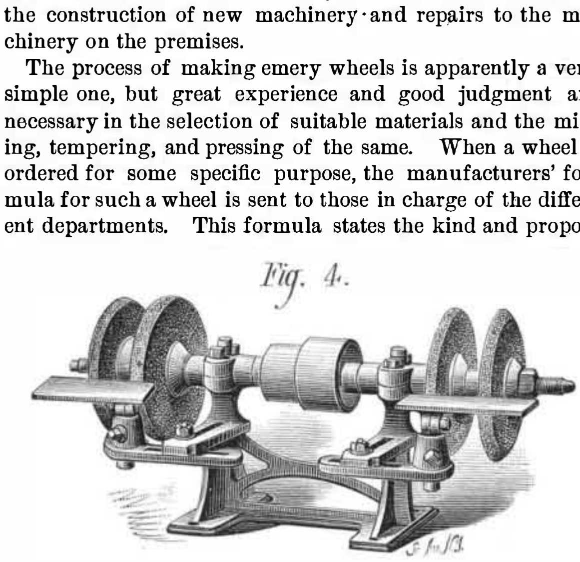
[*Continued from first page.*]
placed in trays and exposed to a uniform and peculiar atmosphere, indicated by a hygrometer, and a certain temperature varying slightly above and below 120°; the pressing room (Fig. 2, page 255), where there are hydraulic pumps and presses of great power, a great variety of moulds, and mechanical appliances for the manipulation of the wheels; a testing room (Fig. 3, page 255), where each wheel is tested before it leaves the manufactory; and a machine shop, for the construction of new machinery and repairs to the machinery on the premises.

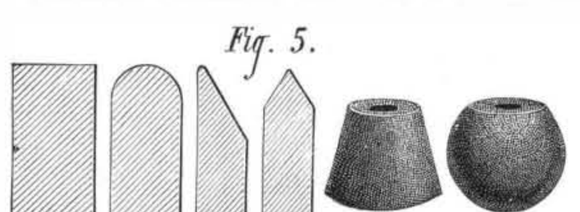
The process of making emery wheels is apparently a very simple one, but great experience and good judgment are necessary in the selection of suitable materials and the mixing, tempering, and pressing of the same. When a wheel is ordered for some specific purpose, the manufacturers' formula for such a wheel is sent to those in charge of the different departments. This formula states the kind and proportion of materials to be used, the pressure and heat to be applied, etc. The first process is the mixing and drying, as already referred to; the second, the pressing. After the composition and adhesive matter have been thoroughly worked and prepared, the mixture is placed in strong cylindrical or other shaped iron moulds and subjected to an enormous pressure. The hydraulic press, represented on the right of the engraving, Fig. 2, has a cylinder $5\frac{1}{4}$ inches thick, made out of gun metal; the ram is 19 inches in diameter; the platen 4 feet square, and the diameter of the Bessemer steel columns is $3\frac{1}{2}$ inches. This press is operated by double force pumps, and is capable of exerting an immense hydrostatic pressure. Attached to this machine is a mercurial gauge which will indicate 1,000 tons pressure. Smaller hydraulic presses are used for lighter work. The pressure on the wheels is applied at top and bottom, and the plates between which the wheel is pressed are heated by steam to certain temperatures. After the wheel has been thus moulded and pressed, the mould is taken to a smaller hydraulic press, which removes the wheel from the mould. It is then left to cool and harden, after which it is turned and "trued up" in an ordinary lathe, the turning being effected by the use of diamond turning tools. It is then ready for testing, which is done by putting the wheel on an arbor and driving it at a high speed, about 10,000 feet (surface speed) per minute. To prevent accident in case the wheel should burst, owing to the great centrifugal force, the wheel and its arbor are inclosed within a strong wooden guard or box, as seen in Fig. 3. Should the wheel stand this test it is considered safe for use. Emery wheels are made at the works of the above-named company, of all sizes and shapes. It is claimed that a wheel of this description, 30 inches in diameter and 5 inches thick, will wear down nearly to the spindle, and will do just as much work as when large if speeded up. Hence the importance of using cone pulleys on the spindles of emery wheels. Small wheels, $\frac{1}{2}$ inch in diameter and $\frac{1}{16}$ inch thick, are made for dental purposes. Fig. 4 represents an emery wheel machine, on the arbor of which from two to six wheels can be placed and operated at one time, and Fig. 5 shows some of the different forms in which the wheels can be shaped. The emery wheels made at these works are strong, durable, and of very excellent quality. Being made under a hydraulic pressure combined with heat, we are informed that perfect regularity in their hardness is obtained. There is no clogging or gumming, and the hardest metal when applied to the corners is cut rapidly away without any perceptible wear of the wheel.

Fig. 4.



THE LEHIGH EMERY WHEELS.

Fig. 5.



FORMS OF EMERY WHEELS.

THE CULTURE OF HOUSE PLANTS.

At this season of the year, a little care bestowed upon the treatment of house plants is better repaid in the future growth of the plants than at any other time. The soil for potting plants must be light. It may be lightened by mixing it with coarse sand such as builders use. The soil should not be pressed tightly about the plant roots, nor should the pot be quite filled with mould. There should always be drainage provided. For pots it is sufficient to well cover the bottom of the pot with small pieces of broken earthenware. But if boxes are used a layer an inch and a half deep of coarse cinders is excellent. This drainage is necessary to prevent the roots from rotting, and it follows that plants should never be watered from the flower pot saucers. But very little water is necessary at this time of year, nor should it be perceptibly warmed. Slips or cuttings will start best in unusually dry soil if the temperature is below 60° Fah., but if planted in coarse sand a liberal supply of water is necessary.

A very common error is to choose old wood for slips or cuttings, whereas the young green branches are the best. They should be planted deeply, and the surface of the soil must be kept loose. In watering, wet the soil in the neighborhood of, but not close to, the cutting. Carnations and pinks are best obtained by layering; that is, the shoots are cut half or three quarters through, and bent so that the part cut may be covered about a half inch in the soil. In about three weeks the part cut will have thrown out roots, when the cutting may be removed from the parent plant and potted by itself. Geranium slips are best obtained by cutting arms of young wood three quarters of the way through at a distance of about two inches from the end of the shoot, and then allowing the partly severed slip to stand about a week or eight days on the parent plant before entirely severing it. Running plants are best propagated by pinning the arms down to the surface of the soil; this will cause them to take root as they spread. To cause plants to grow bushy, pinch the eyes out of the ends of the longest branches, which will then throw out side shoots, and in this way a plant may be caused to grow to almost any required shape. If plants are infested with insects they may be effectually freed as follows: Place them upon a table or platform, on which there are two or three inches of sand, and cover them with a vessel of any kind, or place over them a cloth so arranged as to cover without damaging them. Beneath the vessel or cover insert some burning tobacco, and let it remain for ten or fifteen minutes. This is a much better plan than using tobacco water, because the smoke will permeate between the leaves, where it would be difficult to get the tobacco water; but if tobacco water is used, it should be syringed beneath the leaves in all directions. If the soil is impregnated with insects, as is very often the case from the use of fertilizers, the very best remedy is to let the soil get dry, and then cover it with chimney soot to a depth of about $\frac{1}{4}$ inch; then apply water liberally. This will kill the insects without injuring the plants. Insects in the fertilizer are very common and destructive for plants, and can only be guarded against with certainty by pouring boiling water on the soil after well mixing the fertilizer in it. To prevent the destruction of seed by insects, it may be mixed, before sowing, with either powdered sulphur or soot, the latter being preferable.

To cause a plant to bloom, allow it to become pot bound; that is, let it remain in the pot until the roots have become matted in the pot, and as soon as it has done blooming repot it in a larger pot, taking care not to disturb the roots. In order to facilitate this give the plant a little water; place the hand over the surface of the soil, with the fingers spread out and the stem of the plant between the fingers; turn the pot upside down and tap its edge against something solid, and the plant and mould will come unbroken from the pot. Place the plant in the middle of the new and larger pot, and fill in all around it with rich mould.

Plants raised in the house for subsequent planting in the garden should be placed out of doors in the middle of the day during warm weather, so that they will become gradually accustomed to the change of temperature and not wilt when planted out. They should be planted out in a dry soil and in dry weather, or just before a rain shower.

Steam Launch Performances.

A correspondent writing from Port Royal, S. C., says: "It may be of interest to your readers to know the work performed by a little launch here. Length of boat, 30 feet; width of boat, 6 feet 9 inches; draught of water, 2 feet 6 inches forward, 3 feet 4 inches aft. One vertical engine and boiler on the same foundation (a flat cast iron plate); engine, 8 x 8 inch; pressure of steam, 40 pounds; revolutions, 220 per minute; screw, 3 feet diameter, 42 inch pitch; speed, 8·5 miles per hour. The engine has a piston valve. We exhaust into the stack for draught. With 60 pounds of steam we can make $9\frac{1}{2}$ miles per hour."

Manufacture of Portland Cement.

At a recent meeting of the Liverpool Engineering Society, Mr. Wilkinson Squire described the process of making Portland cement, as practiced at the works of Messrs. Peters, on the Medway, which in brief is as follows: After being excavated close at hand the gray chalk, of which this cement is chiefly composed, is conveyed by a tramway to the mixing pans, where after being mixed with water and one fourth its weight of clay, it is thoroughly stirred and harrowed, and then run off into large tanks called "backs," where it remains for about 3 weeks to settle. At the end of this time the water is run off very quickly by an ingenious process, and the sediment, technically known as "storry," removed to an adjacent drying house, where it is thoroughly dried by the action of heat, and then passed to the kilns to be calcined, and from thence to mills to be ground to an extremely fine powder by large and powerful millstones; the usual test demanded by engineers being that, on being passed through a fifty wire gauge sieve, the residuum should not exceed ten per cent. On leaving the mills, all that remains to be done is the packing and dispatch of the cement.

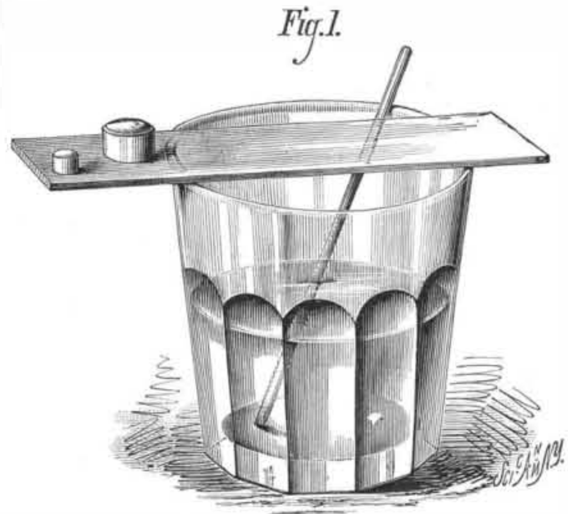
A WATER LENS MICROSCOPE.

BY GEO. M. HOPKINS.

The first microscope in existence consisted of a drop of water. Water lenses as formerly used were unstable and tremulous, and almost if not quite worthless. This difficulty may be overcome, and the drop of water may be rendered available as a microscope lens by confining it in a cell consisting of a short tube having a glass bottom.

Fig. 1 represents the simplest and cheapest of all microscopes. It consists of a thin piece of glass, having attached to it one or two short paper tubes, which are coated with black sealing wax, and cemented to the glass with the same material.

Fig. 1.



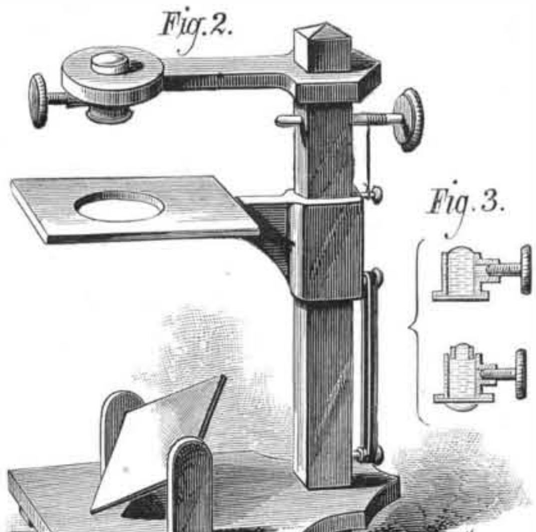
SIMPLE WATER LENS MICROSCOPE.

By aid of the small stick water is placed, drop by drop, in the cells until the lenses acquire the desired convexity. Objects held below the glass will be more or less magnified, according to the diameter and convexity of the drop.

An easily made and convenient stand for the water lens is shown in Fig. 2, and Fig. 3 is a vertical section of the lens, showing the screw for adjusting the convexity of the drop.

The stand is made of wood. The sleeve that supports the table slides freely upon the vertical standard. A wire having a milled head, by which it may be turned, passes through the upper end of the standard, and has wound upon it a strong silk thread, one end of which is tied to a pin projecting from the table supporting sleeve. An elastic rubber band is attached to the lower end of the sleeve, and to a pin projecting from the standard near the base, to draw the table downward. By this device the focus may be nicely adjusted.

Fig. 2. Fig. 3.



WATER LENS MICROSCOPE COMPLETE.

Two standards project from the bed piece for receiving the corners of a rectangular piece of silvered glass which forms the reflector.

The best form of water cell consists of a brass tube about $\frac{3}{8}$ inch long and $\frac{1}{8}$ to $\frac{3}{16}$ inch internal diameter, having in one side a screw for displacing the water to render the lens more or less convex. A thin piece of glass is cemented to the lower end of the tube, and the inside of the tube is blackened.

Several bushings may be fitted to the upper end of the tube to reduce the diameter of the drop, and thus increase the magnifying power of the lens.

Water containing animalcula may be placed on the under surface of the glass, and the lens may be focused by turning the adjusting screw. The lens may also be adjusted to magnify objects placed on the movable table.

If air bubbles form on the upper surface of the glass they may be readily displaced by means of a cambric needle.

AT the recent annual meeting of the American Microscopical Society of the city of New York the following officers were elected for the ensuing year: President, John B. Rich, M. D.; Vice President, Wm. H. Atkinson, M. D.; Secretary, O. G. Mason; Treasurer, T. d'Oremieulx; Curator, John Frey.