty-four inch pulley (using the same gears on the lathe). Now, it seems to me that the lathe should have more to do (the cuts being equal) in turning off a twenty-four inch pulley than in boring a sixteen inch hole. Will some one explain why it requires more power for the bore than the pulley?—K.

2.—ELECTROPLATING.—How can I prepare Britannia metal, tin, and ordinary soft solder, so that they can be electroplated or gilt in a cyanide solution? I cannot get the information from Smee or Napier, but have no doubt that some of your readers can readily describe the desired process.—J. F.

3.—ICE BOAT.—Will some one tell me the dimensions of an ice boat which would carry two medium sized persons?—C. S. M. K.

4.—FIXING LEAD PENCIL MARKS.—I would like a ready way of fixing lead pencil marks to paper.—J. H. R.

5.—JAPANNING.—I wish a recipe for making and using the quickest baking and best Japan.—B. B. C.

6.—MALLEABLE IRON.—Will some one give me practical information how to make malleable cast iron? Or, are there any works explaining the theory?—E. D. P.

7.—SPECTROSCOPE.—I have a hollow glass prism, filled with bisulphide of carbon, two inches on each face. I would like to know what the width and depth of the slit should be, through which the light first passes, what should be the diameter and focal length of the lens in the first tube, and what distance should it be placed from the prism? Also, what power should the telescope be for viewing the spectrum formed, and of what lenses should it be made?—M. T.

8.—MUCILAGE AND INK.—Will some of your readers give me a formula or making mucilage, such as sold by stationers, and also a formula for a good, cheap, black copying ink?—A. S.

9.—CHEAP LATHE.—I would like practical directions for constructing, at the least possible expense, a light lathe of about eight inches swing; as great accuracy is not essential, metal need be employed only where absolutely necessary, as for spindles, bearings, centers, etc. Precise directions, giving dimensions and all other details, would no doubt be welcome to many an amateur mechanic who cannot afford to buy even a cheap lathe, but would at once go in for one if he could only make it himself.—C. M

10.—NICKEL PLATING.—I wish plain practical directions and formula for nickel plating?—T. D. T.

11.—DYEING COTTON BLACK.—I want to dye soft cotton black, and have no steam. Can I do it and get a good color without steam, and would it be better to use aniline black, or the usual dye stuffs?—H. W.

12.—GILDING ON GLASS.—What is the size used for gilding on glass?—M.

13.—TELESCOPE AND HOROSCOPE.—I wish to know, if, with the addition of one more convex lens of one inch diameter I cannot make a terrestrial telescope from the directions given in No. 18, by A. W. G., of Mich.; and will it change the power? I also wish to know the meaning of tracing the horoscope, and how it is done.—E. T.

14.—EMERY WHEEL.—Can any reader of the SCIENTIFIC AMERICAN tell me how to make solid emery wheels that will not gum nor chip?—T. W. B.

15.—OVERSHOT WHEEL.—I wish a rule, simple and practical, for calculating the power of overshot water wheels, and the means of determining with accuracy the power of water in a flowing stream.—T. W. B.

16.—SPEED OF CIRCULAR SAW.—I want a rule for determining the number of revolutions a circular slitting saw of any given size should make per minute.—T. W. B.

17.—REFINING GOLD.—Can some one give me any information on refining gold? I melted over some scrap gold leaf, which appeared to be very free from dirt, but after melting, it looked like a lump of tin instead of gold. When we sell it to the gold beater, he melts it over into fine gold.—F. E. H.

18.—BELT.—Can you tell me why a belt runs to the largest part of a pulley? I have asked a number of mechanics for a year past, but they cannot tell why.—F. E. H.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

TURNBULL'S BLUE.—With much deference to the undoubted erudition of your correspondent, E. C., of N. J., I must point him to an error into which he has certainly fallen, and into which he is likely to lead J. B., who wants to know how to make "Turnbull's blue." E. C. has given a good formula for the preparation of ordinary Prussian blue (Fe_7Cy_{18}). But to make Turnbull's blue, (Fe_5Cy_{12}), the ferricyanide (red prussiate), and not the ferrocyanide (yellow prussiate) must be used. Also, instead of using the tersulphate of iron, which is a sesqui-salt, the proto-sulphate, or some other proto-salt of iron is absolutely necessary to the production of Turnbull's blue, which differs from common Prussian only by being of a brighter tint. Fownes, or any other chemical authority will furnish further information.—C. L. R. S., of D. C.

POUNDING OF PISTON.—Let E. S. take out the trap and put in a half inch globe valve at each end of the cylinder, and keep them open while the engine is in motion. The trap, while good in theory, is liable to fail in exhausting the water whenever the spring, which lifts the valve, loses its strength or is held down by weight of water. The advantage of the globe valve is, that while but a little steam will escape, it effectually exhausts the water.—H. A. G.

TO KILL BEDBUGS.—Any woman ought to be ashamed to ask for an article to kill bedbugs. No one will be troubled with these pests if they will take the trouble to thoroughly cleanse the bed and room once a month. Bedbugs can stand anything better than cleanliness. The March cleansing is the most fatal to them; it destroys them root and branch. Any one troubled with this "peculiar heathen" who will take the trouble to observe the foregoing method for three or six months, will be entirely relieved of them without fail. If the cleaning be continued at intervals of three months, bedbugs will never appear.—C. A. H., of Mass

TO KILL BEDBUGS.—If "Housekeeper," No. 11, page 346 Vol. XXII., will use benzine or gasoline, she can kill bedbugs as fast as she can find them; and by using a spring bottom oiler, the fluid can be forced into cracks and crevices which can be reached only by this or similar means. I cleaned them out of a room lined and ceiled with matched boards, by it. Housekeeper will have to be careful about fire, and the room should be well ventilated till the gas passes away.—J. M. A.

HONING RAZOR.—P. R. says that in honing his razor, he always gets a rough wire edge. So he ought to have. Always hone until you turn the edge, or you might as well not hone at all. Now to get a smooth cutting edge is what you want. Moisten your thumb nail and draw the edge of the razor back and forth a time or two across the nail. Put it on the coarse side of your strap first. Keep trying it across the nail until you get a smooth edge. You can tell this by its feel; for when smooth, it will seem to cut right in the nail, and no roughness will be felt. Then bring up the edge on the fine side of the strap, with a few strokes on the palm of the hand to finish it. If you once get a smooth edge, and it shaves well, never use any strap but the palm of your hand; and I will guarantee it to keep its edge for months. It is very easy to strap the edge off of a razor by strapping too much. Never wipe your razor on dry paper, or cloth of any kind; it will take the edge off.—H. D. W., of D. C.

MAGIC LANTERN.—Your querist, No. 11, page 282, can construct a magic lantern to meet his requirements, as follows: Use a plain convex lens, 4 inches in diameter, and 8 inches focus; put one double convex lens, 2 inches in diameter, in the focus of the first. The light should be placed three inches from the large lens.—H. W. G., of Mich.

OILING FURNITURE.—In answer to query No. 1, in your issue of May 20, I would state for the information of A. H. that pure linseed oil (raw oil) is used for walnut furniture, applied with a brush. Some prefer, however, the red furniture oil, as it gives the wood a darker appearance. If it is to be finished with copal varnish, the oil should be allowed to dry perfectly; then two or three coats of varnish should be applied for the purpose of filling the pores or grain of the wood. After which the article must be rubbed with fine or worn out sand paper to get a smooth surface. Then apply two or three coats of varnish, and rub down and polish or flow as necessary. Care should be taken to let each coat of varnish get perfectly dry and hard before putting on another.—H. L., of N. Y.

POUNDING OF PISTON.—Your correspondent "S. E." in issue of May 20th, asks what makes his piston pound. I set up an engine once that was troubled with the same difficulty, and afterwards spent a large amount of time and some money in trying to remedy the trouble. The company that made the engine, made the cylinders a little longer, giving more clearance, and consequently more steam room at each end, and we never had any more trouble from that source. Our company was striving to be too economical in cast iron, and also trying to waste as little steam as possible in "cushioning," as it is called, but always afterward gave plenty of clearance to the pistons.—C. H. C.

POUNDING IN STEAM CYLINDER.—S. E. asks "what is the cause of the knocking in the cylinder?" I have known valves in steam closets to knock, and sound as though the trouble were in the cylinder. I suspect, however, that the trouble of which S. E. complains, is that the crank is ahead of the steam pressure at the beginning of the stroke, when the governor valve is hard down, so as not to admit sufficient steam to start the piston in time for the crank. This can be obviated by setting the eccentric ahead. If his engine be of short stroke and large cylinder, and set high from the bed plate, and pounds when the governor valve is up, giving full steam, S. E. may depend on it that the bed plate is too weak.—S. G. D., of Pa.

M. E. Y.—Some medicines appear to operate in a peculiar way upon the retina of the eye. For example: Dr. Rose, of Berlin, has described a sort of color blindness, in respect to blue colors only, produced by taking a dose of santonine. After the effect of the medicine has subsided, the natural power of the eye to distinguish blue returns.