tion of the magnesium sulphate is completed by washing the crystals with very dilute alcohol, after which they may be immediately used for further precipitation.

In the complete paper the authors will discuss in some detail the application of this method to the quantitative determination of pectin in the laboratory or in commercial jelly-making establishments. It is considered especially desirable at this time to point out that precipitation by magnesium sulphate may advantageously supplant the use of alcohol in the household test for pectin. While alcohol is not ordinarily available to the housewife, Epsom salts are to be found in every home and in almost every grocery store. By heating a small quantity of the aqueous extract of fruit, dissolving Epsom salts therein, and observing the amount of pectin thrown out of solution, one obtains an accurate measure of the pectin content of the fruit and is thereby enabled to form a judgment as to the amount of sugar necessary to form a jelly.

Discussion of many details of technique and of certain applications of the method here presented in outline are necessarily reserved for presentation in the full paper immediately forthcoming in the journal already named.

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THE CARE AND BREEDING OF ALBINO RATS

At this time when the government is using great numbers of albino rats and mice for inoculation purposes, numerous letters have been received from various sources asking for information regarding a source of supply and the care and breeding of these animals. This demand is so widespread that it is deemed most expedient to give this information in a simple form and to disseminate it to the greatest number of people by publishing it in this journal. In so doing those persons who are anxious to do their bit in this present crisis and who reside sufficiently near base hospitals and cantonments may be able to rear and supply these animals.

Albino rats and mice are exceedingly easy to raise. Their care and feed are practically the same and the cages in which they are kept can be identical. The cages for mice can, however, be much smaller. Our colony at the present time consists wholly of rats and the following applies strictly to them. It in general applies to mice also. These animals can ordinarily be handled by the bare hands without any danger of being bitten. Occasionally, however, a mother with young may be less docile if her young are disturbed. In such cases the use of a pair of heavy gloves is advisable. The oftener the rats are handled and petted the less likely they are to bite.

The cages in which our rats are kept and which we have found most satisfactory are made of one-fourth-inch galvanized wire netting with all the corners, edges and doors bound, or reënforced by galvanized iron (Fig. 1). They are made 12 inches high, 18 inches wide and 24 inches long. A partition of woven galvanized wire, provided with a sliding door (D 4 in. $\times$ 4 in.), divides this into two compartments 12 in. $\times$ 12 in. $\times$ 18 in. Each of these compartments is provided with a woven wire door (D, 6 in. $\times$ 6 in.) which slides up in runners made of galvanized iron (Rn). These doors are of ample dimensions to enable one to easily reach into all parts of the cage.

The bottom is separate and composed of galvanized iron 20 in. $\times$ 25 in. with three of the sides turned up 1 in. The front side is left flat to facilitate cleaning. The cage thus sits in this bottom and can be readily lifted off when cleaned. This process, which should be attended to at least once in two weeks, can be accomplished without handling the rats or without danger of their leaving the compartments to which they belong. This is done by placing the whole cage on a broad table, lifting the top about one half an inch and carrying it along to the bare table. The rats are thus forced along with the cage and the bottom left free. The old sawdust and excelsior used for bedding are now scraped out and a fresh supply added. The cage containing the rats in

their proper compartments is now replaced in the same manner that it was removed.

Clean fresh water is constantly supplied by means of an inverted bottle (*B*) provided with an air-tight rubber stopper (*R*) and glass tube 5 mm. in diameter (*G*). The spring clips (*C*) permit ready removal of the bottles for filling. The bottles are supported at the lower end on two bent wire nails (*S*) between which the glass tube passes (Figs. 1 and 3). We have found bottles containing eight ounces the most serviceable, as they are not too large and do not need refilling very often.

The albino rat is omnivorous in its diet and will devour almost anything a man will eat. They should be fed once each day. The food consists of cracked corn daily, such table scraps as are available, green stuff, such as lettuce, cabbage, etc. Where a large number of rats are being reared it is advisable to procure the refuse from a restaurant or hotel. Table scraps give a fairly balanced diet and

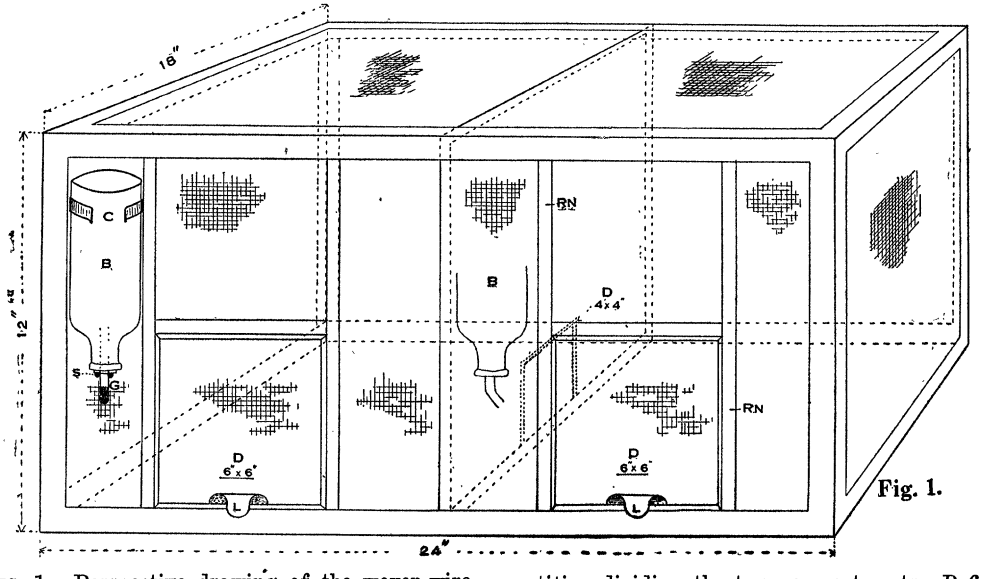

Fig. 1.

FIG. 1. Perspective drawing of the woven-wire portion of the cage showing the dimensions and plan of construction.

B, drinking bottle; *C*, spring clips for holding bottle; *Cg*, cage; *D* 4 in. × 4 in., sliding door in partition dividing the two compartments; *D* 6 in. × 6 in., sliding doors into cages; *G*, glass drinking tube from water bottle; *L*, lifts for sliding doors; *R*, rubber stopper; *Rn*, galvanized-iron runs for sliding doors; *S*, supports for bottle.

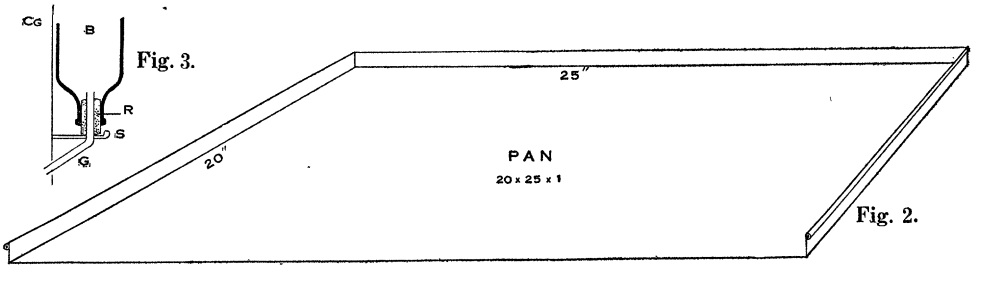

Fig. 3.

Fig. 2.

FIG. 2. Galvanized iron bottom, giving dimensions and plan of construction.

FIG. 3. Sectional view of drinking fountain showing the support of the bottle, *S*, and the manner in which the tube leads into the cage.

we have had excellent success with this food. If table scraps are not available, cooked beans. nuts and meat two or three times per week should be provided. The amount of food given should always be greater than will be consumed if one is desirous of quick returns. When rats are fed on a sufficient quantity of a well-balanced ration they are very prolific and grow rapidly.

A pair should be placed in each compartment. The female comes in heat about every five days and the period of gestation is approximately 21 days. The period of gestation is prolonged a few days if the female is nursing a litter of young during this time. Numerous instances are on record where mating has occurred the same day that young were born.

The number of young in a litter varies from one to fifteen, the average number being about six or eight. They grow rapidly and can be weaned at 30 or 35 days of age. If one desires to maintain a pure breed the young should never be allowed to remain with the parents after they have reached the age of fifty days, as breeding is likely to occur. A litter should always be weaned regardless of age as soon as (preferably just before) a new litter is born to prevent starvation of the newborn. In case the weaned litter is very young (25 to 35 days) milk should be added to their diet. To prevent inbreeding the sexes should be separated at weaning and confined in separate cages. With proper food, however, inbreeding can go on without apparent detriment for a number of generations.

The sexes in the young may be distinguished by the following characteristics:

The males may be recognized by a greater distance between the anus and the genital papilla.

In the male the genital papilla is larger than in the female.

At about 15 days of age the nipples are visible in the female.

After the hair covers the body a strip extending from the anus to the genital papilla remains almost bare in the female, while in the male this region is covered with hair except a small area immediately below the anus which later becomes the scrotum.

After the descent of the testes into the scrotum the males can readily be distinguished.

The age at which the young females become sexually mature varies between rather wide limits, but usually between 70 and 90 days. The earliest age at which we have found them sexually mature is 69 days. Lantz[1] records a case of sexual maturity at the early age of 35 days and Jackson[2] one at 49 days. Sexual activity in the females may continue until they have reached the age of 600 days. We have not determined the ages at which sexual activity begins and ceases in the male.

A great difference is noticed in the ability of females to produce young. Some appear to be sterile, while others have given birth to as many as nine litters. If one is desirous of securing numbers, the offspring from prolific breeders should be selected for breeding.

The rats do best in a well-ventilated room of fairly uniform temperature. Extreme temperature should be avoided.

Since these animals need daily attention they can not be shipped long distances unless provision is made for watering and feeding them en route. Our available supply is quite limited but we can generally furnish a few pairs to any one within shipping distance who is willing and able to breed rats for purposes of supplying the government, or for general scientific research.

The three main items for success are cleanliness, a sufficient quantity of a balanced ration, and avoidance of great changes in temperature. With these carefully looked after success is assured.

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[1] David E. Lantz, "Natural History of the Rat," In "The Rat and its Relation to the Public Health," by various authors. P. H. and M. H. Service, Washington, 1910.

[2] C. M. Jackson, "On the Recognition of Sex through External Characters in the Young Rat," *Biological Bulletin*, Vol. XXIII., No. 3, August, 1912.