

## NEW THERMOMETER SCALE.

BY J. ASHER.

I have recently devised a new scale for the thermometer. I divide the space between the absolute zero ( $-459.4^{\circ}$  Fah.) and the freezing point of water into 1,000 degrees. The advantages which it presents are:

1. It has no minus degrees, and not a conventional, but an absolute zero. Hence no ambiguity can occur.

2. It will be very convenient in reducing the measurement of gases to the standard temperature, which is the freezing point. The temperature of a gas will be so many thousandths of the volume it would occupy at the freezing point of water. A gas in the new scale expands 0.001 of its volume, measured at the freezing point, for each degree of increase in temperature.

3. The degrees are smaller than those of other scales. Hence greater accuracy may be had when we use whole numbers only. Each degree is almost exactly half a degree Fah., the ratio being as 30 to 61.

4. A thousand, a round number, expresses the whole range of temperature, in the solid state, of water, the most useful substance.

5. The two principal points are absolutely fixed. The boiling point is objectionable in this regard, for it varies with the atmospheric pressure.

Here are some temperatures in what I propose to call the milligrade scale:

M.	
1386°	Water boils.
1293°	Alcohol boils.
1134°	Blood heat.
1000°	Water freezes.
853°	Mercury freezes.
0°	Absolute zero.

For common use the scale would not extend below  $853^{\circ}$ .

Strathroy, Ontario, Canada, November 11, 1887.

[FROM THE GARDENERS' CHRONICLE, OCT. 22, 1887.]

## The Problem of the Hop Plant Louse Fully Solved.

Will you permit me to announce through your columns a discovery of no small importance to the hop growers of England and of the world? It is known in America that I have for some time been making investigations on the habits of the hop plant louse (*Phorodon humuli*, Schrank), especially with a view of solving the mystery attaching to its winter existence. A resume of the results up to the middle of last August was made public at the late meetings of the American Association for the Advancement of Science, and also of the British Association, and has already appeared in abstract in your columns, September 17 last, p. 333. That abstract gave the ascertained facts and predictions up to the time I left America (August 17); and while one of my most trusted observers has been following the closing phases of the annual life cycle of the species there, I have been doing the same here in Surrey and Kent, and particularly on Mr. Charles Whitehead's place near Maidstone, where all the conditions were favorable. Although I have not yet received the final results from America, I feel quite convinced that they will prove similar to those obtained here, which may be summed up (omitting much interesting detail) as follows:

During the hop harvest (this year in Kent at its height the last week of September), and some time prior thereto, the insects are fast getting wings. This is the only winged generation produced on the hop, and all individuals, irrespective of brood, show the tendency to become winged, so thoroughly is aphid life, like plant life, influenced by temperature and season. The first to get wings are agamic females, and they instinctively leave the hop yards and settle upon different varieties and species of *Prunus* and begin at once to breed and bring forth young. Their flight is much influenced by meteorological conditions, but they swarm in the air during mild and pleasant days. On my very first visit to Maidstone, several settled on my person while I was being driven from the station, and where wind and temperature were favorable I have known them, in a single day, literally to cover certain sheltered damson trees close to a hop yard, where but few could be detected on such trees the previous day. They array themselves on the under side of the leaves, heads generally all in one direction, and in a very few days they are interspersed with their pale and wingless young, though each produces but four to five before dying.

These wingless individuals are the only generation produced in autumn on *Prunus*, and are the true sexual females. White at first, they become yellowish-orange and olivaceous with maturity, the head and the members darkening. The last to acquire wings in the hop yards are males, and they settle upon the plum leaves (this year most numerous October 5), and fecundate the females, which thereafter lay a few eggs (not more than four or five) around the latent buds, and in any crack or sheltered part of the twigs, especially of the previous year's growth. The eggs, at first yellowish-green, soon get darker, and finally black, and become, in time, more or less covered with dust particles, mould, the exuviae of mites, etc., which adhere by means of the sticky "honeydew" everywhere produced by aphides.

The winged males are easily distinguished from the

winged females by their smaller size and greater unrest, and when the former are most abundant the latter have disappeared. At the present writing the males are fast dying, and drying up, but the impregnated females still survive, though there have been snow and several white frosts. Some of the later born will doubtless live on till the leaves have fallen; but all will perish with the first severe frost, and the species will be perpetuated through the winter egg, as already set forth. The first eggs were observed on the 8th of this month. My observations show that the winged emigrants from the hop, while preferring the damson, feed and breed on all other varieties of *Prunus* which I have had an opportunity of examining, and which include the Bullace (a yellow plum), the Victoria (large red), the Black Diamond (large black), the Yellow Gage, the Green Gage, and the Orleans. Trees examined in counties where no hops are grown reveal only the plum aphid (*Aphis pruni*). This species, which remains on the plums the whole year, also occurs in late autumn in the agamic winged female, the winged male, and the wingless sexual female forms; and though often mixed with the hop *Phorodon*, is easily recognized by the want of cornicles, and by the greener color, darker members, and black eyes of the true female, which oviposits in similar situations as the *Phorodon*, and whose eggs are scarcely distinguishable from those of that species.

The absence of *Phorodon* multiplication on the hop, and the manner in which stray plants in field or hedge-row are forsaken, while what I have described is going on upon plum, is as marked as the freedom of plum in early summer after the winged migration therefrom to the hop.

The observations here recorded have shown (as such minute observations always do) the unreliability of inexperienced testimony. As in America, this has been a year of exceptional freedom from hop lice in England, and when I first visited the hop yards at the commencement of the gathering, I was told very generally by laborers and owners that no lice had been noticed lately, whether on the hop or on the damson, and that I should find none. Yet, though the leaves of the hop were remarkably free, I had no difficulty in finding the lice in the burrs, or crawling in all conditions through the loose texture of the sacks being filled by the pickers, while the first deposited on plums were detected on the very first tree examined.

In conclusion, I have been struck with the great similarity in the general aspect of things both on the hop and the plum here and in America. Everywhere parasites and predaceous enemies of the lice belonging to the same or similar genera, and in some instances the same species, and everywhere the omnipresent red spider (*Tetranychus telarius*), and its equally omnipresent circular red eggs at this season! And while the lower average summer temperature will cause fewer generations of the *Phorodon* to be produced in England (probably only six or seven) than in America (where thirteen have been traced this year), and the beginning and ending of the insect's activity will be more abrupt there than here, yet in all essential points the life history of the species in the two countries is the same.—C. V. Riley, Tunbridge Wells, October 10, 1887.

## How to Plant Deciduous Trees.

On the transplanting of trees, a writer in the *Garden* (London) gives the following advice, which is both practical and timely, and as applicable to this country as in England.

The best time for planting trees and shrubs is when they are dormant, that is, after they have made their season's growth and before they have begun to start afresh. Deciduous trees speak for themselves; when their leaves have fallen they may be said to be at rest, and they should be transplanted before the buds have begun to swell. Not that there is much mischief in a little delay, but the proper time is before the buds have become excited. The next point is to take up the tree with every fiber, if possible, undamaged, and more care is required to do this than many think proper to bestow upon it. I have seen valuable trees literally torn up by the roots in some nurseries because men would not take the trouble to lift them properly. How, therefore, can such trees be expected to thrive for at least a season or two after removal? Again, if the roots are mutilated, the head of the tree must be reduced in proportion. Moreover, in planting, the earth must be made to fill up all the interstices between the roots—there must be no hollow places; and, when a tree has been much mutilated, it is a good plan to puddle or, at least, make the pit in which the tree is to be put a kind of mud hole, that is, pour into it two or three pailfuls of water, and throw in a cone of loose earth, on which the tree should be placed, spreading out the roots well and filling up all round with loose soil. By moving the tree sideways, backward and forward, lifting it now and then a little, and continuing to fill in with earth, it may be made a fixture at a proper height, and a little patience will enable you to hold it moderately firm until stakes can be put in to support it and the soil settles. This kind of

treatment is unnecessary when the trees are small and carefully lifted, as they should be.

I prefer dry planting when the soil is in good order and finely broken; the soil can then be got in among the roots well enough to answer the purpose. In that case the point of most importance is to take the plants up well. Dig round them in a circle, as far off the stem as the ends extend, and release the latter carefully, so as not to break them; then, with a sharp knife, cut off the tap root close to the stem, and all ends that may happen to have got accidentally bruised, and, having roughly estimated the quantity of roots lost or injured, make amends by reducing the head in proportion. Cut out all weak shoots close to the stem, and remove any that grow upward or cross each other in the center, retaining only the best branches in the best positions, and, if any of them be too long, shorten them. Then, having made a pit large enough to hold all the roots, fill in with some soft, well-worked soil, and press the roots into position without bruising them. Hold the tree upright while the hole is being filled in, and shake it, in order that the soil may get well worked in between the roots. When the tree is properly placed, fill up the rest of the hole, and tread it well in, not by pressing the soil close to the stem, but by treading on it all round where the points of the roots are. When pretty firm drive in three stakes, in a sloping direction, so as to meet at the stem, and to these fasten the tree, so as to prevent wind waving.

A much neater way, however, of fastening trees is to drive three posts into the ground, in the form of a triangle, and nail some slabs to them. I have moved cedars 35 feet high, and fastened them quite securely in this way, the posts being driven into the ground 6 feet deep. But though deciduous trees show us so well when they are at rest, that period is not so apparent in the case of evergreens. It needs close observation to ascertain when they are at rest. With some it is at midsummer, with others later; but the cause of so many failures in transplanting evergreens is moving them when they are in active growth. If the foliage has attained its full size and proper color, and if the last growth made has assumed the same color as the rest of the trees, transplanting may be done with safety. If the ground where the trees are to be planted is dry, it must be well watered; and even the branches must be sprinkled if the weather is warm. Plants taken out of peat form an exception, for it frequently happens that a ball of earth, larger than the entire root space, lifts with them, and they are thus unaffected by removal. They do not, indeed, lose a fiber.

To recapitulate, planting successfully consists, first, in removing the plant from the place in which it grows without disturbing its roots much; secondly, if any roots have been lost, cut in the head so as to lessen the work which the roots that remain have to do; thirdly, in placing the tree again in the ground where it is to stand, solidly, and with the roots as nearly as possible in the position in which they were before removal; and lastly, in supplying moisture, if it be deficient, and in so fastening the tree in its place that it shall not afterward be injured by wind waving.

E. B.

## Brick Clay.

The following analysis of blue clay from Farmington, Maine, was made by Mr. W. V. Wentworth, and may be of interest for reference:

SiO <sub>2</sub>	63.69
Al <sub>2</sub> O <sub>3</sub>	17.02
FeO and Fe <sub>2</sub> O <sub>3</sub> (mostly FeO)	10.18
CaO	0.97
Na <sub>2</sub> O	4.02
H <sub>2</sub> O	4.05
	99.93

An approximate mechanical analysis gave the following results:

Coarse sand	3.73 per cent.
Fine sand	22.97 "
Fine clay	69.25 "
Water	4.05 "
	100.00 per cent.

The sand was mostly feldspar, with traces of quartz and mica. The clay is used for brick making.—*Amer. Jour. Science*.

## An Improved Earth Plate.

Professor Dorn, in the *Electrotech. Zeits.* for October, proposes a form of earth plate which should be valuable to all observers of earth currents, if, as is claimed for it, it reduces polarization to a minimum. It consists of a flat open box, made of wood or cement, and coated inside with asphalt. This is placed at the bottom of a hole in the ground. An amalgamated zinc plate lies flat in the box, and an insulated wire leads from it to the surface. Care must, of course, be taken that the joint is well covered, so that nothing but zinc is in contact with soil. An earthenware pipe stands on the zinc and rises to the surface. The box is then tightly rammed with clay, and soaked with concentrated zinc sulphate solution, and the hole filled up. Solid sulphate is dropped down the tube and solution poured after it. A little fresh sulphate from time to time will keep the plate in order.

**A New Rock Breaker and Dredge.**

A solution of the difficult question of widening and deepening the Suez Canal, at the Suez end, appears to have been provided by Messrs. Lobnitz & Co. in a large marine dredger launched from their yard at Renfrew on October 6. This vessel, which is named the Derocheuse, is intended to inaugurate a new and simple method of excavating subaqueous rocks. She is very powerful and strongly built, and embodies a novel principle in rock breaking, invented by Mr. H. C. Lobnitz. Instead of using the ordinary system of boring holes in the rock under water, and breaking up the rock by means of explosives, the work is done by means of heavy blows with long chisel-shaped cutters. These cutters weigh each about four tons, and, when dropped upon the rock, they break it up, and dislodge it ready for removal by dredging. This has been demonstrated by various dry land trials with these cutters on some of the hardest rocks to be met with in Scotland. The cost of excavating and removing rock by the blasting system, when working at, say, 30 feet under water, may be stated at 20s. per cubic yard. With the new system, of which the Derocheuse is the pioneer representative, 4s. per cubic yard will easily cover the cost of breaking the rock and raising and carrying away the debris.

Various trials, which were carried out from March to June of this year at Craigmillar Quarry, Edinburgh, under the personal supervision of engineers from the Suez and Panama Canal companies, and Scotch and French engineers, have given most satisfactory results. At the last of these experimental trials the results showed an average of over 6 cubic feet of rock dislodged for each blow of a cutter weighing less than two tons. Similar results were attained at the other trials. The lowest average result was about 4 cubic feet per blow of this light cutter.

The dimensions of the Derocheuse are: Length, 180 feet; breadth, 40 feet; depth, 12 feet; and she is divided into eighteen water-tight compartments. She has machinery on board of a total indicated power of 1,000 horses, including hydraulic engines and rams for working the ten rock cutters, which are each 45 feet in length. For these, ten 6 ton hydraulic hoists are provided, capable of lifting to a height of 60 feet, and working with a pressure of 1,000 pounds per square inch. By means of a set of levers, one man can maneuver the whole rock-breaking apparatus without moving from his post, everything being self-acting and simple.

The rock, when broken and dislodged, is immediately lifted by a powerful dredging apparatus, the buckets of which work between the rows of cutters. This dredging machine is fitted with Lobnitz's guide wheel and pitch wheel driving gear, and is specially designed for the present purpose. It is capable of dredging from a depth of 10 feet down to a depth of 40 feet below the surface of the water, and will dredge ordinary material with ease and economy, and will also remove rocks of the most refractory nature.

On deck the Derocheuse is fitted with various powerful winches and cranes. There is special hydraulic gear on deck for maneuvering two steel pivots, which enable the vessel, when at work, to adopt a very neat system of covering the ground by a series of concentric curves. Thus the work never stops for the purpose of maneuvering, and every portion of the ground can be properly dealt with, leaving a level surface. In short, nothing that could tend to make the vessel efficient for her purpose has been omitted; and comfortable accommodation is provided in the vessel for the civil engineers, officers, and crew who will work her. Having twin screws, driven by two pairs of independent compound engines, solely used for propulsion, the Derocheuse will steam out to her destination, where she will immediately set to work upon the rocky part of the bed of the Suez Canal, where there are about three million tons of very hard rock to be removed.

During the last six years Messrs. Lobnitz & Co. have built for the Suez, Panama, and other works more than 26,000 tons of dredgers, floating cranes, hopper barges, and tugs, with over 20,000 indicated horse power of machinery.—*Iron*.

**THE "ROBINSON" VICTORIA HANSOM.**

The popularity of the Hansom cab, patented in 1834 by Mr. Joseph Hansom, is attested by the fact that there are now some 10,000 in use in the city of London. Hitherto they have been distinctively a closed vehicle. By a recent improvement, which we here illustrate, this feature is disposed of. The "Robinson" Victoria cab provides at will a perfectly closed Hansom, undistinguishable from the ordinary one, or an open carriage, adapted for full enjoyment of the pleasure of a drive in fair weather.

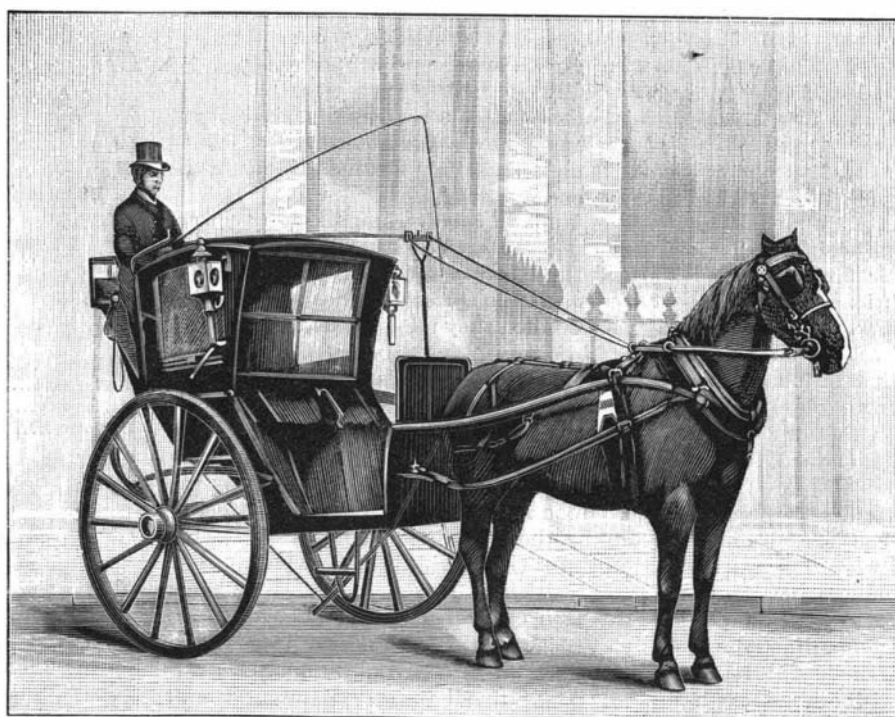
Besides this feature of opening or closing, other im-

**THE ROBINSON VICTORIA CAB—OPEN.**

provements are introduced. Thus the wheels have heavy rubber tires, similar to those of bicycles, so that a quietness of motion is by this feature alone insured to a considerable extent. The sash frames are metallic, and move in rubber-cushioned grooves, so that whether open or shut they cannot rattle.

The cab can be opened or closed by the driver in three seconds, while the horse is on the full trot. No intervention of the passenger is required. A sudden shower does not bring about a delay for putting up side curtains or adjusting other fixtures.

To close it, the two parts of the roof and the back are moved by one hand, without any noise, smoothly into their place. The action of the foot upon a pedal almost simultaneously raises the two side sashes, and the interior is completely inclosed. The reverse series of operations effects the opening. A slight pressure upon the foot pedal drops the side windows. A stud upon the roof is pressed, which releases the catch. The rear half

**THE ROBINSON VICTORIA CAB—CLOSED.**

of the roof and the back drop down. Reaching forward, the front half is pulled back, when it folds into place like an ordinary buggy top.

Our illustrations show the cab both open and shut. The general system of construction is also clear from them. It is needless to insist on how great an improvement this brings about. The transport by cab will assume a new aspect when the occupant can effect the journey in an open vehicle, with the knowledge that on a sudden shower of rain it can be instantly closed.

The inventor, Mr. J. C. Robinson, of London, whose present address is 140 Nassau Street, New York, has been interested in various street railroad enterprises in Europe, and having just completed the successful organization of a similar company in London, is now here to effect the introduction of this vehicle in our streets. After a personal trial of it we wish him every success, believing it to be a decided advance upon the ordinary Hansom and the coupe.

**Progress of Triple Expansion.**

The Drummond Castle, the second of the Castle line of Royal Mail steamers which has been tripled by Messrs. T. Richardson & Sons, of the Hartlepool engine works, lately left Hartlepool for a full speed trial of her new machinery. The original engines were built by Messrs. John Elder & Co., in 1881, and were of the two-crank compound type, having cylinders 51 inches and 88 inches in diameter, with a stroke of 4 feet 9 inches. These have been converted into three-crank triple expansion, with cylinders 33 inches, 55 inches, and 88 inches, steam being generated in three very large double-ended boilers, at a pressure of 150 pounds. During the twelve hours' trial the engines worked most satisfactorily, after which the ship was taken over by the representatives of the Castle Company, and left for London, where she arrived in due time, having made a very successful passage.

Besides the alterations to the main engines, a large refrigerator has been fitted, by means of which the passengers will be supplied with fresh meat, fish, milk, etc., throughout the voyage. All the cabins which were damaged by fire in London have also been renewed by Messrs. Withey & Co., of the Middleton Shipyard, and the whole of this work was accomplished in the short space of fourteen weeks. Messrs. Richardson & Sons have been advised by the Currie Company that the saving of fuel on the Grantully Castle, as compared with the old engines and boilers, has been 34 per cent on the voyage from London to Cape Town, and this great success has resulted in a decision to place their finest steamer, the Roslyn Castle, in Messrs. Richardsons' hands to triple, and she will arrive in Hartlepool early next year. This great saving in fuel has also been accomplished in the Union Company's steamship Trojan, which has just returned from her third Cape voyage. It is an interesting fact that the Drummond Castle's engines complete the large total of 30,000 indicated horse power manufactured by Messrs. Richardson & Sons since last January.—*The Engineer*.

**Carpet Moths and Beetles.**

A correspondent, in a seemingly discouraged mood, writes to the *Carpet Trade and Review* saying that carpet moths are playing sad havoc in Detroit, Lansing, and other cities at the West. Ordinary poisons seem to make them fat, and he appeals to the editor to suggest some remedy, adding that it would be hailed with pleasure by the sufferers and the trade generally.

The editor, after reminding the correspondent that he has already published several articles on the habits of carpet moths and beetles, adds that among the most effective remedies are kerosene oil and corrosive sublimate. Wads of cotton saturated with kerosene oil and placed in the cracks between the boards of floors are said to be efficacious against moths and carpet beetles. Corrosive sublimate is, perhaps, a still better remedy. Dissolve in an open jar one tablespoonful of corrosive sublimate in two quarts of boiling water, and after allowing the solution to remain undisturbed a few hours, apply it to both sides of the carpet or rug, using for the purpose a small whisk brush. It is not necessary to use more of the solution than enough to slightly dampen the surface of the fabric. As the solution is poisonous, it should be plainly labeled. In the case of carpet beetles, it is sometimes necessary to reduce the quantity of water in the solution, using but one quart instead of two.

The Carriage Builders' National Association, at their last meeting, passed a resolution approving of the adoption of 4 feet 8 inches, measured from outside to outside of tire on ground, as the standard track for carriages in the United States.