

## A USEFUL CAGE FOR THE REARING OF SMALL INSECTS ON GROWING PLANTS.\*

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In the rearing of aphids and their parasites, and scale insects for the past two years, the writer has found a specially designed cage of sheet-celluloid very satisfactory. Such a cage was made necessary from the unsatisfactory use of the standard lantern globe cages for rearing aphids, and other larger screen cages in common use for rearing insects on growing plants.

While sheet-celluloid has long been used by entomologists in various ways for rearing cages, chiefly to enclose portions of plants outdoors, so far as the writer has been able to learn, nothing has been published regarding it. Some time ago Mr. J. J. Davis, of Perdue University, who has been engaged in collecting data for a book on rearing methods, was asked to verify this assumption. He replied that his records disclosed no publications on the use of celluloid in the construction of rearing cages, although they had used it in Indiana for some time; but not the type of cage the writer had designed. Without claiming any originality for the idea for the use of this material in rearing cages, the writer believes it desirable to place on record his experience with it; especially in the type of cage discussed below, which he believes to be different from those in common use.

Any cage for rearing insects under normal, natural conditions, must provide for the same conditions of light, temperature and moisture within the cage as those which appear in the surrounding outside habitat; or as near these conditions as possible. In other words, the cage must allow for a free circulation of air, permit the entrance of the maximum amount of light, and not cause a condensation of heat or moisture. Still another feature bears considerable importance when dealing with small insects, and that is the absence of any cracks or niches in which the insect may hide or escape.

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Lantern globes, so commonly employed in rearing aphids and other small insects, were extensively used in the above rearings; but under conditions of direct sunlight and higher temperature so often encountered during the spring and summer months, they were found to overheat and "sweat" so badly as to be practically useless. In casting about for a cage that would remedy the faults found in glass and still possess the other desirable features, one was constructed out of sheet celluloid, which satisfied the requirements.

The simplest and most suitable form of cage is the cylindrical type made by bending together the edges of a rectangular piece of celluloid and sealing them with 95% alcohol.† Ventilation holes of any size and position on the sheet, may be cut in before bending. After the edges are sealed together and the cylinder is formed, the ventilation openings and one end opening are covered with fine cheese-cloth or voile, shellaced on the celluloid around the edges of the openings. The cage is now ready to be placed over the plant, usually a small one in a pot. In order to hold the cage securely in position and provide a smooth white surface on the bottom of the enclosure about the plant, melted paraffine is poured on the soil around the plant, and the open end of the cage set down into it after the edges have first been given a thin coat of vaseline to prevent the adherence of the paraffine. Thus treated the cage may be lifted free when the paraffine cools, leaving a smooth tight groove into which the edges just fit and prevent the escape of any insect when the cage is in place.

In addition to the type of cage described above, the writer has found sheet celluloid a very satisfactory material with which to construct exceptionally small cages for a portion of a plant like a small twig, or a part of the surface of a leaf or fruit on which it is desirable to confine small sedentary insects such as scales and aphids. In these small cages, ventilation may be secured by punching small holes in the celluloid with a fine needle. Shellac was found useful in joining together the sharp edges of the cage and sticking it to the plant surface. This material soon dries, with a hard surface so that it will not entangle the insects, and yet remains soft enough to prevent cracking and breaking apart.

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†Suggested by Mr. Larrimer of Indiana.

Cages thus constructed from sheet celluloid possess the following desirable features:

1. They are as transparent as glass, and do not "sweat" or concentrate heat like the glass cages.
2. With this material they can be made any size and shape desired.
3. They may be ventilated by cutting any number and size of openings in the side.
4. The completed cage is very neat and smooth within, making it easy to observe specimens at all times.
5. Entry for the introduction or removal of material is easily made by tearing back a corner of the cloth ventilator, or lifting up the cage from its paraffine base.

The undesirable features are:

1. Cost in material and time for making.
2. Possible deterioration on exposure to the elements. This defect was called to the writer's attention by Mr. J. J. Davis in a private communication. Automobile owners also complain of this rotting of the celluloid in their curtains. However, in the writer's experience with the material used in rearing cages, often under most unfavorable conditions of heat and moisture, he has found no such deterioration.

These many advantages possessed by celluloid have caused the writer to regard it with much favor as a material for solving the difficult problems of a suitable cage for small insects on growing plants. He hopes that the publication of this short article will bring the material to the attention of others who may have overlooked its great usefulness in cage construction.

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