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**Methods of Control of
Household Pests**

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Extension Entomologist

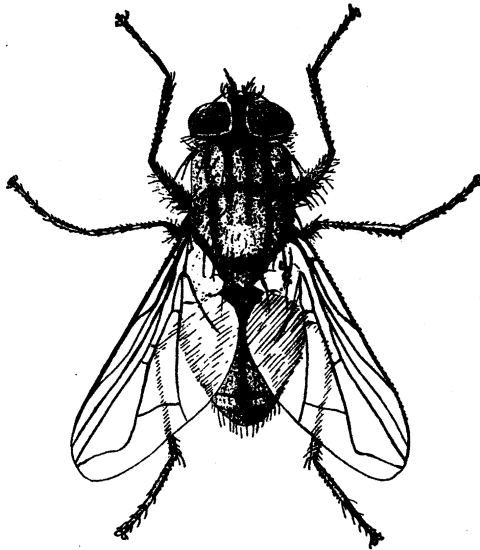


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METHODS OF CONTROL OF HOUSEHOLD PESTS

C. F. STILES
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Household pests of this country cause the loss of thousands of dollars every year and the direct injury to man himself cannot even be estimated. Rats, mice, roaches, clothes moths, mosquitoes, house flies, bedbugs, and stored grain insects have been allowed to infest the household with little concern on the part of the occupants. In former times they were considered annoyances and little was done to control them, but since the discovery that mosquitoes carry malaria and yellow fever, and that flies are the chief agent in the spread of typhoid, the subject has taken on an entirely new significance.

The neglected pile of old tin cans in the back yard in which remain various amounts of water after a rain may alone furnish a breeding place for enough mosquitoes to infest a whole neighborhood. House pets which carry fleas are looked upon in a new light and the house fly has become one of the most dreaded of all insects.

It is the purpose of this bulletin to discuss briefly the life histories of some of the most important pests that infest the household and to give practical methods for their control.

ACKNOWLEDGEMENT

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CLOTHES MOTHS

Clothes moths probably cause more financial loss in the household than any other insect, since it is their habit to feed upon woolen material and furs which are in storage and are often found in the upholstering of furniture.

Normally the moths appear in the spring and may be seen flitting about rooms most of the summer. The moths do no harm but they deposit eggs which hatch into the tiny white larvae that eat the clothing. The larvae are voracious and soon eat holes in the garments on which they are feeding. Breeding and egg-laying continues through the summer and during the winter in heated houses.

Methods of Control

Sun and Air. Before garments are put away for the summer they should be carefully cleaned. Either dry cleaning or washing with soap and water is effective. If neither of these methods are practical as in the case of rugs and furs, the garment should be hung in the air and sun, then brushed thoroughly on both sides so as to dislodge the eggs and larvae that may be on them. After the garments have been thoroughly cleaned, sunned and aired they should be packed away in paper bags, cedar chests or especially prepared closets or chests which are discussed in the following pages.



Adult and Larvae of Clothes Moth

Cedar Chests and Closets. It seems that the aroma of red cedar, which is due to the volatile oil in the wood, will kill the very young or newly hatched larvae of the clothes moth. It will not, however, kill the moths themselves, nor will it destroy the eggs of the moth or the older larvae. The odor has a repellent effect on moths, and if the clothing is free from the eggs and larvae of these insects when it is placed in a cedar chest, it will be protected from the moths and remain undamaged apparently for long periods of time.

Paper Bags. Moth proof bags of large sizes are now offered for sale at many drug stores and department stores. The bags are large enough to receive skirts and coats without folding and are so constructed that moths cannot gain entrance to the inside. These bags are safe receptacles for the storage

of materials liable to infestation with moths and will last for several years. They must be tightly sealed, especially around the hanger.

Cold Storage Plants. Clothes moths do not work at a low temperature. Cold storage plants are common nowadays in all cities and in many small towns. During the summer these plants are available for the storage of furs, rugs and other valuable woolen goods.

Heat. Temperatures from 120° F. to 128° F. maintained from six to eleven minutes will kill the eggs and the larvae and no doubt would destroy the moths.

Hydrocyanic Acid Gas. Rooms may be fumigated for clothes moths with this poisonous gas in the same way as recommended for bedbugs. See pages 7, 8, 9, 10.

Napthalene. Napthalene flakes and balls, when used in sufficient quantity, apparently do have a killing effect on the moths, the larvae and the eggs. To get definite results Napthalene must be used in tight chests, trunks or other containers where the fumes given off by the slow evaporation of the crystals will be confined. From one to three pounds of flakes or balls should be scattered thoroughly through the layers of clothing in the average size trunk or chest.

Carbon Disulphide. Carbon disulphide is an excellent fumigant for single rooms, chests and closets. It is sometimes called "high life." It is a colorless liquid that looks like water, and when exposed to the air evaporates quickly. From four to six pounds of the liquid to each 100 cubic feet of space when the rooms are at a temperature of 70° F. or above should kill all moths and larvae. *Because of the inflammable nature of the gas, it must be kept away from fire in any form.*

To apply, place the carbon disulphide in a shallow container near the top of the receptacle being fumigated and close the room, trunk, or closet tightly.

SILVERFISH

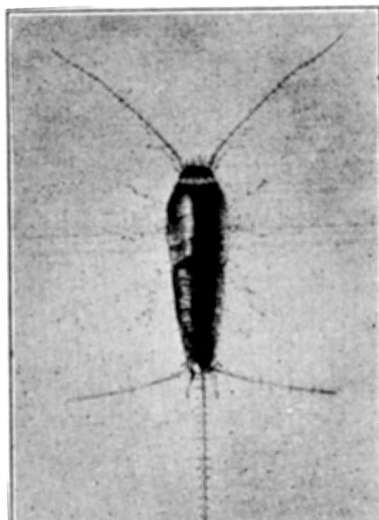
The Silverfish or Fishmoth is a glistening silver or pearl-gray insect that is often found hiding under books, papers, clothing or similar articles.

This insect usually shuns the light and can run very rapidly to places of concealment, therefore it often becomes very abundant and causes considerable damage before its presence is noticed.

The fishmoth feeds on starches and does its most serious damage to book bindings in order to get the starch and glue. It will also eat any clothing or piece goods in which there is starch or sizing.

Control

1. Mix 12 parts of sodium fluoride powder to 100 parts of wheat flour. Put in places where fishmoth are found, or dust their haunts with sodium fluoride in such a manner that the silverfish will have to run through it to get to and from their hiding places. Since this material is poisonous, due caution must be taken to see that children or pets cannot get it. Powdered Borax, which is nearly as effective as sodium fluoride, may be used in the same way, but considerably more times is required to kill. Borax has the advantage that it is non-poisonous to children and pets. In each case the powder will remain effective as long as it does not crust over the top.
2. Mix one-half to three-fourths of an ounce of white arsenic with one pint of wheat flour and add enough water to make a thin paste by boiling. Pour this paste



Adult Silverfish, about $2\frac{1}{4}$ times natural size. (Marlatt
—Farmers' Bulletin 1665)

on flexible cardboard or paper; when dry roll into cylinders with the poison inside, and place where fish-moth are found.

3. Pyrethrum or Derris powder may be dusted on bookshelves or other places where it can be used, but it must be renewed often as it loses its strength when exposed to the air.

For quickly killing hordes of silverfish found overrunning basements and furnaces and storage rooms, spray with a saturated solution of paradichlorobenzene in carbon tetrachloride. As the carbon tetrachloride evaporates fine crystals of paradichlorobenzene will form on the sprayed objects, but these in turn will soon evaporate, causing no damage. If the room sprayed with the carbon tetrachloride-paradichlorobenzene mixture can be closed for 24 hours, the results will be better. For starched clothing and similar objects liable to injury, frequent handling and airing and the destruction of any insects found are to be recommended, in addition to the remedies noted above.

BEDBUGS

The eggs of the bedbug are white and are oval in shape. They are laid in cracks and crevices of bedsteads and furniture, under loose wall paper and in similar places, in batches of a few to 40 or 50, and they hatch within a week or 10 days and are full grown in six or seven weeks.

Control Methods

Sodium Cyanide. The house must first be vacated. It is not necessary or desirable to remove any of the furniture or household effects except articles of polished brass or nickel as they will be slightly tarnished by the gas. Liquid or moist foods should be removed. Fires should be put out.

The cubic contents of each room on each floor should be carefully computed and from that the amount of materials for each room should be computed from the following formula:

| | | | |
|------------------------------------------|---------------|---|--------------------------|
| Sodium cyanide (98-99% avoirdupois oz... | 1 | } | per 100 cubic ft. space. |
| Sulphuric acid | fluid oz...1½ | | |
| Water | fluid oz...3 | | |

A tabular statement should then be prepared similar to the following:

| Floor | Rooms | Cubic Feet | Water fl. oz. | Acid fl. oz. | Cyanide av. oz. | No. of Generators Needed |
|--------|---------|------------|---------------|--------------|-----------------|--------------------------|
| Third | Garret | 7,000 | 210 | 150 | 70 | 2 |
| | Front | 2,800 | 84 | 42 | 28 | 1 |
| Second | Middle | 1,400 | 42 | 21 | 14 | 1 |
| | Spare | 2,200 | 66 | 33 | 22 | 1 |
| | Back | 2,000 | 69 | 30 | 20 | 1 |
| First | Parlor | 4,400 | 132 | 66 | 44 | 1 |
| | Dining | 3,400 | 102 | 51 | 34 | 1 |
| | Hall | 2,000 | 60 | 30 | 20 | 1 |
| | Kitchen | 1,800 | 54 | 27 | 18 | 1 |
| Total | | 27,600 | 819 | 405 | 268 | 10 |

Rooms requiring more than 30 ounces of cyanide should have the charge divided and two containers provided for the fumigation.

The house is prepared for treatment by seeing that all windows are closed and calked, if of loose construction, with wet paper or cotton batting tucked tightly into the crevices. As the house must be aired by opening the windows from the outside, those selected for opening should be examined to see that they pull down easily, and if too high to be reached from the ground they should be provided with strong cords reaching to the ground. These should be tested to see that they function properly. It is not advisable to calk these windows. Fire places and flues should be stopped up and registers should be closed. Carpets and rugs should be rolled back loosely to avoid burning in case the acid should boil over or splatter.

As generators, stone or crockery jars having a capacity of four gallons are preferable, they should be examined for cracked places. A three gallon jar is large enough for 15 to 25 ounces of cyanide. A four gallon jar for 20 to 30 ounces.

The jars should be distributed to the various rooms and placed on several thicknesses of old papers. The proper amount of water should be measured into each and the acid should then be measured out and poured slowly and carefully into the water to avoid splashing or boiling.

The proper amount of cyanide for each jar should now be weighed out and placed in a paper bag beside the jar. When this has been done in each room everything is in readiness to start the fumigation. All persons except those who are going to set off the charge should now leave the house. Not more than two persons should attempt to work at this.

Starting at the top of the house the person setting off the charge should lower the bag of cyanide gently and quickly into the acid and leave the room at once. He should pass through the upper story and place all the bags in the jars as quickly as possible, then go to the lower floor and repeat the procedure. The gas is lighter than air so the fumigation must start at the top of the house. As soon as the last bag is in the acid the operator should leave the house, lock the door from the outside and set up a warning sign against the entrance.

To obtain the greatest efficiency, 24 hours should be allowed for the fumigation, at the end of which time the windows and doors should be opened from the outside. The house should not be entered for at least an hour after first opening the windows. It is advisable to allow a complete airing of several hours and the house should not be reinhabited until all traces of the odor of the gas have disappeared. This odor has been compared to that of peach kernels.

The contents of the generating jars should be poured into the sewer trap or disposed of in some place where they will not be a source of danger, and the jars thoroughly cleaned.

Points to be Stressed: Bedbugs can be cleaned out by fumigating the entire house with cyanide. The greatest difficulty is using this method is that cyanide is a very poisonous gas and that the house must be vacated for two or three days. *No person should attempt to use this method who has not had experience in handling cyanide gas. The cyanide and gas are deadly poisonous and extreme care should be exercised.*

Never go into the house after the generators are started until it has been aired out thoroughly.

Calcium Cyanide (Cyanogas). A great advance has recently been made in the use of hydrocyanic acid in fumigation. A comparatively new material, calcium cyanide, makes it possible to fumigate without having to use the old generator method as described in the first method for controlling bedbugs.

The house is prepared for treatment in the same manner as in the first method. Three thicknesses of newspapers should then be sprayed on the floor and granular calcium cyanide spread over them in a thin layer at the rate of two pounds to each 1000 cubic feet of room space. The moisture of the air is sufficient to liberate the gas. The same exposure should be given and the same precautions observed as in the first method.

After the rooms have been thoroughly aired the paper and the residue should be rolled up and disposed of by burning.

Fumigation should not be attempted when the temperature is below 70° as the bugs will be so inactive as to render the treatment inefficient.

Weigh calcium cyanide out of doors and place correct amount for each room in containers with air-tight covers. Each container is placed in its corresponding room. The cyanide is then placed on the papers.

Remove all silver articles before fumigating with calcium cyanide but if they are tarnished due to exposure this is easily removed by polishing. If paint is discolored, a weak solution of hydrogen-peroxide will renew its color.

Gasoline or Kerosene. Mix the gasoline or kerosene with an equal quantity of turpentine. (Note: Kerosene will spot, so care should be taken in its use.) Place in an oil can. The mixture should be squirted into the cracks and crevices where the bugs are. A probe should be used to open up cracks to allow the entrance of the liquid.

This method will not eradicate bugs from a house where they are established over the entire house. It will help to keep the bugs in check and where they are only locally established it is a convenient method to use.

Infested bedding should be treated with gasoline. Articles that can be washed in gasoline are best treated in that way, others can be sprayed or painted with it.

To make this method effective a great deal of care must be taken to treat all places where bugs may be.

It is not a disgrace to get bedbugs, but it is to keep them.

FLEAS

There are many kinds of fleas recorded from this country, but the dog flea is the one ordinarily found in this section.

A flea does not pass its whole life cycle on the host that it infests. Only the adult is found on the infested animal, the other stages being spent in entirely different situations.

The eggs of the dog flea are deposited as a rule on the body of the host. It is probable that in some instances the eggs are deposited on the floors, carpet or cloths on which the dog may be lying. If laid on the host they fall to the floor. The eggs are white and waxy and easily visible to the eye.

The eggs soon hatch and the worm-like larvae crawl away into cracks and crevices where they feed on whatever organic matter can be found.

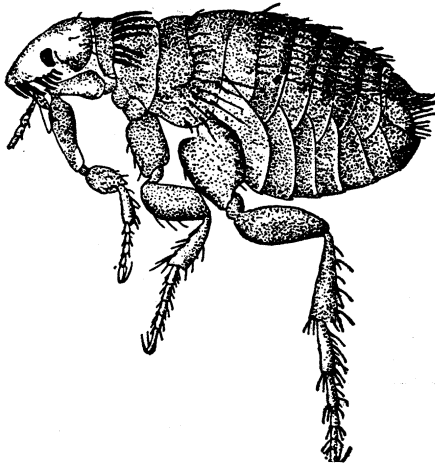
Control Methods

Creosote Stock Dip. Dogs and cats may be kept reasonably free from fleas by frequently bathing them in creosote stock dip. The stock dip bath should be made up of the proper strength as indicated on the container. The cat or dog should be carefully and thoroughly washed in the bath. Care must be exercised to see that the insects on the head are thoroughly soaked. The animals should be kept in the bath from 5 to 10 minutes. They may be allowed to dry or may be washed in warm water and soap. Or the animals may be treated with pyrethrum or derris-dust. Most flea powders on the market contain one or both of these substances.

The powder should be thoroughly rubbed all over the animal and worked into the fur or hair. Since in some cases the fleas may recover it is a good plan to place the animal over a newspaper which should later be burned.

A common source of trouble is where pet animals are allowed to bed under the house. In such retreats fleas breed in immense numbers and will attack persons that are near the house foundation. They may also invade the house. Under such circumstances the soil can be given a thorough wetting with a pyretherum spray, such as any of the common fly sprays on the market, and the animals kept out by screening.

Destroy eggs and larvae in breeding places. Remove the rugs and carpets, sweep the floors thoroughly and collect the



Dog Flea much enlarged

dust obtained and burn, as it contains many eggs and immature forms. The rugs and carpets should be beaten and shaken to remove the eggs and immature stages.

The floors should be scrubbed with strong soap suds. When dry the rugs and carpets may be replaced, the floor having first been sprinkled with naphthalene crystals or phrethrum powder.

Fleas breed in dust in the cracks of floors and like places and in or under the bedding of animal pets. These should be carefully treated to destroy the eggs and immature forms.

CRICKETS

The poet may find great comfort in the chirp of the cricket in the chimney corner, but to the housewife it is a danger signal which, if not heeded, may result in the destruction of some valuable garment or other fabric. Crickets like to hide in dark places, the closet being the favorite, and with its sharp, cutting mouth-parts cuts holes in the clothing or other fabrics stored there.

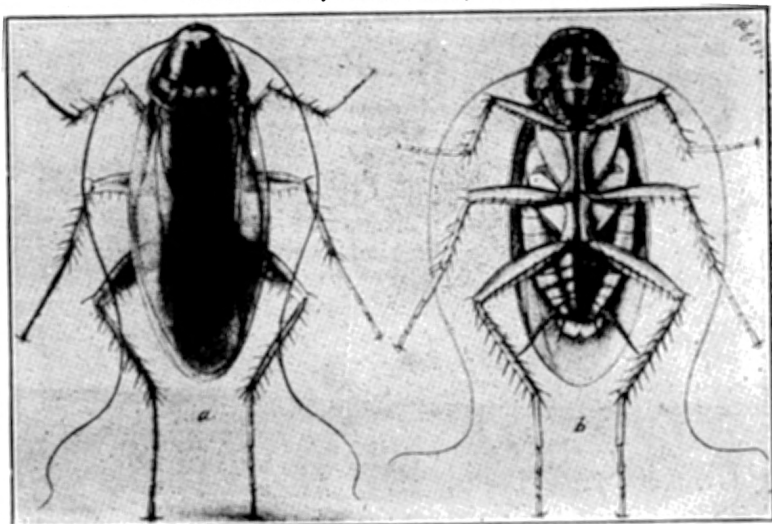
Control Methods

Lead Arsenate, White Arsenic, Paris Green. Crickets are very fond of cut green vegetables and sweetened liquids. One of the most simple baits is made by cutting up a few uncooked potatoes, apples or carrots and sprinkling the same with lead arsenate, white arsenic or Paris green. Distribute the poisoned bait where the crickets frequent. One must be careful in using a bait of this kind so that nothing else gets the bait.

COCKROACHES

Cockroaches are particularly annoying because their favorite hiding place is the kitchen and pantry where the foods are kept. They attack almost any kind of food and pollute more than they actually destroy. They are likely to attack the bindings of books and other leather goods.

The eggs of the roach are laid in a sort of capsule. There are about 40 eggs in a capsule and each egg is in a separate compartment. These eggs hatch on the average of about 39 days from the time the capsule appears. The rate of growth of these young cockroaches is apparently slow in most cases and varies with the temperature and the food supply.



Adult Roach

Control Methods

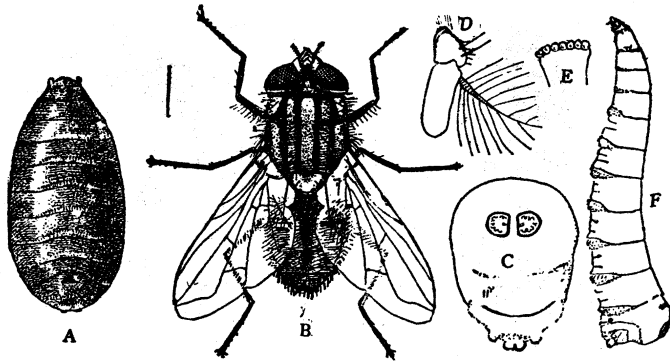
Before applying control measures for cockroaches, it is necessary to thoroughly clean up those places which are infested.

Sodium Fluoride. This is a fine white powder available at most drug stores at a reasonable price. It has proved to be the best substance known for combating roaches. It may be used pure or mixed with equal parts of flour, and should be dusted over all places frequented by roaches. The best results can be obtained by the use of a dust gun, as this will force the dust into cracks and crevices. If a dust gun is not available it can be dusted through a cheese cloth bag. This dust is apparently very annoying to the roaches, causing them to come out of their hiding places and rush more or less blindly about. In a few hours they become paralyzed and die.

The treatment may need to be repeated two or three times at about two day intervals. Care should be taken that sodium fluoride does not contaminate human food.

HOUSE FLIES

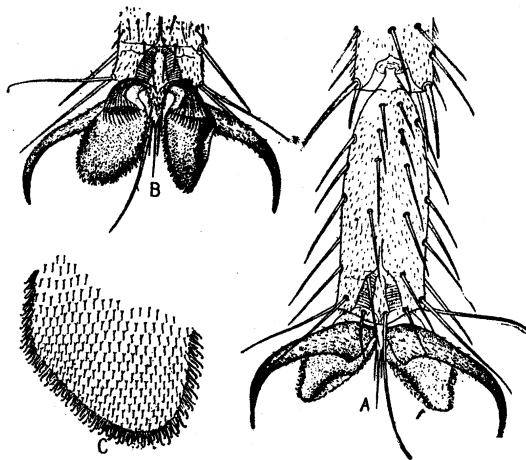
One of the most annoying and insanitary of the household insects is the housefly. In all its habits and instincts it seems to be a lover of filth. The eggs are usually deposited in manure, preferably horse manure. Sometimes they are laid



Life History of House Fly

on cow manure and often on human excrement especially in open toilets and on other decaying vegetable and animal matter. The most dangerous of these places is open toilets, for in these places the germs of typhoid fever, dysentery, and infantile diarrhea may be found.

Each foot of the fly is furnished with two pads and each of these pads bears many tiny hairs which secrete minute drops of a sticky liquid that holds the fly to the ceiling on which it walks. (See Figure B.) The hair on the body of the fly and the sticky foot pads entangle and gather up millions of germs from all sorts of filthy places. The fly may distribute these wherever it may happen to tread.



Foot of House Fly greatly enlarged

The mouth parts of the fly form a proboscis, on the end of which are two lobe-like organs called the oral lobes. When the fly finds a solid substance such as a grain of sugar, it applies the oral lobes to the food, sends out some saliva to dissolve the solid material, and then gradually sucks the solution into the mouth.

It has now been definitely proved that house flies carry, both externally and internally, certain disease producing germs. For example, several observers have found that the bacilli of typhoid fever may be carried on the feet, legs and bodies, and in the alimentary canal of flies. It has been charged that house flies carry the bacilli of cholera and tuberculosis, as well as the germs of infantile diarrhea and other juvenile intestinal diseases.

Control Methods

The methods of controlling the house fly consist of eliminating the breeding places of the insect, in actually destroying the fly, and in preventing the fly from entering the house.

Eliminate Breeding Places. Remove manure daily. Scatter thinly over the surface of the ground where it is placed.

Outdoor toilets should have a fly proof pit, and in addition the contents should be carefully covered each day with a liberal supply of fine road dust or sifted ashes. The pit should be emptied as often as possible and the contents buried far from wells and springs of drinking water.

In general, the premises should be kept free from the accumulation of garbage and heaps of decaying vegetable matter, especially piles of grass cuttings and special effort should be directed to keeping pigeon, and poultry houses, and the stables of farm animals clean.

Destroying Flies

Formaldehyde. One of the most satisfactory fly poisons can be made by diluting one-half cup of milk and one-half cup of water and adding a little syrup or sugar. To this mixture add one tablespoon of formaldehyde and mix thoroughly. Place in shallow containers where the flies occur. Take care to keep away from children.

Pyrethrum. This is a powder sold for the purpose of killing all kinds of household insects. At night all windows and doors of the room to be treated should be closed and fresh powder should be sprinkled liberally over the floors and furniture. In the morning the flies will be found lying around dead or stupified and they may then be swept up and burned.

Traps. There are many different types of traps, many of which are excellent, and their use is recommended, especially early in the season when the first appearing flies may be caught.

Screening

When the above methods are not practical, or if it is impossible to put them into practice, one must revert to screens. All doors and windows should be screened with a good grade of screen wire not less than sixteen mesh. The doors and window frames should fit tightly so it will be impossible for flies and mosquitoes to enter around the edges. It is cheaper to buy new screen to replace old worn-out screen than it is to buy fly spray to kill flies after they enter the house.

MOSQUITOES

There are many species of mosquitoes in the United States. Those concerning us mostly are some of the house mosquitoes of the genus *Culex* and some of the malarial mosquitoes of the genus *Anopheles*.

The *Culex* transmits no disease but because it is so well known it serves as an example of the manner in which mosquitoes live. It breeds almost every place in which fresh water may be found; in quiet pools, roadside ditches, hollow stumps, rain barrels, cisterns, tin cans, etc. The eggs are laid on the surface of the water in somewhat boat-shaped masses. Each contains from 75 to 300 eggs. When first laid the eggs are yellowish white, but a little later they become dark brown in color and appear as small masses of soot floating on the water. The eggs float on the surface of the water from 24 hours to several days before hatching, according to the temperature. From these the eggs hatch into tiny larvae known as "wigglers." The wigglers live on bits of plants and vegetable matter that they find in the water. In about two weeks they develop into the adult mosquitoes which annoy us so much.

The *Anopheles* mosquito rarely breeds about the house, but chooses a ditch, a pool, or the shallows of a spring, brook, creek or river for its *breeding* place.

The eggs are laid singly and at random on the surface of the water, although they naturally run together and cohere in loose, irregular groups. The larvae of the *Anopheles* lies in a horizontal position just beneath the surface of the water. They may be recognized by the position they assume in the water. The *Culex* hangs at an angle of 40° with its head downward.

The full grown Anopheles is somewhat larger than the Culex. The wings are heavier and present a spotted appearance. The female Anopheles bears three long, slender projections on the head, while the female house mosquito has but one. When the house mosquito alights its body is held parallel to the surface, whereas the body of the Anopheles usually rests at a considerable angle to the surface on which it alights.

Control Methods

Obviously, the best method of controlling mosquitoes is to destroy their breeding places. Tin cans and other useless receptacles in which water may collect should be buried. Rain barrels and tanks may be covered with galvanized wire netting so as to prevent the mosquitoes from laying their eggs in the water.

Kerosene. In many cases, ponds, pools, and tanks that cannot be drained or stocked with fish may be sprinkled with kerosene oil every two weeks during the summer. The oil spreads over the water in a thin film and prevents the wigglers from breathing through their tubes, consequently they are drowned. The oil also kills the eggs and prevents the mosquito from depositing any more.

Repellents of Adult Mosquitoes. Various mixtures, oils and ingredients are used for repelling adult mosquitoes. Oil of citronella sprayed in and around porches where mosquitoes are troublesome is a fair control for a few hours but is not reliable as an efficient control.

The following mixture is recommended: cedar oil, one ounce; oil of citronella, two ounces. A few drops of this mixture on a cloth hung on the bed will keep mosquitoes at a distance and will be effective for a long time.

Natural Enemies. Into those pools and tanks that cannot be drained or that are not desirable to cover with oil, fish may be introduced which will destroy the wigglers. For example, goldfish, sunfish or certain minnows, especially the top minnow, serve to keep pools free from mosquitoes.

CEREAL INSECTS

Every household is in constant danger of becoming infested with beetles or moths which work in household cereals such as rice, flour, corn-flakes, etc. These pests are brought into the house in flour or cereals and then multiply until they not only become a nuisance, but often completely ruin all cereal food in the house. The beetles are very small (one-eighth inch long) and are reddish or brown in color. The grain and

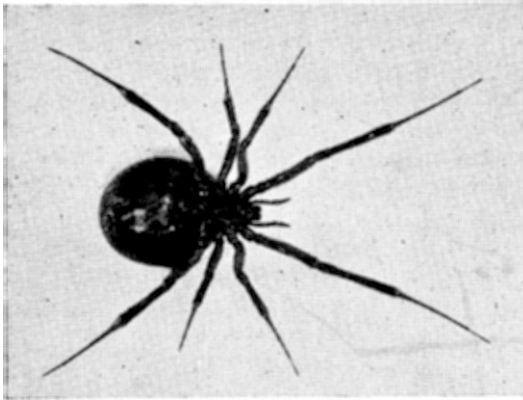
clothes from a little above the knee downward and into the shoes and stockings, or it may be rubbed over the legs and ankles. Naphthalene has been successfully used in the same manner. While the sulphur, being inodorous and perfectly effective, is undoubtedly preferable against harvest mites alone, naphthalene is a safeguard against various forms of man-infesting tropical insect pests. Vaseline, pure or mixed with sulphur, will serve the same purpose, but is not so agreeable on account of its oily nature and the certainty of its soiling the clothing.

Destruction of the Mites in the Field. Much complaint has been made of the presence of harvest mites on lawns and in vegetation in country grounds and along pathways and roadsides, and information has been solicited by many, including officers of country clubs and the like, for methods of eliminating the mites from such locations. This can be accomplished by keeping the grass, weeds, and useless herbage mowed as closely as feasible, so as to expose the mites to the sun. In some cases this can be facilitated by dusting the grass and other plants, after cutting, with flowers of sulphur or by spraying with dilute kerosene emulsion in which sulphur has been mixed. Grasses on the border of ponds frequently by cattle, wild blackberry bushes, and similar plants should also be cut down and destroyed in the vicinity of houses and where children and older persons are liable to mite infestation by passing through them. Well cultivated fields kept free from weeds are not infested with "chiggers," and in the course of time, perhaps a year or two, the measures prescribed, if carefully carried out in grassy locations, should also entirely free these from the pests.

BLACK WIDOW SPIDER

Latrodectes mactans, Fabr.

The poisonous spider known as "black widow," "hour glass," and "shoe button" is generally prevalent in Oklahoma. The "black widow" name originated from the fact that after mating the female may kill and eat the male. The red area outlined in the form of an hour glass on the under side of the abdomen gives rise to the name "hour glass spider." The jet black color and rather smooth appearance of the spider with small thorax attached to the large spherical abdomen gives rise to the name "shoe button spider." The similarity is perhaps intensified by the legs on the thorax which appear like a staple or threads attached to a detached shoe button.



Ventral view of Black Widow Spider, about natural size. Notice the hour glass marking on the under side. Photo by G. A. Bieberdorf

The coal black colored female, with the exception of the red hour glass marking, is from one-half inch to three-fourths of an inch long. The male is about half that size and is marked with a middle longitudinal orange colored line and four rather oblique, pale stripes on each side.

They generally live in irregular, coarse, strong, webbed nests in dimly lighted places such as outhouses, sheds, deserted buildings, stone and trash piles, wood and brush piles, dead stumps, sides of fence posts, and among the branches of such plants as tomatoes and cotton.

They feed mainly on insects, both large and small, that become entangled in their webs. When a grasshopper or similar insect becomes entangled therein the spider generally bites it on a leg which soon causes paralysis and consequent death.

This spider is not particularly aggressive, but a person is likely to be bitten if an exposed part of the body contacts its nest in an agitative manner.

Both sexes are poisonous but the male is less dangerous. The poison glands are near the base of the pair of needle sharp claws on the under side of its head. The poison can flow through these piercing organs.

The bite on a person is sharp and painful although the wound is rather inconspicuous. The surrounding area turns pale at first, then red, followed by slight swelling. An aching pain soon develops which spreads to other parts of the body. Breathing becomes forced and irregular and circulation de-

creases. Fatal results may follow. However, with proper medical attention a patient should become normal within less than a week. Potassium permanganate as for snake bites has been recommended. Hot baths seem to be advisable and afford appreciable relief.

In case of a suspected black widow bite the spider should be captured for determination and the services of a physician obtained.

It seems that black widows were more prevalent during the summer of 1934 and 1935 than formerly. Mild winters and dry summers may account for this supposed increase. However, publicity may have been the chief factor which caused attention of people to the spider so that more were actually seen than formerly.

Life History. The female develops her eggs in a light yellow, balloon-shaped, silken cocoon which generally turns darker with age. These cocoon-like egg cases are about five-eighths of an inch long by seven-sixteenths of an inch wide. Each female develops about a dozen in one year. Some may contain only a small number of eggs while others may contain upwards of 1,000. They are suspended in the spider nest and guarded by it. After the eggs hatch the young may remain in the cocoon from a week to nearly a month. They eat an exit hole in one side of the case through which all issue, single file, spinning a strand of silk anchored behind them. They soon scatter and begin constructing irregularly shaped nests in places previously mentioned. Under laboratory conditions, females and males which emerged from a cocoon October 16 developed to maturity February 4 and 11 respectively.

Control. Inspection of their haunts, such as frequently visited by persons, and the mechanical destruction of the spiders and egg cases is advised.*

RATS AND MICE

Every household is familiar with the destructive, as well as the annoying and filthy habits of rats and mice. They attack almost any kind of foodstuff and pollute as much as they destroy. In many instances clothing, bedding, papers, rugs, and upholstered furniture have been ruined by their attacks.

Methods of Control

Traps. Place the bait on the trigger of the trap and place in or near where the animals commonly run. The trap method of eradicating rats and mice is the most desirable as it

* Discussion of Black Widow Spider by C. E. Sanborn, Professor, Emeritus, Entomology.

eliminates the danger of the animals dying and decaying in inaccessible places. In badly infested places it is often necessary to resort to poison because of the large numbers.

Barium Carbonate. For one baiting mix one cup of corn meal with one-fourth cup of barium carbonate. Place in shallow pans and then place where rats and mice are common. Barium carbonate may be mixed with meats, cereals or succulent bait and often it is advisable to put all three baits so that the animals may have their choice. The house should be made mouse-proof by tacking tin over holes so that when the rats and mice are cleared out they will not be able to reinfest the house.

Barium carbonate is preferred to red squill in places where no animals or poultry are present because it is cheaper and acts more quickly. Before attempting to kill rats with any poison, they should be baited with the same kind of food that you intend to use with your poison. For instance, if you are going to use poisoned hamburger bait the rats with unpoisoned hamburger the night before you use the poison. If they fail to eat the bait, you may have to experiment to find out what bait the rats will take.



Rats destroy more than they eat. Each rat eats or destroys \$2 worth of food each year. How many rats do you feed?

Photo by U. S. Biological Survey

Red Squill. Red squill is a perennial bulb that grows wild along the coast of the Mediterranean Sea. Its acid taste is highly objectionable to most animals, but is relished by rats. It is marketed in both liquid and powder form, and either one is effective. The powder, as a rule, is more toxic to rats, less expensive, and keeps better; it can also be mixed readily with a wide variety of baits.

Because of the variability of commercial red squill, it is necessary in preparing rat baits to vary the proportion of red squill to the foods used. Directions for use accompanying red squill products purchased should serve as a guide in this respect.

Red squill can be used when poultry, cats, dogs, hogs and other domestic animals are present because they refuse to eat it or are unable to retain it in their stomachs.



Screen all outside openings with hardware cloth to prevent rats from entering. Photo by U. S. Biological Survey

Calcium Cyanide. Calcium cyanide dust, the material used in this work, is a bluish powder with a very characteristic odor. When this dust is exposed, the moisture of the air is sufficient to liberate a gas known as hydrocyanic acid. This is one of the most poisonous gases known and persons using the material should take care not to inhale it. When this gas is

liberated, even in rather dilute concentrations, it will kill any animal inhaling it in a very short time. Even though a rat leaves a runway into which the dust is being forced, he usually dies before going far, as he will ordinarily have breathed sufficient gas to kill him before escaping.

The calcium cyanide dust may be applied with the common garden dusting machine or with a dust gun prepared especially for combating burrowing animals. The duster should have a hose attached to the distributor pipe so that the dust can be forced directly into the rat harbor. The hose should be inserted into a rat burrow and the dust pumped in. A careful watch should be kept and if dust is noticed escaping from the burrow, the openings should be filled with moist earth. The dust may be readily detected since it appears as a smoke-like cloud when escaping. Usually when the dust begins to come out of other openings, the burrows have been sufficiently filled with the material and an extra stroke or two on the pump will insure good measure. The hose should then be transferred to another entrance and the treatment repeated until all the burrows have been treated. To insure good results all of the openings to burrows and runways should be closed after they have been treated. It must be remembered that this method will be satisfactory where the concentration and spread of the dust can be controlled. In other words, it is only satisfactory where the rats are in burrows or dens.

The operator should be very careful not to inhale the dust or the fumes from it.

Care should be exercised in keeping the stock supply of calcium cyanide and the used pump where children and domestic animals will not have access to it.

REFERENCES

Farmers Bulletins:

- 658—Cockroaches
- 671—Harvest Mites or Chiggers
- 699—Hydrocyanic-acid Gas Against Household Insects
- 734—Flytraps and Their Operation
- 740—House Ants
- 754—The Bedbug
- 897—Fleas
- 1101—The Argentine Ant as a Pest
- 1260—Stored Grain Pests
- 1353—Clothes Moths and Their Control
- 1408—Suppression of the House Fly
- 1472—Damage by White Ants
- 1533—Rat Control
- 1570—Mosquitoes, Remedies and Prevention
- 1665—The Silverfish

New York Extension Lesson 134
by Glen W. Herrick,
Household Insects and Their Control.

meal moths closely resemble the clothes moth, but there is not such a heavy fringe around the wings. These moths and beetles lay their eggs in the cereal. The eggs hatch into tiny larvae and are the so-called "worms" found in the cereal.

Methods of Control

Heat. Place the infested cereal in a shallow pan, and put the pan in the oven and bring the temperature to 135° F. and hold at this temperature for from 10 to 15 minutes. Remove from oven and run through a fine sieve to remove all dead insects.

Heating will kill all stages of the insects and in no way injure the cereal.

Carbon Bisulphide. Place the infested cereal in tin can or box with tight-fitting cover. Put a small quantity of carbon bisulphide in a shallow dish on top of the cereal (2 ounces carbon bisulphide is sufficient for 50 pounds cereal). Cover the can or box tightly and allow fumigation to continue for at least 18 hours.

Carbon bisulphide is highly inflammable and must be kept away from fire or lights.

PLANT LICE, MEALY BUGS, WHITE FLY, SCALE INSECTS

Ordinarily the leaf-eating insects do not affect the household plants. Only those insects which have sucking mouth parts are serious. Of these there are four which cause the most trouble—plant lice or aphids, mealy bugs, white flies and scale insects.

Plant Lice or Aphids. These are the small green, black or brown insects that are found on terminal stems and leaves. They cause the leaves to curl, wither and die. They suck their food from the inner tissues of the plant.

Control. Spray with one to one and a half teaspoonsful Nicotine Sulphate (Black Leaf 40) to one gallon of warm water in which one ounce of soap has been dissolved.

Mealy Bugs. Mealy bugs may be readily recognized by their distinct white powdery appearance. They are also sucking insects and cannot be poisoned.

Control. Frequent and forceable sprayings with plain water is usually effective. Sponging and brushing with soapy water are remedies which should be resorted to only when forceable spraying is impracticable.

White Flies. White flies may be known by their white, floury appearance. The adult four-winged flies are about

one-sixteenth of an inch in length and are very active. This insect sucks the juices from the foliage of houseplants, causing them to turn yellow and die.

Control. Spray the under side of the leaves of infested plants with a solution of soap and water. One-half a pound of toilet soap dissolved in three gallons of water should be used.

Scale Insects. In general there are two kinds of scale insects, namely, those with a soft shell and those with a hard shell. They have sucking mouth parts and either kill or reduce the vitality by sucking the juices from them.

Control. Sponging or spraying the plants with common laundry soap, one-fourth pound to one gallon of water, or Black Leaf 40, used at the rate of one and one-fourth teaspoonsful to one gallon of water to which one ounce of soap is added is effective. Wash off in two hours to prevent injury to the foliage.

When not sure which insect is present the following should be used:

(For all)—Mix 7 parts of oleic acid and 10 parts of nicotine (Black Leaf 40). This will make a thick salve-like material. Dissolve two level tablespoons of this material in one gallon of soft water, in which has been dissolved a small amount of laundry soap, and spray or dip the plants in this solution.

When house plants are infested with mealy bugs, white flies, or soft bodied scale, it is necessary to use nicotine oleate because the Black Leaf 40 will not penetrate the waxy covering of these insects when used alone.

ANTS

Ants are a constant nuisance in many households during the summer months. There are several species which cause trouble in dwellings. Most of them nest outside and enter houses only for the purpose of gathering food. Others are truly household ants, building their nests within the building.

The little red ant, or Pharaoh's ant, is the best known house species. It was originally a soil ant, nesting out of doors in warm countries, but in temperate regions it passes its entire existence in heated houses, making itself a general nuisance wherever food is stored.

The Argentine ant is a much worse house pest than even the little red ant or any of the other house ants and is, in addition, a very serious enemy of field and garden crops and orchard trees. Small in size and dark brown in color, it is able to

invade practically every part of the ordinary dwelling, store, etc. The Argentine ant eats almost anything but has a marked preference for sweets and meats of all kinds. In summer it may be located anywhere, under sidewalks, under brick piles, under old boards, in an old tin can, in fact any place convenient to the food supply. In the winter months they concentrate into larger colonies and seek warm, dry, secure nesting places in which to hibernate.

The "thief ant" feeds on animal matter, including dead insects, and has been reported as attacking the sprouting kernels of Indian corn. It is very small and yellowish in color. It may readily be distinguished from Pharaoh's ant by its much lighter color and smaller size.

The Harvester ant is the large red ant that we often find in yards and fields. They tunnel deep into the soil and construct mounds at the surface openings of their tunnels. All vegetation within ten feet of these mounds is usually destroyed.

Almost any of the common garden or lawn ants which build little crater nests in lawns or in soil about the house may become temporarily or on occasion a house pest in their search for food. Five species have achieved notoriety in this way. One of these is the little black ant. It is essentially a lawn or meadow ant, and its entrance into houses is due to chance or accident. When these or other lawn ants gain access to houses, the nuisance can often be eliminated by tracing them back to their outdoor colony and destroying the latter.

Methods of Control

Sodium Arsenate. In a half cup of syrup place a small amount of sodium arsenate (the size of a small lima bean). Stir until the sodium arsenate is thoroughly mixed through the syrup. This bait should be placed in shallow pans where the ants are abundant. Care must be taken to keep this bait away from children.

There are numerous baits which can be equally well used to combat ants. The one given is quickly made up and is effective.

Tartar Emetic. For ants that are feeding on sweets, bread or cake, mix one part tartar emetic to 20 parts of extracted honey or syrup and place in the cans where ants will have access to it.

For ants that are feeding on meats and greases, mix one part tartar emetic to 20 parts of lard or meat fryings and place in the bait cans where the ants can have access to it. To make

the bait cans, take a can having a tight-fitting cover and punch three or four holes the size of a ten-penny nail near the top. When the bait has been placed in this container the cover should be put on tightly. The ants will enter through the holes in the side of the can and carry the poison mixture away to their nests. In this way the queen and developing ants will be destroyed. Do not expect immediate results from the application of this bait as it will take a week or 10 days to clean up the nest, but this gives the most lasting results of any ant poison that can be used against the little house ant. Care should be used to keep the bait away from children and irresponsible persons as it is a rather violent poison.

The pavement ant builds its nest beneath the pavement or under flagging stones in the yards of dwellings. From these situations of vantage and nearness to dwellings, the pavement ant has acquired the habit of entering houses, and in some instances has become quite as much a pest as the house ant.

Cyanogas. Enlarge the entrance of the ant hole with a piece of wire or some similar object and place about a tablespoon of the Cyanogas in this entrance. Cover quickly with not less than three thicknesses of paper and cover the paper with a thin layer of soil to keep the gas from escaping. A heavy wet blanket may be used instead of the paper. Three applications, six days apart, are usually sufficient.

Cyanogas is a deadly poison and must be used with great care.

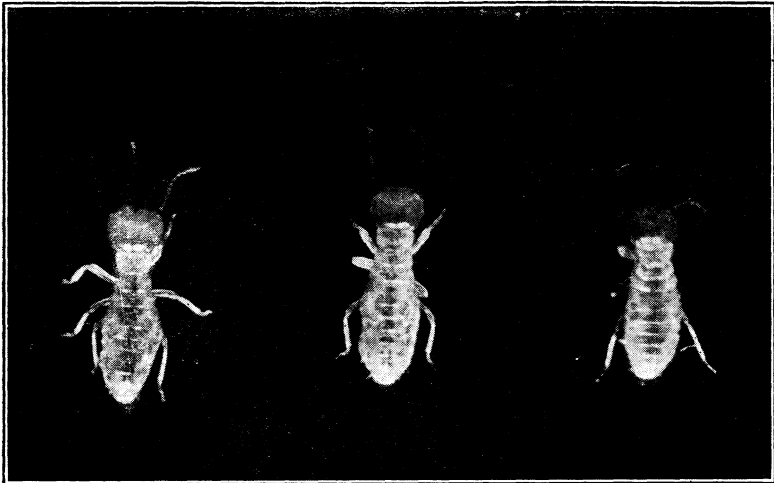
Carbon Bisulphide. Carbon bisulphide may be used the same way as Cyanogas. This substance may be placed in the nest with an oil can having a long spout. Use two or three ounces or more of the liquid, depending on the size of the nest.

One of the best methods of destroying the Harvester ant is by the use of carbon bisulphide. Experiments in Oklahoma show that it is best to dig the mound down to the depth of about eight to twelve inches and leave the hole open overnight. Treat the next day with carbon bisulphide, using about one-half teacup full to each ant mound. It should be poured in the openings that the ants have cleaned out during the night. The soil should then be replaced and packed tightly.

TERMITES

Termites or white ants are not true ants although they are superficially antlike and live in colonies made up of different forms or casts. The winged male and female termites which are seen for a short time in the spring or fall are on their way

to start new colonies. These parent termites are not injurious but their descendants, the wingless workers of the new colony, are very destructive. These are rarely seen because they do not crawl about in the open but stay in the earth under ground or in wood. If they want to reach woodwork above the ground, they build earth-like tubes to crawl through, so they are always under cover.



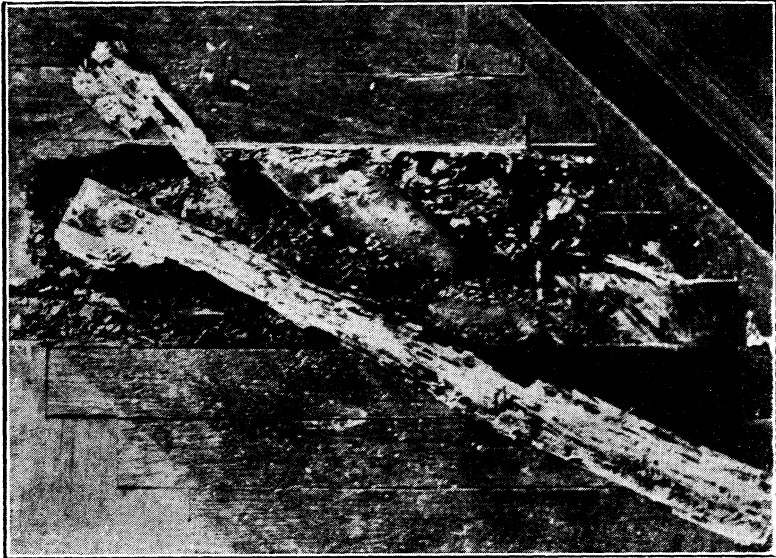
These are the workers that do the damage

Damage by termites or "white ants" is serious to many classes of crude and finished forest products and is occasionally serious to living trees and other plants. These are especially injurious to foundation timbers, the woodwork of buildings, and materials stored in buildings to which they have gained entrance.

The woodwork of buildings may be protected from the attack of termites by proper construction and by the use of wood treated with preservatives. These insects can be eliminated where already established in buildings by removing wood in contact with the ground and replacing it with wood chemically treated.

To construct buildings so that they will be white-ant proof, make the foundations where possible, entirely of stone, brick or concrete, including stone or metal columns or pillars in basements to support the floor above; make concrete walls and flooring in basement or cellar, and lay concrete floors on a gravel base. Where stone or concrete foundations are imprac-

tical use timber impregnated with coal tar creosote. Lay basement window sills and frames over concrete, and do not allow woodwork to come in contact with the ground. Never sink untreated timber in the ground or in moist concrete.



Hardwood floor damaged by Termites

Complete dryness of the foundation and of basement walls and flooring is an important means of rendering buildings safe from attack. Provide for air spaces between the ground and wooden flooring and lay concrete floors on a gravel base.

To eliminate termites already established in buildings, examine the foundation timbers and other woodwork in the basement to determine the approximate point of entrance and the extent of damage already accomplished.

After removing the damaged wood and destroying the earthen tubes that the termites have constructed, the soil should be treated with a full strength of crude liquid orthodichlorobenzene. This chemical should be applied in a trench two or three inches deep, dug close to the interior walls and also along the exterior foundation walls if it is thought that the termites are coming from the outside. It should be used at the rate of one gallon to ten linear feet of trench. It should also be applied at the same rate and in the same manner around chimney foundations and masonry pillars supporting

the main structures and porches. This material will burn slightly, so be careful and do not get it on the face or into the eyes.

Where there is danger of orthodichlorobenzene reaching the roots of ornamental plants, etc., paradichlorobenzene in the crystalline form may be used. A shallow trench three inches deep should be dug around the foundation and the crystals placed therein to the depth of two inches and then covered with loose earth. About five pounds per ten linear feet should suffice.

The use of these and other soil poisons is especially applicable to buildings raised on masonry pillars or partially filled-in basements or porches. Experiments show that soil treatments are not permanent and one may expect a re-occurrence of termites in a few years if termite shields are not put in place. After the soil has been treated, replace the damaged timbers with rock, brick, concrete, or metal work, or substitute for the foundation, timbers impregnated with coal tar creosote.

For permanency, metal shields should be placed over the foundations if termites are especially bad. The outer edge must extend at least two inches from the face of the foundation and the projecting edge bent downward to an angle of forty-five degrees. In masonry buildings, this shield should be inserted in the masonry at a height of at least eighteen inches above the ground.

If the following suggestions are carried out, termite injury will be lessened and in some instances may be controlled. *First*, remove all waste wood materials from beneath the building. See that no wood comes in direct contact with the soil. Should there be any wooden supports, remove them and replace them with masonry or creosoted timbers. *Second*, where ventilators are not present, they should be installed at the rate of two square feet of air space to each twenty-five linear feet of foundation. They should also be arranged so there will be a cross draft. These openings should be screened with hardware cloth to prevent rats and other animals from gaining entrance to the house. *Third*, there should be a clearance of at least eighteen inches between the floor joists and the soil. Twenty-four to thirty inches is preferred. *Fourth*, all nearby dead trees and stumps should be removed as they furnish breeding places for termites.

Since subterranean termites always require access to damp

earth, shut off this source of moisture. The insects will then be unable to extend their galleries farther and will perish.

Injury to living vegetation is occasionally serious. It can be prevented by clean cultural methods, deep fall plowing, and the use of insecticides. No satisfactory soil treatment has been found that will rid the flower bed of termites and not injure the plants. Rotation of the flower bed, elimination of pieces of wood, old stumps, roots and wooden stakes will help. Do not use barnyard manure if termites are troublesome.

CHIGGERS OR HARVEST MITES

These pests are the larval or six-legged form of harvest mites, the adults of which have eight legs. The adults are of different shades of red and are quite visible. They do not burrow into the skin as is sometimes supposed but attach themselves to the epidermis by their mouth parts. After they are engorged with blood like ticks, they release this hold and fall off.

Methods of Control

As chigger infestation is usually contracted by coming in contact with infested areas, it is obvious that the best means of prevention is the avoidance of exposure. If, however, a bath is taken in hot water or water containing salt or strong soap within a short time after exposure and the clothing is changed, considerable relief will result.

Palliatives. If exposure has been unwittingly incurred or precautions have been neglected and the characteristic irritation has set in, warning the patient of trouble to come, a counter-irritant or cooling lotion should be applied directly to the affected parts. For this purpose moderately strong ammonia applied when the symptoms are first manifest, has given good results. Bicarbonate of soda, or common cooking soda or saleratus, may be substituted in supersaturated solution. Similar alkaline solutions would probably also serve in counteracting the insect poison, which is acid. These substances should be applied liberally until the irritation subsides. Some persons have testified to the value of a 10 percent dilution of carbolic acid. Alcohol, camphor, essence of peppermint, and similar preparations are very "cooling" but afford, as a rule, only temporary relief. A dilute tincture of iodine or collodion applied to the affected parts is a good remedy in case of severe suffering. The latter acts by protecting the "sore" spots from the air.

Sulphur is a sovereign remedy for mites and is the best preventative of attack. When exposure is unavoidable and where vegetation is not more than two or three feet high, a sure preventative is found in sifting flowers of sulphur into the under