

MICROSCOPIC NOTES.

BY GEORGE M. HOPKINS.

QUICK METHOD OF MOUNTING DRY OBJECTS.

There is a certain class of microscopic objects that need little or no preparation for mounting, and require no protection beyond a well secured glass cover. Many of these objects are interesting and in some degree valuable; but the microscopist considers them hardly worth



Fig. 1.—QUICK METHOD OF MOUNTING MICROSCOPIC OBJECTS.

the trouble of mounting. For such objects the method shown in the annexed engravings is of great utility, as it permits of inclosing the object quickly, completely, permanently and in presentable form, and while it seems especially adapted to such objects as are common, and

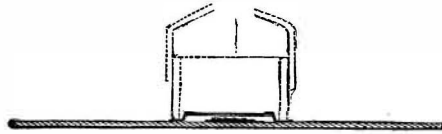


Fig. 2.—SECTIONAL VIEW OF THE SLIDE AND HEATING TOOL.

liable to remain unmounted, it is, of course, applicable to almost any dry object.

To carry out this method, only two articles, in addition to those usually possessed by microscopists, are required; one being the ring, with an internal flange at the top and an external flange at the bottom, the other a heating tool, consisting of a ring of brass attached to a suitable handle.

The rings of which the walls of the cells are formed are spun or stamped from disks of Britannia metal, sheet brass, or other sheet metal, with a narrow internal flange or fillet at the top for receiving the cover glass, and a wider external flange at the bottom, for attachment to the slide. The rings vary in depth according to the depth of cell required. The under surface of each ring is coated with thick shellac varnish and allowed to dry thoroughly. When the varnish is dry and hard a clean cover glass is dropped into each ring, and the ring is placed bottom upward on the warming stand and heated until the shellac melts and thoroughly covers the edge of the cover glass. The ring is now allowed to cool, when the cover will be ready for use. It will, of course, be understood that a quantity of rings and covers are thus prepared and held in reserve. In fact, it is to be hoped that the manufacturers of microscopists' supplies will furnish the rings and covers thus prepared, ready for instant use.

The object to be protected is attached to the slide by means of cement, in the usual way. A ring containing a

glass cover is arranged over the object, and the heating tool is warmed and placed upon the outer flange of the ring, as shown in the sectional view, Fig. 2. By this means sufficient heat is imparted to the ring to melt the shellac upon that portion touched by the heating tool, and cause it to attach itself to the glass slide. It is the work of an instant to cover an object in this way, and the slide needs no further finish; but the operator may, if he choose, lacquer the rings to prevent them from tarnishing.

A thin ring provided with the coating of shellac may be applied to an ordinary balsam mount to increase its security.

By applying to the ring a suitable cement, a liquid cell may be made. The object to be mounted in the liquid cell is wet with the liquid and placed on the slide. The ring is then secured in the manner above described, and the liquid is afterward introduced into the cell through an aperture previously made in the side of the ring. This aperture is stopped with cement, applied with a hot wire or needle.

DIMINISHING THE POWER OF AN OBJECTIVE.

It is often desirable to diminish the magnifying power of an objective and at the same time increase its penetration. For example, if one possesses a 1½ inch or 2 inch objective, and desires to examine objects like minerals in the natural state, crystals, seeds, etc., he will find it necessary to focus up and down upon the object to see it in all its parts. A 3 inch or 4 inch objective would furnish the desired power, but it is not at hand.

To increase the focal length, and, at the same time, enlarge the field and deepen the focus, it is only necessary to place a double convex lens of, say, 5 inch focus about half way down the draw tube. The action of such a lens is the reverse of that of an amplifier.

SALICINE WITH HALF OF THE FIELD BACKED WITH MICA.

Fig. 3 of the engravings shows the beautiful circular crystals of salicine in a field partly covered by mica, to exhibit the phenomenon of the reversal of the rotation of the radial color bands by the action of a thin film of mica on the polarized beam. It is difficult to convey the idea fully by means of an illustration in black and white. The crystals are formed on a cover glass and protected by another cover glass, either with or without balsam. A thin film of mica is placed upon the stage of the microscope, so as to occupy one-half of the field. The mount of salicine is then laid on the stage, over the mica, so as to fill the entire field. If the crystals above the mica and those unbacked by mica seem to revolve in opposite directions as the polarizer is turned, no further experiment is necessary, and the salicine, with its mica backing, may be permanently mounted. But if this effect is not secured at first, mica films of different thicknesses should be tried.

Gardening under Difficulties.

The Chinese are a very industrious people, and nothing is allowed to go to waste that can possibly be utilized. As the empire of China is the largest on the

globe, and contains nearly half of the entire number of the human race, the necessity of economy is very apparent. They not only cultivate the land, but all of the lakes, ponds, and marshes are gardens in which aquatic plants, suitable for food, are largely raised. Among these the water chestnut is pre-eminent, and is said to be of a very palatable and wholesome nature. In a narrative of Lord McCartney's embassy to China, it is related that his lordship's attendants, in passing through a part of that empire, saw a man cultivating the side of a precipice, and on examination they found he had a rope fastened around his waist, which was secured at the top of the mountain, and by which he let himself down to any part of the precipice where a few yards of available ground gave him encourage-

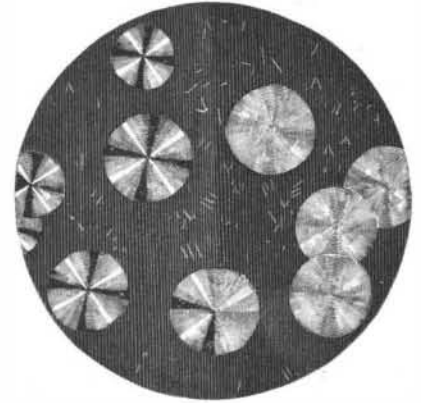


Fig. 3.—CRYSTALS OF SALICINE UNDER POLARIZED LIGHT—HALF OF THE FIELD BACKED BY MICA.

ment to plant his vegetables and his corn. The whole of the cultivated spots, which were at some distance from each other, appeared to be not more than half an acre, and near the bottom of the precipice, on a hillock, he had a little hut.—*American Agriculturist.*

A NOVEL ELECTRICAL EXPERIMENT.

An interesting example of the mutual repulsion of similarly electrified bodies is shown in the annexed engraving.

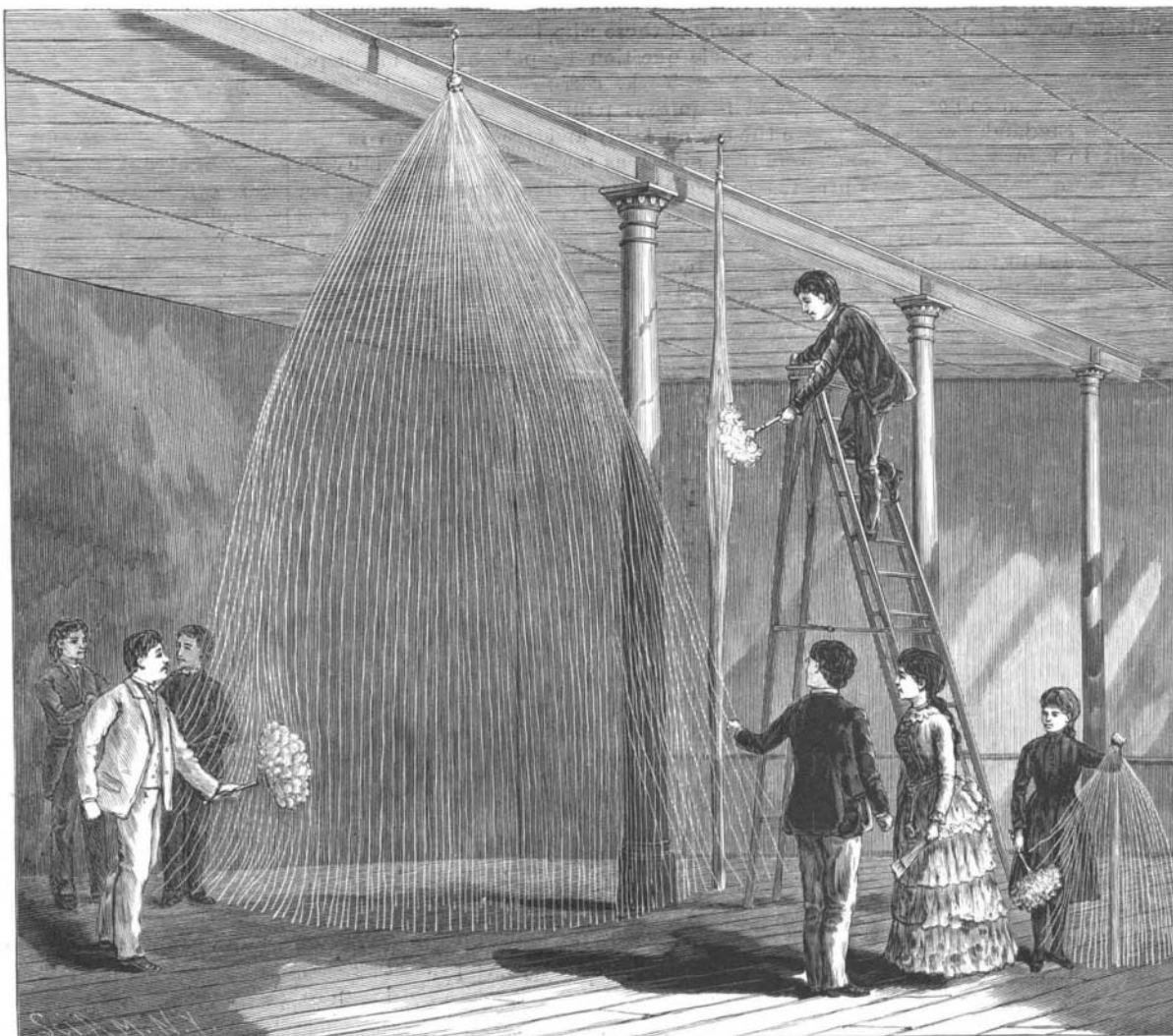
The divergence of the leaves of the electroscope, the repulsion of electrified pith balls, straws, and silk threads, and the electrification of human hair while being combed, are all familiar examples of the same electric action; but the rubber strips employed in this experiment have the advantage of being readily electrified and of retaining the charge for a long time.

For this beautiful experiment we are indebted to Mr. C. Voorhis, of the National Suspender Company, of the city, who, in handling some of the rubber threads used in the manufacture of suspenders and other elastic webs, noticed that the threads at times repelled each other. The repulsion was naturally attributed to electrification, and the experiment illustrated was at once suggested. The elastic rubber strips

used in the experiment (which were seventeen feet long and about one-sixteenth inch square) were suspended from the ceiling in one of the apartments of the SCIENTIFIC AMERICAN office, and were electrified by simply brushing them with a feather duster. The threads became more and more divergent as the electrification proceeded, until it finally became impossible to approach the threads without becoming enveloped in them.

Upon gathering all of the free ends of the threads together, the repulsion of the threads at their mid length caused them to separate widely. When once electrified, in a dry day the threads retain the charge for hours. They can be discharged by connecting them with the ground through the body, by drawing them through the hand.

This curious experiment is one which anybody may easily try at small expense. It illustrates the phenomenon of electrical repulsion in the most striking manner.



REPULSION OF ELECTRIFIED THREADS.

English Views of an American Book.*

Erroneous ideas are entertained by most Englishmen and by many Americans about the relations existing between that portion of the great English-speaking community which remains associated with Great Britain, either at home or in her colonies, and that other portion, now the main body, which prefers to have its own system of government apart from the old country. That the diversity between the two systems of government differentiates these two portions of communities not only English-speaking, but to all intents and purposes British, into different nations, must of course be admitted; but that there ought to be any feeling apart from taste or convenience which should cause any member of either of these communities to attach himself preferably to one rather than to the other seems, if we consider the question as it actually stands at present, absurd on the face of it. During a period extending over about a century and a half, Britons (themselves a race of settlers in Great Britain) settled in various parts of North America, without any feeling that they were deserting their own kindred in thus making homes for themselves elsewhere. Gradually as they grew in numbers, as they gathered together into cities, and as their wealth increased, they appeared of greater importance in the eyes of the home government, as being better worth taxing to supply the sinews of war for contests in Europe. It was not, however, as enemies of Great Britain that they resisted, but in self-defense against the injustice of rulers who regarded nations as a sort of property. They were not Americans fighting against Britons, but Britons in America fighting for independence against the rulers of Great Britain at home. If national rivalry at all were in question, one might say, considering that the King of Great Britain was of almost undiluted German blood, and that besides Britons only Germans fought against the independence of our British race in America, that the contest was between Britons and Germans. This, however, would be to exaggerate the difference between the actual character of the war of independence and what that war is commonly held to be, alike by Britons here and by men of our own British stock in America; and no exaggeration is needed. The mistake actually made is marked enough. It prevents the average Briton from glorying in the noble effort by which our people more than a century ago achieved victory for their just cause; and it prevents the average American from recognizing that it was while Americans were British in name as well as in fact (for this they have always been) that they achieved the independence which is the greatest glory of one of these nations, and should be the greatest glory of both.

America being derived, as we know she was, from an essentially British stock, and being essentially British in blood and character, the Briton who finds it suit his purpose to join the American community has no reason for regarding himself as debarred from so doing by any claims of the home community upon him. There are, in fact, no such claims now any more than there were in the case of those who went out as colonists to America in the seventeenth and eighteenth centuries. Nor should an American who finds it convenient to make the old country or one of its colonies his home, consider that he is deserting his own people any more than a Virginian or a New Englander would so think, who found it convenient to return to England in the old days, before the war of independence had definitely separated the British race into communities having different governments. The only kind of patriotism which can be regarded by reasoning men as a virtue is loyalty to the people; loyalty to a form of government and loyalty to a tract of land are qualities appropriate only to semi-savage races.

If all Britons believed in monarchy, not only as a system which it would be inconvenient to change, but on principle, and if all Americans were equally earnest in the belief that a man is necessarily degraded who remains within a community ruled (even nominally) by a sovereign, the case would doubtless be very different. It would then be a point of patriotism for a Briton to remain British and for an American to remain American. Or if war were likely, one might almost say if war were possible, then—as war, essentially degrading, necessarily brings with it many unpleasant conditions—it might be a sort of duty for Americans and Britons alike to remain severally under their own respective flags. But Britons are not monarchist nor Americans republican in that foolish sense. The Briton knows that he has taken nearly all effective evil out of monarchy—for all at least who respect the dignity of their manhood. (As for the rest, those who being free prefer to ape slavery, and having the right to stand erect fall to boot licking—with an appetite—it matters little what form of government they have.) The American, in like manner, knows that if he and his fellows willed they could substitute a king for a president, yet give up no atom of their freedom or their self-respect.

* "Triumphant Democracy; or, Fifty Years' March of the Republic." By Andrew Carnegie. London: Sampson Low, Marston, Searle & Rivington.

The Briton, even if he call himself (not being concerned about trifles) a subject, is as free from all real subjection as the American citizen. If he speaks with esteem or respect of any king or queen who chances, as has happened, to be virtuous and intelligent—or even both—it is as men or women he regards them, and his respect implies no admission that the original atrocities were just by which the English monarchy was founded and the people temporarily brought into real subjection. Still less does such reasonable esteem for a king or queen changing to be worthy of esteem imply approval of the wars, the iniquities, or the immoralities by which nearly all the rulers of this country afflicted and offended the people in past times. The American in like manner knows that neither his own people nor the kindred people here would suffer such iniquities or anything approaching to them to be perpetuated, even though America should choose to give to its government the title of monarchy, or though Great Britain still allows the name to remain after the evil of it is dead.

As for war, if war is possible between two such communities as Great Britain and America, then the shame of that is such as to overshadow any such shame as might belong to being on one side or the other side in a contest which would be unutterably degrading to both.

These remarks have been suggested by the reading of Mr. Andrew Carnegie's interesting work, "Triumphant Democracy." It brings before the reader more thoroughly than any book we have yet seen the importance of the ethnic question in considering the fortunes of a nation, and the comparative insignificance of the particular form of government which the nation may find convenient. Mr. Carnegie calls his book "Triumphant Democracy," but, so far as we can see, he in no sense shows that democracy, as such, has had much to do with the progress of America. Democracy regarded in its negative aspect has been, doubtless, all-important in determining the fortunes of the States. But this implies only the converse proposition that a nation which begins its career in a state of actual subjection to more or less rapacious rulers, and their plunder-loving followers, cannot possibly make rapid progress until it has shaken itself free and replaced a state of real subjection by one of practical citizenship. If the progress of America during the last century has been almost incomparably more rapid than that of the old country, it has not been because of any inherent virtue in democracy, but because the progress of America as a nation has not been hampered by oppressive misgovernment. There is curious evidence of this in the degeneracy of the present race of politicians in America. England would be ruined in a couple of generations if her politicians were as worthless as those who have attained power in America (we make no comparison in regard to English statesmen, for there are no statesmen in America).

But what good fortune it is to a nation to be let alone, to have a fair start in national life, instead of having to struggle out from under a dead weight of oppression, this book shows well. We commend it to the careful study of those who imagine that they have settled the whole question by pointing to municipal bribery at New York, corrupt State legislation at Albany, and iniquitous political life at Washington. Compare the nation fairly and truly pictured in this book, a nation about as much to be judged by its politicians as England by lords-in-waiting and other flunkies at court, with the America of a hundred years ago—extending the comparison so that while the former is compared with the England of to-day, the latter is compared with the England of a hundred years ago—and it will be felt, we think, that America must have had some immense advantage in the race. What that advantage has been cannot well be doubted. Democratic government has done little for America, and of late the little that her politicians have done has been harmful; but the power and the right which Americans possess to go their own way, and their manful determination to hold that right, let governments, their own included, do what they will, have been all in all to the great nation of our kinsmen across the Atlantic. Even the possession of the suffrage by persons utterly unfit to vote on any higher question than the paving of a back alley has not been able to do one-thousandth part of the harm one might have expected.

An illustrative map taken from an old edition of the "Encyclopædia Britannica," is as strongly suggestive of what America was when that map was thought sufficient as is the letterpress of that work so far as it relates to the United States. Not one page in all is devoted to the description of the infant nation which had just begun to run alone. Except for a line or two about Virginia, one might suppose the States were still British colonies, though the edition bears date 1783. Not a single line implies that there had been any contest worth mentioning, on the other side of the Atlantic. The map was manifestly drawn to correspond with this feeling of contemptuous indifference for the young nation.

America was, indeed, but a small nation then, though

it deserved the respect and sympathy of Great Britain, since, while as yet it was not America, but a community of British colonists, it had maintained its just claims to independence against the full strength of the mother country. But consider what it is now! The three millions of 1770 had grown to thirteen millions in 1830, and now to nearly sixty millions—"more English-speaking people than exist in all the world besides," more than the whole population of the United Kingdom, plus twice the population of the British colonies. In 1850 the total wealth of the United States was 1,686,000,000*l.*, that of Great Britain being 4,500,000,000*l.*; now the wealth of Great Britain is about 9,000,000,000*l.*, or almost exactly double what it was in 1850; but the wealth of the United States had risen in 1880 to 9,790,000,000*l.*, and is now nearly 11,000,000,000*l.* In 1850 it was hardly worth while to mention America's manufactures in the same breath with those of Great Britain; in 1880 British manufactures amounted to 818,000,000*l.*, those of the States to 1,112,000,000*l.*—nearly half as much as the manufacturing wealth of the whole of Europe. As our author well puts it, though Great Britain manufactures for the whole world, while America is gaining only the control of her own markets, British manufactures in 1880 had not two-thirds the value of those of the century-old republic. The annual savings of America are 210,000,000*l.*, exceeding those of the United Kingdom by 50,000,000*l.*, and those of France by 70,000,000*l.* In comparing the American carrying business with that of Great Britain, we seem to find the younger country behind, since the American shipping amounts to but nine millions of tons, that of Great Britain to eighteen millions. But when we consider the internal commerce between the States, we recognize a difference the other way. This internal commerce exceeds the entire foreign commerce of Great Britain and Ireland, France, Germany, Russia, Holland, Austro-Hungary, and Belgium combined. The Pennsylvania Railroad system, alone, transports more tonnage than all our British merchant ships!

These are but a few samples of the wonders which Mr. Carnegie—a Scotsman by birth, and not a politician, but a man of business—has to tell about the development of America. We commend his book to the careful reading of men who think. For party men, or men otherwise liable to be swayed by mere prejudice, the work will be pleasing or irritating, according to the direction in which their proclivities tend. But for those who look hopefully, or at least longingly, to the future of the human race, it is a work whose every page will be full of meaning.—*Knowledge.*

Melting Points of Metals.

Metals.	Centigrade.	Fahrenheit.
Aluminum.....	degrees 700.....	degrees 1,292
Antimony.....	425.....	797
Arsenic.....	185.....	365
Bismuth.....	264.....	507.2
Cadmium.....	320.....	608
Cobalt.....	1,200.....	2,192
Copper.....	1,091.....	1,995.8
Gold.....	1,381.....	2,485.8
Indium.....	176.....	348.8
Iron, wrought.....	1,530.....	2,786
Iron, cast.....	1,200.....	2,192
Iron, steel.....	1,400.....	2,552
Lead.....	324.....	617
Magnesium.....	235.....	455
Mercury.....	-40.....	-40
Nickel.....	1,600.....	2,912
Potassium.....	62.....	148.6
Platinum.....	2,600.....	4,712
Silver.....	1,040.....	1,904
Sodium.....	96.....	172.8
Tin.....	235.....	455
Zinc.....	412.....	773.6

Simple Test for Wall Paper.

A simple and easily applied test for wall papers has been devised by Mr. F. F. Grenstedt. No apparatus is needed beyond an ordinary gas jet, which is turned down to quite a pin point, until the flame is wholly blue. When this has been done, a strip of the paper suspected to contain arsenic is cut one-sixteenth of an inch wide and an inch or two long. Directly the edge of this paper is brought into contact with the outer edge of the gas flame a gray coloration, due to arsenic, will be seen in the flame (test No. 1). The paper is burned a little, and the fumes that are given off will be found to have a strong garlic-like odor, due to the vapor of arsenic acid (test No. 2).

Take the paper away from the flames and look at the charred end—the carbon will be colored a bronze red; this is a copper reduced by the carbon (test No. 3). Being now away from the flame in a fine state of division, the copper is slightly oxidized by the air, and on placing the charred end, a second time, not too far into the flame, the flame will now be colored green by copper (test No. 4). By this simple means it is possible to form an opinion, without apparatus and without leaving the room, as to whether any wall paper contains arsenic, for copper arseniate is commonly used in preparing wall papers. Tests one and two would be yielded by any paper containing arsenic in considerable quantities.—*British Medical Journal.*