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T. H. FRISON, Acting Chief

ENTOMOLOGICAL SERIES, CIRCULAR 11, REVISED EDITION

Habits and Control of Termites

BY AUGUST E. MILLER AND W. P. FLINT



Mature Winged Termite ($\times 6$)

URBANA, ILLINOIS

1931

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[Printed by authority of the State of Illinois.]


JOURNAL PRINTING CO.
SPRINGFIELD, ILLINOIS
1931

53999—3M—3-31

Ilbc
no. 23
vol. 6

HABITS AND CONTROL OF TERMITES

BY AUGUST E. MILLER AND W. P. FLINT

Termites, or white ants, as they are sometimes called, are found throughout Illinois except in the extreme northern counties. Damage from these insects has apparently been increasing during the past ten or twelve years and now amounts, according to very conservative estimates, to at least five million dollars a year.



Fig. 1—Adult Worker
($\times 8$)



Fig. 2—Adult Soldier
($\times 8$)

New buildings may be made termite-proof without much added expense if a few precautions are taken in their construction, as recommended in the provisions for building codes on page 12 of this circular.

In buying property, one should always look carefully for evidences of termite infestations, as many buildings have been sold when so infested.

Buildings once infested may be cleaned of termites by following the directions given in this circular. The expense of such an operation will depend on the degree of infestation, the type of building, its location,

and several other factors. Termite infestations should be cleaned up as promptly as possible, for delay almost always means additional expense. Although an infestation may sometimes come to an end without special measures being taken to combat it, the insects ordinarily persist from year to year, doing more and more damage. In some cases the infestations may continue for a number of years with only moderate damage, but in other cases the buildings are seriously injured or nearly destroyed in two or three years or less.

In order to bring out more clearly the special points in regard to these insects and their control, this circular is written in the form of questions and answers.

1. What are termites? Termites are social insects living together in colonies somewhat like ants, although these colonies differ in some respects from those of the ants.

The workers (Fig. 1) are milky-white to gray, slightly flattened insects, about one-fifth inch long, without wings and with cutting mouth parts. They are usually the most numerous individuals in a colony.

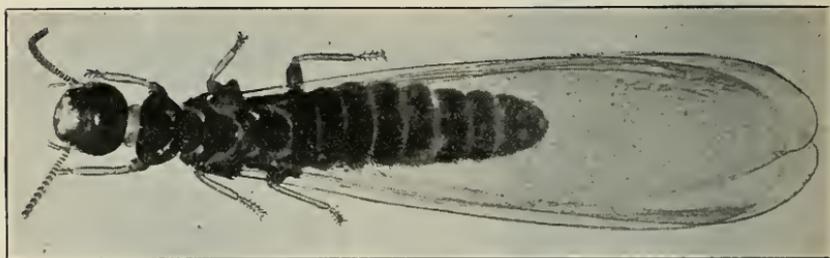


Fig. 3—Adult of First Sexual Form with Wings Folded ($\times 8$)

The soldiers (Fig. 2) are of about the same shape and size as the workers and have no wings. They have a yellowish abdomen and large reddish-brown head with strong pincher-like jaws.

There are three sexual forms. Males and virgin females of the first form (Fig. 3) are black, faintly tinged with brown, of the same general shape and size as the workers, and have four long silvery wings which give them a length of about one-half inch. Fertile females, or queens, are of the same color as virgins, but with bands of white across the abdomen in the older ones; the body is variously distended with eggs, and the wings have been broken off at a definite joint near the base. The latter individuals are but rarely seen.

Males and females of the second and third forms never develop wings with which to fly, nor are they black. The second form is quite common in Illinois. These queens, likewise, become quite large.

Of the three species of termites occurring in Illinois, reference is here made only to the commonest one, *Reticulitermes flavipes* Kollar.

2. What damage is done by termites? Termites eat all manner of wooden structures and materials which are favorably exposed to their attack and unprotected. They work their way upward from the ground into the walls of houses, barns and other buildings, weakening the floors and their supports, so that the infested buildings ultimately become unsafe for use. The pests even burrow into tables, chairs, bookcases, and other heavy pieces of furniture to which they have access. They also work havoc with fence posts, telephone and telegraph poles, railroad ties, lumber yards, and warehouses; and they frequently attack living plants.

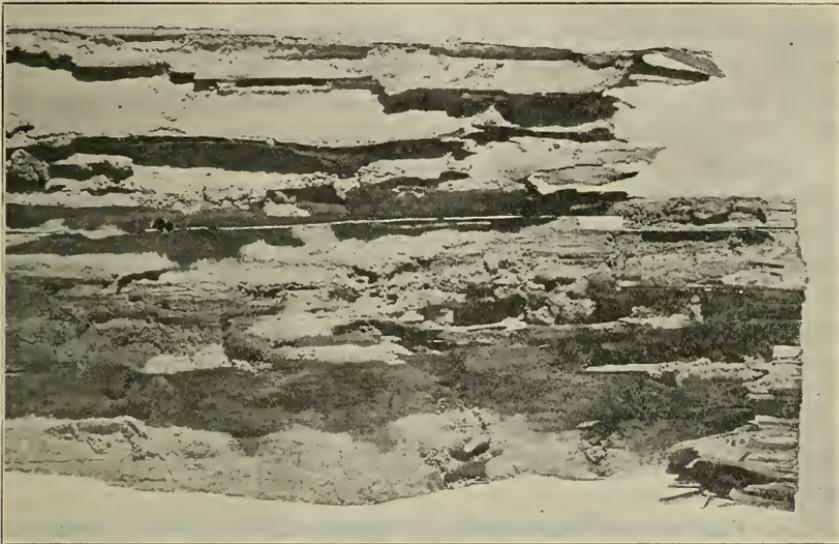


Fig. 4—A Section of 2" x 12" Joist Showing How Completely Termites Consume the Wood

3. Where did termites come from? Our common species has long been known in North America. It at first maintained itself in and about dead trees and other vegetation in forests and fields, and still does so to a large extent. Quite likely these insects caused some damage in the Indian villages long before white men entered the country. However, as man converted various forest products to his needs, the termites maintained themselves in the changing environment and became ravenous property-destroying pests.

4. What are the food habits of termites? Wood and other forms of vegetation comprise the bulk of the consumed food. Vegetable products, such as cotton and linen cloth, paper, paper board, straw board, and boxing, are typical of materials in which termites will also work.

All kinds of natural wood, if slightly moist, will serve as food, although a few tropical hardwoods and the resinous portions of some conifers are partially resistant. Very wet wood is seldom attacked.

5. What are suitable nesting sites? Termites do not usually live in very moist situations, nor are very dry situations suitable for their colonies. They seem to prefer a moderately moist site where the wood, which serves as food as well as shelter for the colony, is directly in contact with the soil or, at most, only a few inches from it. Fairly wide departures from this rather ideal condition are sometimes found, yet moisture seems absolutely necessary, and a suitable food supply must be available.

6. How are the nests established? During the spring of each year, there appears from each well-established nest a large swarm of winged males and females. Of the myriads of them flying into the air, only a few survive the ravages of birds, predaceous insects, and other unfavorable conditions. A pair will alight and search out some suitable site in or under a log, stump, or other plant remnant. The wings soon break off, and mating occurs. The process of colonization is at first slow. A small cell is cut out, which in time is extended into a short gallery. A few eggs are deposited. These hatch, and in a few months the young begin cutting at the wood for food, thereby enlarging the gallery system. The queen's capacity to lay eggs increases, and there is a corresponding increase in the number of individuals in the nest. Thus, in a healthy colony, the system of galleries steadily becomes larger.

Certain secondary sexual forms to be found in most nests also wander to new sites through underground galleries, and thus establish new nests.

7. How are termites socially organized? Essentially, there are three castes of individuals present in a nest. The workers are primarily engaged in cutting new galleries in the wood as they feed and in feeding the immature stages and queens. Most of the wood thus cut away is eaten at once. It is not digested by the termites themselves but is acted upon by innumerable one-celled intestinal residents which convert the wood into a material from which the termites derive their supply of energy. In addition to gallery cutting, the workers construct sheds of soil and wood particles to cover their runways where these are exposed. The several materials are firmly joined together with the aid of salivary and intestinal secretions.

The soldiers apparently are unable to cut and consume solid wood after becoming mature. Their food then consists largely of wood fragments partly digested by the workers, which they are able to secure in the galleries. With their large heads they can effectively block the passageways against any enemy several times their size. They will also

rush to the attack with wide-open jaws. If caught out of their galleries, however, they are at the mercy of even a weak adversary.

Several sexual phases may occur in a colony of termites. Of primary importance are the normal and fully developed males and females capable of flight. It is the queens which are most active in perpetuating the colony. However, should the colony for any reason lose the services of a true queen, there will usually be adopted a replacement queen from among certain immature termites. A few of these potential queens are to be found in the nest at all times and they may become capable of reproduction, although a true queen is functioning. The males continue to live after the colony becomes established, and they aid somewhat in gallery making.

8. How long do termites live? There is little definite information upon which to base an answer to this question. It is probable that workers normally live from several months to a year or possibly longer, and queens are known to have lived as long as twenty-five years.

9. How may the presence of these insects be detected? Because the termites shun light at all times, except for swarming, they may be present in a building for a long time without being suspected. The following indications should be heeded as a timely warning of hidden danger:

(a) The appearance of large swarms of the filmy-winged, black creatures from February to June.

(b) The presence of few or many earthen sheds, or tracks, over the basement walls, and earthen tubes suspended from the joists. (See Fig. 6.)

(c) The weakening of flooring or other woodwork, whether plain or painted, usually first evidenced by blistering or warping of the surface. Investigation will usually reveal many of the white, ant-like creatures in galleries beneath the thin remaining shell of wood.

10. What conditions about a property are most likely to encourage an infestation?

(a) Wooden cellar windows, whether painted or plain, so set that soil or debris is, or may come, in contact with them, offer the path through which termites gain access to houses in 90 per cent of the cases examined in Illinois.

(b) Outside doors with wooden sills resting on the ground or on weak masonry are liable to attack.

(c) Wooden porch and floor supports, resting on the ground or masonry insufficient to keep soil and debris from about the base, are unsafe and through them termites may enter a residence.

(d) Buildings beneath which there is no cellar and in which wooden lower-floor supports either rest on the ground or are but slightly

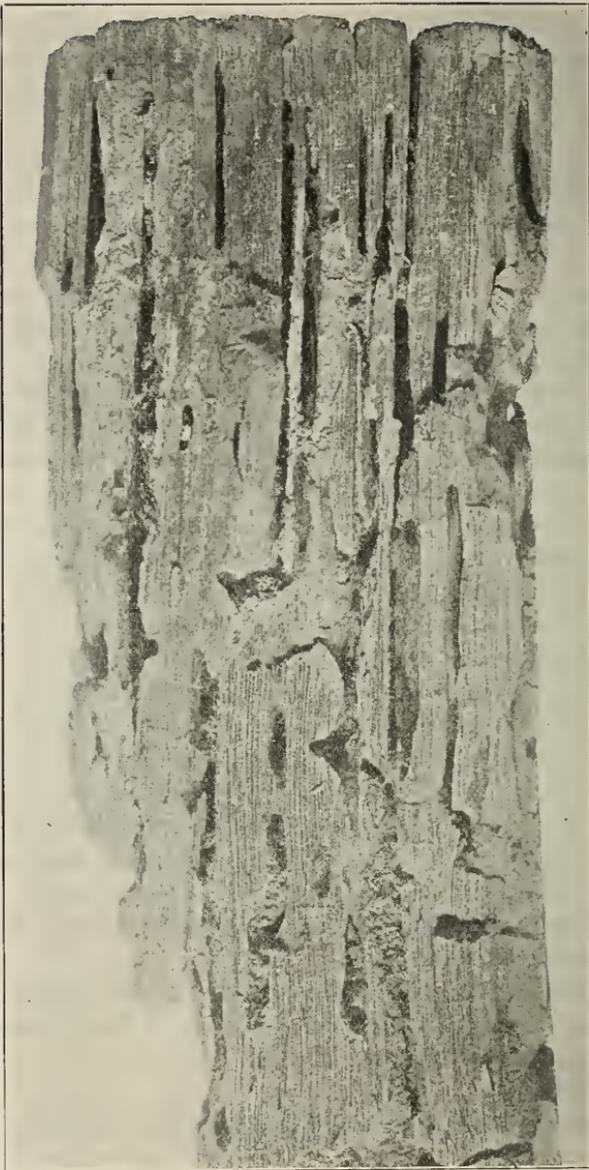


Fig. 5—Upper End of a Fence Post Showing Damage by Termites

removed from it, offer points of entrance for termites. Such situations are frequently quite damp and so are favorable for termite colonization.

(e) Cellar walls are often of such imperfect masonry construction that termites are able to enter the cracks, weak lime mortar joining, or porous gravel concrete. The unbroken airway left in most brick or block walls, if accessible to the termites, is a favored place for extensive gallery making. If much more than 10 per cent of lime is incorporated into the mortar, the termites may actually dissolve away sufficient material to permit their entrance into a building. Poured concrete walls should be firmly tamped.

(f) Dead portions of injured trees and dead stumps; posts, poles, wooden plant supports, and trellises set in the ground; heavy fibrous roots and stalks of dead and living plants; and large accumulations of moist leaves, brush, animal dung, and vegetable debris—all offer suitable feeding sites for termites.

11. What are the methods of checking ravages by termites?

(a) Only metal frames should be used for cellar windows when there is the least possibility of the frames coming in contact with soil.

(b) Any wooden structure or support which must be used in contact with the ground should be thoroughly saturated with hot crude coal-tar creosote to a point at least a foot above the line of contact. Pressure-impregnated wood is more durable and well justifies its use. Wooden posts and stair-risers in the cellar should rest on the concrete flooring and not extend through it. Outside supports of stairways should be of metal or masonry; if wooden supports are used, they should be mounted on tight cement piers.

(c) Mortar used in cellar walls should not contain much more than 10 per cent of lime. At some point, preferably at the top of the foundation, a metal, slate, or tight cement cap should be set so as to break completely any path between the air space in the wall and the wooden sills. (See Fig. 6.)

(d) All wood which must be set in the ground out of doors should be thoroughly soaked in hot crude coal-tar creosote. The surface so treated should extend at least a foot above the ground line. All dead or dying trees or stumps and other useless wood and plant remains should be burned at once. These should not be taken into the house for use as fuel when termites are known to be in them. All waste wood should be kept off the ground about the premises.

(e) In buildings already infested it is necessary to remove only the badly damaged wood and then to take some method of preventing the termites from maintaining a contact between the wood of the buildings and the ground. This may be done by raising the building slightly and inserting a metal shield between the framework and the foundation,

great care being taken to have this shield fit tightly around all pipes or wires which go into the building through the foundation. If possible, the foundation should be made termite-tight, and wherever soft-mortared brick walls are used for supports it is better to replace them, using cement mortar.

(f) Only wood so damaged as to be mechanically worthless need be removed in making repairs, providing that thorough installation of insulating materials has been made. Those termites remaining in the wood will soon die, since they cannot reach a supply of moisture.

(g) When infestations are light or just started, at least a part of the termite colony may be destroyed by applying Paris green as a dust to the galleries where the insects are working.

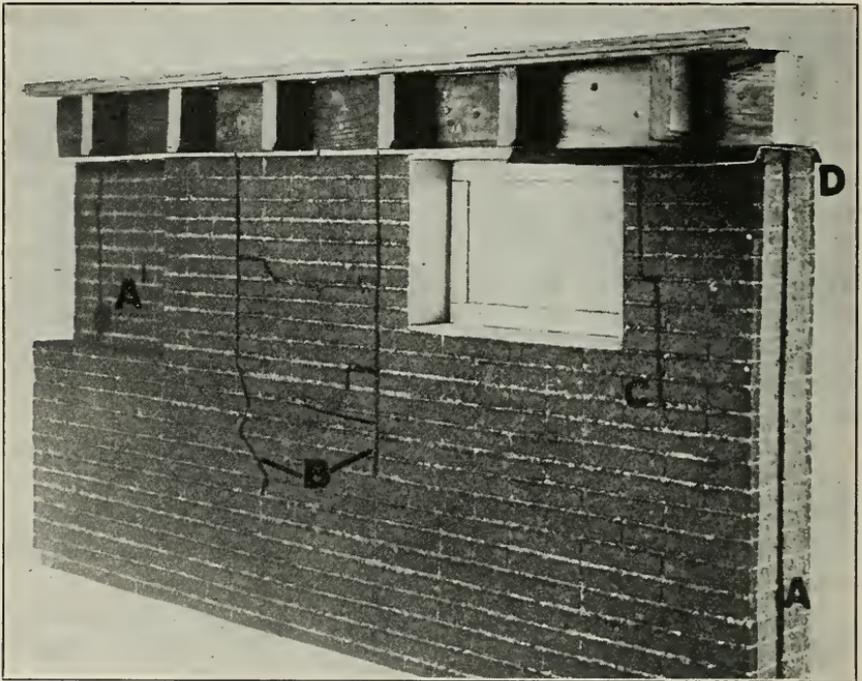


Fig. 6—Section of Brick Wall Showing Certain Features of a Termite Infestation

- A. Wall space left for insulating purposes, but offering recesses in which termites may build extensive sheds (A¹) or even establish a nest.
- B. Termite sheds on inner face of a wall. Note that sheds may pass over cement cap on wall to reach wooden sills and joists.
- C. Termite shed passing upward but stopped by metal termite guard.
- D. Section of metal termite guard in place. Note deflected projecting edges and the manner in which the wall space is completely intercepted. This type of installation is advised for brick or frame houses and should be inserted between sills and supporting foundation and partition walls.

Co-operation within the community is the best assurance of success, since an infested property is a constant menace to adjoining buildings. The following recommendations advocated by Dr. T. E. Snyder of the United States Department of Agriculture, Bureau of Entomology, have served as the basis for certain clauses inserted in building codes in some southern and western states, to eliminate, if possible, future termite damage. They are given here with slight modifications for the use of Illinois communities wishing to take similar steps, since it is a fact, often proved in dealing with termites, that a dollar spent for prevention saves from ten to one-hundred dollars necessary for elimination.

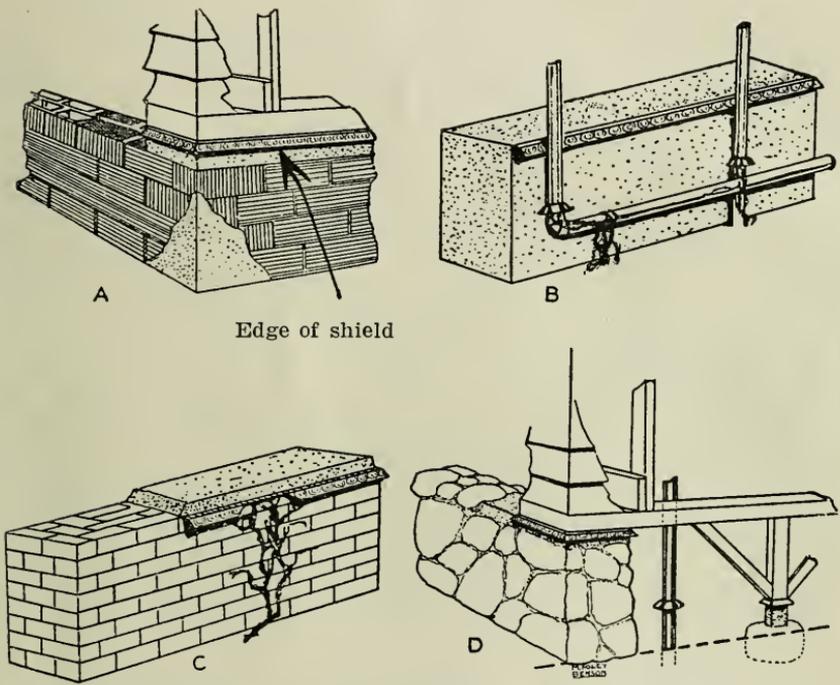


Fig. 7—How to insulate foundation units of hollow tile or solid masonry against termites

- A. Foundation wall of hollow tile surfaced with stucco, showing metal termite shield in place. Notice how the top of the wall is capped with sheet slate and concrete.
- B. Concrete wall with termite shield at top, the horizontally laid piping fitted above bend with metal shield to shut off termite tubes. The vertical pipe also has a termite shield.
- C. Brick wall fitted with termite shield and capped with concrete. Notice how the shield mechanically blocks the earthlike shelter tubes of the termites.
- D. Stone wall fitted with termite shield and capped with concrete, the wooden posts insulated from the ground with base stone and concrete block. Notice the termite shields on the post and piping.

(Adapted from U. S. D. A. Leaflet No. 31)

Provisions for Building Codes for Insuring Protection from Termites and Decay

1. Wood or fiber products, when not impregnated with an approved preservative, shall not be placed in contact with the earth or within 18 inches thereof, excepting wood columns or posts over a concrete floor, which columns shall be provided with non-corroding metal or concrete base plates or footings six inches above the floor. This applies to steps, which shall be laid over a concrete base, projecting at least six inches beyond the supports of the steps.
2. Timber to be used in contact with the earth shall be thoroughly impregnated by a standard pressure process with coal-tar creosote or other equivalent preservative. Timber shall be completely framed before treatment, whenever possible, but when cutting after treatment is unavoidable the cut surfaces shall be thoroughly coated with coal-tar creosote or other equivalent preservative.
3. Masonry foundations and footings shall be laid in Portland cement mortar. Foundations built up of masonry units, whether hollow or solid, shall be capped below woodwork with at least one inch of Portland cement mortar, or with mortar and slate, or solid or joined non-corroding metal, or other equally efficient seal.
4. In the case of frame buildings, a metal termite shield shall be provided, continuing completely around the top of the masonry foundation, including all pillars, supports, and piping, below the woodwork of the building, on both the inside and outside surfaces. Such a shield may be formed of a strip of non-corroding metal (such as copper, zinc, or an alloy of copper 28 per cent, nickel 67 per cent, iron, manganese and silicon 5 per cent), firmly inserted in the surface of the masonry, or between the foundation and the wood so as to intercept the wall space, with the projecting edges bent downward at an angle of 45 degrees and extending horizontally at least two inches from the face of the foundation. In masonry buildings this shield can be inset in the masonry at a height of at least eighteen inches above the ground.
5. Floor sleepers or joists imbedded in masonry or concrete, or laid on concrete which is in contact with the earth, shall be impregnated with an approved preservative.
6. Expansion joints between concrete floor and wall shall be filled with liquid asphaltum and the right angle joint covered with a sanitary cement mortar or Portland cement concrete finish of an arc of at least two inches in length.
7. The ends of wooden beams or girders entering masonry or concrete shall not be sealed in, but shall be provided with boxes affording an air space at the end of the piece of not less than one inch at side of member unless the ends of such timbers are impregnated with coal-tar creosote or other approved preservative.
8. Where there are spaces under floors near the earth, they shall be excavated so that there will be no earth within eighteen inches of the wood, and they shall be provided with cross ventilation. Such ventilating openings shall be proportioned on the basis of two square feet for each twenty-five lineal feet of exterior wall, except that such openings need not be placed in front of such building. Each opening shall be provided with twenty-mesh non-corroding metal screening.
9. All wooden forms on foundations shall be removed from masonry work within fifteen days.

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