### HOW TO MAKE STATUARY IN PAPER.

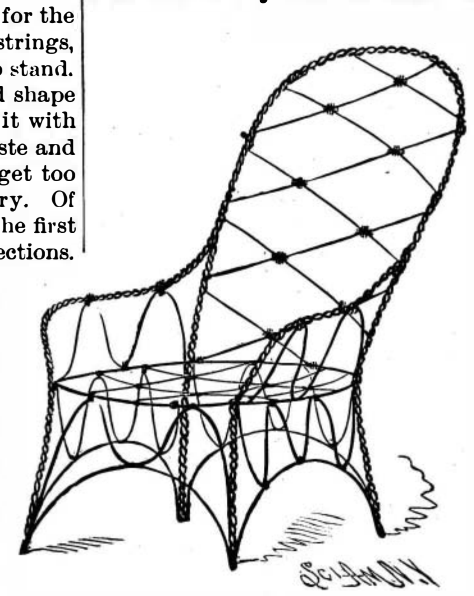
A new branch in the art of home adornment, which is well worthy of attention, has been wrought by Mrs. Cordelia Shont, of Pittsburg, Crawford Co., Kansas. Our notice was first called to the work of this artist by Mrs. A. N. Leigh, of the same place, who sent us a photograph of the originals from which our engraving has been produced. The principal example is a graceful statue of a female figure, made of paper, and there are also vases and chairs. Our engraving hardly does justice to the statue, which is quite an artistic production. Asall these specimens are of home manufacture, we have thought it would be interesting to our readers to learn from the author herself how they were made, and we accordingly give the following account, which Mrs. Shont has kindly furnished to us:

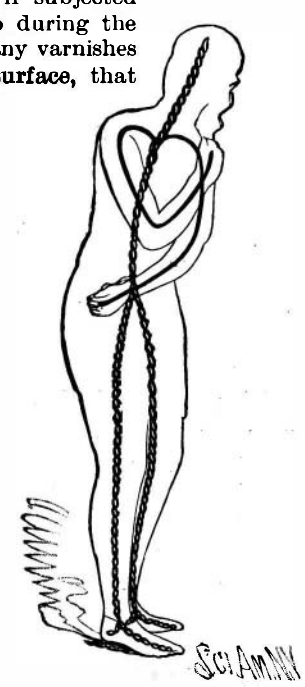
"You will see by the photograph that the principal piece of work is a statue, the title of which is "Surprised at the Bath." The expression is intended to be one of displeasure. It is five feet high, weighs ninety pounds, is made of waste wrapping paper and flour paste, and finished with several coats of white lead.

"There are three vases and two chairs made of paper, which have been in use for nearly a year, and have not suffered from use.

"The statue is solid. There is a wire frame for the limbs and head. I wound it with stout cloth strings, wet in flour paste, let it dry until firm enough to stand. Then I put on the paper until it was the desired shape and size, always letting it dry after going over it with two or three thicknesses of paper wet with paste and well pressed down with my hands. When I get too much on in one place, I whittle it off when dry. Of course, the more nearly correct it is made in the first place, the less work there will be to make corrections.

"Taking everything in consideration, I think paper is the best material for working out one's ideas in art or ornament that has ever come in use, because every one can get the material, and if we fail or make a mistake, or wish to change, we can do so without losing all of the work. After I had the statue nearly done, I changed it by sawing the neck and waist in to the wire, then turned and bent in the shape desired, cut out some wedge-shaped pieces of paper, and pasted them in the cavity until it was all solid and firm as ever.





"The chairs have wire frames tied where the wires cross, with strings wet with paste, then filled and pressed in between with paper till even with the wire, and as much more as desired. Pieces of stout cloth are good where increased strength is required, always finishing with paper. The paper can be rasped to make it straight. Sandpaper and oil paint make a good finish.

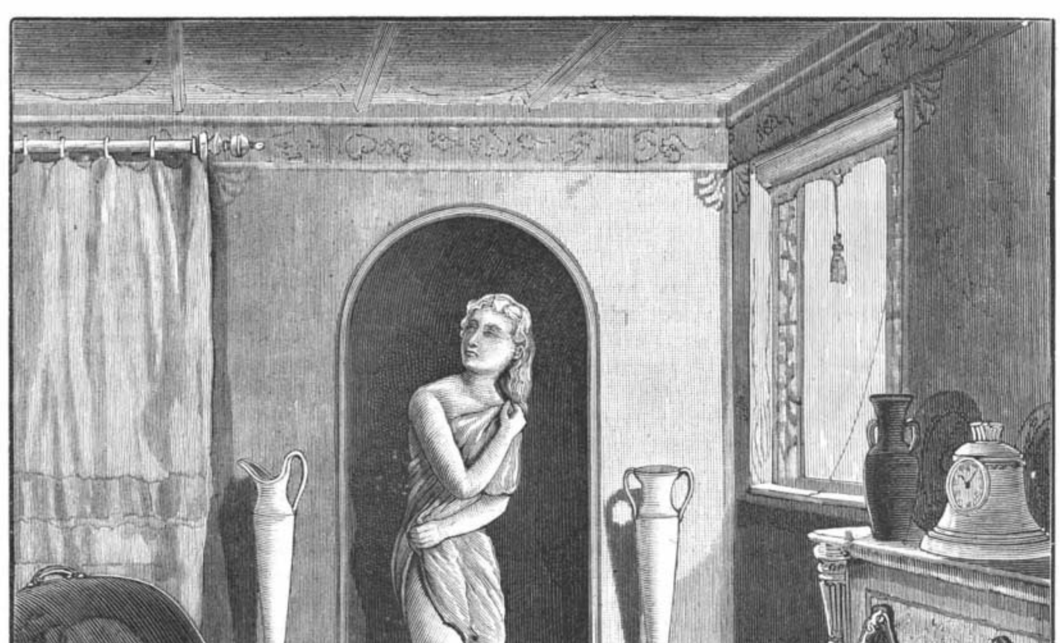
"The vases are made by cutting paper and sawing or pasting it in shape. It is best not to put too much paper on at once, but dry often.

"I commenced the statue last June, and had it ready for the fair in October. It might take longer to make one in marble. In paper we can try as often as we please to improve the expression. Marble may always be considered the best in art, but paper has a great many advantages. It can be knocked about with little care, and if broken can be repaired. I executed this work and hardly missed the room it took in the house. It is light and easily carried and stowed away anywhere, when I had other work to do. I never would have had a chance to do in marble what I have and can do with paper, and that may be the case with many others.

"I send three sketches; the heavy lines, five in number, in the statue represent the length of the wires. They can be bent any shape to suit. It is easier to make the hands and ears separate, then fasten in and finish afterward. The feet must be made solid at first, or they will not bear the weight if moved while damp with new paste.

"The crosses in the chair show where the wires are tied with pasted strings. Then paste on and fit in as stated before.

"A cone-shaped paper is all that is necessary for a straight vase; for a very slim stem, a wire frame will make it so stout there will be no danger of breaking."



HOW TO MAKE PAPER STATUARY.

### Varnishing Glass.

BY NELSON K. CHERRILL.

In a recent number of the *Electrician* it is mentioned that Messrs. Siemens and Halske have recently adopted the system of dipping lamps in a thin semi-transparent varnish to obtain the effect of ground glass. As the writer has had much experience in this class of work, a few notes of the best mode of procedure may be of interest. The application of various modifications to the normal appearance of a lamp by means of varnish, either colored or plain, is by no means a novel expedient, and a similar plan has, I believe, been commonly employed in many places for decorative work.

The most important point in the application of varnish to a lamp is to get it to dry just in the right condition. Most kinds of varnish that will dry "bright" under ordinary circumstances will become "matt" if subjected to a chill, or to the action of damp during the drying, and at the same time many varnishes intended to dry with a "matt" surface, that would represent ground glass, dry "bright," if the conditions of drying are not quite suitable.

The class of varnish best adapted to this kind of work is what is known as photographer's negative varnish. This class of varnish dries almost as hard as the glass itself, and when well applied is very durable. When colored lamps are needed, the varnish should be of a quality to dry "bright," but when the effect of ground glass only is required, the simplest way is to use what is known as "retouching" varnish, which gives a "matt" surface at once. In default of this, the ordinary negative varnish can be easily modified to give the desired surface by the addition of a little weaker alcohol, which almost always has the desired effect; but if there is any difficulty, a little common resin, which chills very easily in drying, may be added to the varnish.

As to the mode of applying the varnish to the lamps, the best plan is to hang them on a frame by their contacts, so that a current can be passed through them during the operation. The lamps should be well washed in warm water, in which there has been dissolved a liberal dose of soda. A thorough rinse with fresh cold water should be given, and the bulbs should then be carefully wiped quite dry with clean linen rags. If the work is to be very nicely done, the operator who hangs up the lamps on the screen should have on linen gloves, as finger marks on the glass are apt to show when the whole process is finished. The varnish is poured into an upright glass vessel large enough to contain the lamp. A common drinking glass is as good as anything, if large enough to admit the lamp. In pouring out the varnish, care should be taken not to disturb any sediment which may be at the bottom, and if not quite clear it should be filtered, as it is of the greatest importance to avoid any small floating particles, which would cause spots or streaks on the finished surface.

All being ready, if the varnish is to dry bright, *i. e.*, for colored lamps, etc., switch on the current to the lamp for a few moments, so as to render it slightly warm. Then turn it off, and taking the glass of varnish in the left hand, raise it under the lamp until the whole globe is immersed. If the lamp is in any kind of rigid fitting it will be very easy to immerse it, but if it is merely hung on a couple of wires, it will require the aid of a little instrument, consisting of a forked piece of wood, to push the globe down into the varnish. As soon as the varnish entirely covers the globe, lower the glass with one steady movement, so that the draining off the superfluous varnish shall be commenced in one even wave all over the globe. Any hesitation or pausing in the motion of the glass will be almost sure to cause a line on the finished lamp.

As soon as the tumbler of varnish is quite clear from the lamp, turn on the current again, and leave it running, while several more lamps are being done. When about twelve lamps have been varnished, the first will be ready to come off. But a little care must be taken till the lamp is quite cold, as some varnishes will finger mark readily at this stage. If the varnish is to dry "matt," the lamp should be plunged quite cold, and no current should be put into the lamp till the varnish has chilled all over, then a little warmth will aid the drying, and will also harden the varnish. Almost any color can be given to the varnish by the simple use of Judson's dyes, which will readily mix with the varnish and impart their characteristic tints.

Blue is the most difficult color to arrive at satisfactorily, as the dye does not seem to blend so well with the varnish as the other colors, and, besides, the color is spoilt by the yellow tone of the light. To avoid this part of the difficulty, the lamps which are to be used blue should be run as *hot* as possible, while those for red or yellow colors may be comparatively cool, the yellow especially so.

It goes without saying that all the testing of the lamps must be finished before the varnishing is commenced.

A pleasing effect is sometimes produced for purely decorative work by using a little dye with the "matt" varnish.

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THE lightest production of quicksilver in the United States for the last ten years was last year's, being only 27,756 flasks. The increased imports of nearly 8,000 flasks from England to the United States include the large transit trade of that article to the Mexican mines.

### Life in a Sun Cluster.

In the constellation Hercules there is a compact star cluster well known to owners of powerful telescopes as one of the most interesting and wonderful phenomena to be found in the heavens. To the naked eye it looks like a faint star. In the telescope it appears as a spherical mass of stars, with short, straggling streams, also composed of stars, radiating from it. William Herschel computed the number of stars in this cluster at not less than 14,000. In the center they appear so compressed that it is impossible to count them.

Of course, every one of the members of this starry swarm is a sun, and astronomers have sometimes piqued their imagination by wondering what must be the condition of things prevailing in such a system of suns, and what results flow from the inevitable laws of gravitation there. Could inhabited worlds exist in a sun cluster?

A calculation of the probable size of the stars in the cluster in Hercules, and of the average distance which separates one from another, has just been made in England by Mr. J. E. Gore. He concludes that they have an average diameter of 45,000 miles, and that the distance from any star in the cluster to the next star is 9,000,000,000 miles.

Taking Mr. Gore's figures as being probably as near the truth as we can get, a little consideration will give us some very interesting results. If the stars in question are only 45,000 miles in diameter, the surface of each possesses an area about one-quarter as great as that of the planet Jupiter. Their distance apart, as calculated by Mr. Gore, is more than twenty times the present distance of Jupiter from the earth. Just now Jupiter shines brighter than any star in our sky, with the exception of Venus. If its disk were reduced to one-quarter of its actual size, and it was removed twenty times as far away as it is, it would become invisible to the naked eye.

But Jupiter shines only by reflected light, while the stars, being suns, shine with their own light, which is enormously more brilliant than that of a planet. So if we wish to get an idea of the amount of light shed by one of these clustered suns in Hercules, we must put a body that shines after the manner of the sun in the place of Jupiter. Now, if we should remove the sun to a distance of 9,000,000,000 miles, or, roughly, a hundred times as far away as it actually is, it would send us only one ten-thousandth part of the light that we now receive from it. Then, if we should reduce it to a diameter of 45,000 miles, equal to that of the stars in the Hercules cluster, its light would be reduced about 360 times more, so that it would then shine to us with only one three-million-six-hundred-thousandth part of the light that it now sheds upon the earth. This, then, supposing that the intrinsic brilliancy of the stars is the same as that of the sun, would represent the amount of light that one of the stars in the cluster sends to its next neighbor.

But in order to get a conception of the appearance that such a star would present, we must compare its light with that of the stars in our sky. This comparison involves a good deal of uncertainty, owing to the great differences in the various estimates that have been made of the brightness of the stars as compared with the sun or moon. Still, we can probably get near enough to the truth for our purpose. Take the bright star Sirius, the most brilliant fixed star in the heavens. Any one who wishes can see it in the southern heavens early in the evening at this season. Various estimates of the light of Sirius have made it from one twenty-thousand-millionth up to about one five-thousand-millionth of the sun's light. Suppose we adopt the latter figure as being the most favorable to Sirius. Then, comparing this with the fraction representing the light of a star in Hercules as seen from its nearest neighbors in comparison with that of the sun, namely, one three-million-six-hundred-thousandth, we find that the light of the star is nearly 1,400 times as great as the light that Sirius sends to us. In other words, if we could visit the cluster in Hercules, we should find that its stars, as seen from a distance of 9,000,000,000 miles, their average distance apart, would shine 1,400 times as bright as Sirius shines in our sky.

Sirius is probably 500 times as bright as the faintest star that the naked eye perceives on a clear night. Then imagine a star three times as much brighter than Sirius as Sirius is brighter than the smallest star you can see, and you will have some notion of the brilliancy of the stars in question as seen from one another.

Now let us suppose a world revolving around a star situated at the center of the cluster. Assuming that the surrounding stars are arranged in a pretty symmetrical way, there would be a dozen of them within a distance of 9,000,000,000 miles, and each of these would, as seen from the world at the center, appear 1,400 times brighter than Sirius appears to us. There would be upward of fifty stars twice as far away, each of which would be 350 times as bright as Sirius. Thus the stars of the cluster, as seen from the center, would go on increasing in number and diminishing in brightness; but as the total number is limited to 14,000 or 15,000, the outermost stars would be approximately 135,000,000,000 miles away, and each would shine six times as bright as Sirius.

It is apparent that there would be a sort of perpetual daylight at the center of such a congregation of suns. Let us see about how bright this light would be. Of course our supposititious planet might receive from the sun to which it belonged as brilliant a daylight as our sun gives to us, but what would be the illumination of its nights; or, in other words, of that side of it which was turned away from its sun? Zollner has estimated the light of the sun to be 618,000 times as great as that of the full moon. This, upon the estimate of the amount of Sirius' light as compared with the sun's that we have adopted, would give the moon about 8,000 times as much light as Sirius.

Since each of the stars in the cluster has 1,400 times the light of Sirius, at 9,000,000,000 miles distance, and there are a dozen of them within that distance of the center, it follows that these dozen stars will shed above twice as much light upon a world in the center of the cluster as the full moon sends to us. And since the light received from a body varies inversely as the square of its distance, while the number of such bodies arranged in the roughly spherical way we have supposed would increase directly as the square of their distance from the center, it is clear that the amount of light received from the whole cluster would be as many times the amount received from the twelve stars nearest the center as the radius of the cluster exceeds 9,000,000,000 miles. This would be about fifteen times, and so the total amount of light shed upon the center would be fifteen times the amount shed from the first twelve stars, or about thirty times the amount that the full moon pours upon the earth. But only half the stars of the cluster would be above the horizon at once, and so the illumination of the night sky on our imaginary world would be fifteen times as bright as the light of the full moon upon the earth.

The number of stars visible to us with the unaided eye on a clear night is not over 3,000, and the great majority of these are so faint that they require some attention to be seen at all. How contemptible, then, is the starry firmament presented to us in comparison with the glorious heavens in this sun cluster of Hercules, where more than twice as many stars as we can see blaze nightly with a radiance so brilliant that the faintest of them are six times as bright as the greatest star in our sky!

Indeed, the light of all these astonishingly bright stars diffused in the atmosphere of our imaginary planet would be so great as largely to rob the individual stars of their brilliance, just as the light of the moon or the blaze of the electric lights upon the Brooklyn bridge serves to partially efface the stars in our sky.

Another effect of this splendid display of stars would be to shut out from the view of the inhabitants of the center of the cluster all the outside universe. In the flood of light poured from the members of the cluster the other stars beyond them would be invisible, and the dwellers within the system would be, so to speak, shut up in a little universe of their own, knowing nothing of the greater universe beyond, in which we see their cluster floating like a mote in the sunbeams.

It remains to consider briefly what would be the condition of things upon a world circling around one of the stars at the outer edge of the cluster. Here, as a moment's thought shows, the appearances presented would be very different from those at the center of the cluster. Less than half of the sky visible from such a planet would be occupied by the brilliant stars of the cluster, while the other half would be, so to speak, open to the universe outside. The appearance of its night sky would depend upon the position of the planet in its orbit, and also upon the situation and inclination of that orbit with reference to the cluster. At certain seasons, the inhabitants of such a world might have a blazing nocturnal spectacle like that enjoyed by a world at the center of the cluster, or might see half of their visible firmament occupied by those splendid stars, while the other half was almost a blank by contrast; and at other seasons the stars of the cluster might be entirely concealed, and they would look off into the same starry universe that we behold. Or the orbit of the planet might be so situated that the clustered splendors we have described would be visible from only one of its hemispheres, so that the inhabitants of the other hemisphere, hearing the fame of this great celestial display, and desiring to behold it, would have to journey half around their globe to gratify their curiosity, as we have to go into the southern hemisphere to see the Southern Cross, the Magellanic clouds, and other celebrated sights of the austral sky.

But, somebody may ask, can inhabited worlds exist in such a system as that described? We certainly have no reason to think it impossible that they should. It is difficult, however, to understand just how the cluster itself exists. The complicated attractions prevailing among its members put it beyond the power of mathematical analysis to unravel their orbital motions. But facts are stronger than theories, and our eyes assure us that the cluster is there. Moreover, it is by no means the only phenomenon of the kind in the heavens. There are many star clusters, some as compact as this one in Hercules. As to the question of life in them, it can, perhaps, neither be proved nor disproved. But it is more agreeable to the mind, and more in accordance with the progress of science, which tends continually to establish the unity of the physical universe, to believe that intelligent beings enjoy the splendors of these distant capitals of space, than to think of them as barren and tenantless—mere spectral lights amid the "Saharas of creation."—*N. Y. Sun.*

### The Finest Fibers.

At a recent meeting of the Physical Society, a paper was read "On the Production, Preparation, and Properties of the Finest Fibers," by Mr. C. V. Boys, M.A. The inquiry into the production and properties of fibers was suggested by the experiments of Messrs. Gibson and Gregory "On the Tenacity of Spun Glass," described before the society on February 12, and the necessity of using such fibers in experiments on which Professor Rucker and the author are engaged.

The various methods of producing organic fibers, such as silk, cobweb, etc., and the mineral fibers—volcanic glass, slag wool, and spun glass—were referred to, and experiments shown in which masses of fibers of sealing wax or Canada balsam were produced by electrifying the melted substance. In producing very fine glass fibers, the author finds it best to use very small quantities at high temperatures, and the velocity of separation should be as great as possible. The oxyhydrogen jet is used to attain the high temperature, and several methods of obtaining a great velocity have been devised. The best results obtained are given by a cross bow and straw arrow, to the tail of which a thin rod of the substance to be drawn is cemented. Pine is used for the bow, because the ratio of its elasticity to its density—on which the velocity attainable depends—is great. The free end of the rod is held between the fingers, and when the middle part has been heated to the required temperature, the string of the cross bow is suddenly released, thus projecting the arrow with great velocity, and drawing out a long, fine fiber. By this means fibers of glass less than one ten-thousandth inch in diameter can be made.

The author has also experimented on many minerals, such as quartz, sapphire, ruby, garnet, feldspar, fluorspar, augite, emerald, etc., with more or less success. Ruby, sapphire, and fluorspar cannot well be drawn into fibers by this process, but quartz, augite, and feldspar give very satisfactory results. Garnet, when treated at low temperatures, yields fibers exhibiting the most beautiful colors. Some very interesting results have been obtained with quartz, from which fibers less than one one-hundred-thousandth inch in diameter have been obtained. It cannot be drawn directly from the crystal, but has to be slowly heated, fused, and cast into a thin rod, which rod is attached to the arrow, as previously described. Quartz fiber exhibits remarkable properties, as it seems to be free from torsional fatigue, so evident in glass and metallic fibers, and on this account is most valuable for instruments requiring torsional control. The tenacity of such fibers is about fifty tons on the square inch. In the experiments on the fatigue of fibers, great difficulty was experienced in obtaining a cement magnetically neutral, and sealing wax was found the most suitable.

An experiment was performed illustrating the fatigue of glass fibers under torsion, and diagrams exhibited showing that the effect of annealing them is to reduce the sub-permanent deformation to about one tenth its original amount under similar conditions. Annealing quartz fibers does not improve their torsional properties, and renders them rotten. Besides the use of quartz for torsional measurements, the author believes that quartz thermometers would be free from the change of zero so annoying in glass ones. He exhibited an annealed glass spiral, capable of weighing a millionth of a grain fairly accurately, and also a diffraction grating, made by placing the fine fibers side by side in the threads of fine screws. Gratings so made give banded spectra of white light.

### Apes as Workers.

The ideas of M. Victor Meunier with regard to the domestication of apes are discussed in the new number of the *Revue d'Anthropologie*, by Madame Clemence Royer, the French translator of Darwin. Madame Royer does not doubt that, under a proper system of training, apes might be made good workers. They lack perseverance, indeed, but in general intelligence they are, she thinks, superior to the dog, the horse, or even the elephant. She points out, however, that it would be necessary to feed domesticated apes with great quantities of fruit, bread, and eggs, that the process of educating them would be costly, and that for many generations they would probably be injuriously affected by the climate of Europe. Her opinion is that, if the experiment is to be made, it should be made first of all in tropical countries, where apes might be taught to labor in connection with the cultivation of coffee, cocoa, and cotton.