

NOTES ON THE TERMITES OF INDIANA.

BY

HARRY F. DIETZ,

Assistant Entomologist, Department of Conservation.¹

Termites, or "white ants" as they are popularly known, are insects that have forced themselves on the attention of entomologists because of their economic importance. Because of their life history and habits and the fact that they live in colonies or social communities, the individuals of which belong to different castes, there is no reason why termites should not attract more attention than they do from biologists in general. The interesting work of Snyder (1, 5, 6, 7, 11)² and Thompson (11-14 inclusive) bear out this statement.

The present paper deals with observations on these insects with special reference to their economic aspects. Until recently there has been a tendency among entomologists to regard the termites of the United States, east of the Mississippi and north of the Ohio river, as one species, namely *Reticulitermes (Leucotermes) flavipes* Kollar. This is in spite of the fact that Snyder and Banks (1, 6, 7) have pointed out that there are two other species of the same genus *Reticulitermes* namely *R. hageni* Banks and *R. virginicus* Banks whose range in this country are at present not well defined. These two species were both found and described since 1907 from Falls Church, Virginia, a few miles from Washington, D. C. It should be pointed out that this region is one that has literally been "combed" by entomologists since the formation of the U. S. Department of Agriculture. It is therefore quite possible that intensive work will reveal not only the presence of *R. hageni* Banks and *R. virginicus* Banks over a wider area than they are now known to occur but also the presence of one or more new species.

Distribution of Termites in Indiana.

Reticulitermes flavipes Kollar is the only species that until the present time has been recorded in Indiana. Snyder (7) records it from the vicinity of South Bend, Indianapolis, and Jeffersonville. During the past season Columbus and Lafayette have been added to this known distribution.

Reticulitermes virginicus Banks was collected for the first time in Indiana at Indianapolis on July 1, 1920, by the writer. The forms collected were winged colonizing adults. The nearest point to Indiana from which this species has been recorded is Okolona, near Louisville, Kentucky (Banks, 1).

Reticulitermes hageni Banks probably occurs in Indiana, though the nearest point to our State from which it is recorded is Kane, Greene County, Illinois (Banks, 1).

Swarming.

There are two times when termites are reported to the Division of Entomology. These are as follows: First, when the annual swarming of

¹Published with the permission of the Chief of the Division of Entomology and the Director of the Department of Conservation of Indiana.

²The figures in parenthesis refer to the Literature cited.

the winged colonizing adults takes place (males and females); secondly, when the characteristic damage that these insects do to buildings and their contents or to living plants is first noted. Fifteen reports of swarming or injury were obtained this year and in eight cases specimens were collected all of which proved to be *R. flavipes* Kollar.

The first swarming of termites this year was on February 29th. This was in a house in the northern part of Indianapolis. The time of swarming was 4:00 p. m. and the temperature out-of-doors was 50° F. and indoors about 70° F. No specimens of this swarm were obtained and no subsequent swarming took place.

The second swarming was in a factory building in Indianapolis on March 5th, 1920. The temperature out-of-doors was 10° F. and there was six inches of snow on the ground. The indoor temperature ranged from 50° F. at night to 70° F. and over in the day time. The swarming here took place between 8:30 and 10:00 a. m., the maximum emergence occurring about 9:00 a. m., and occurred daily at this time for four successive days.

On March 15th and April 5th *R. flavipes* swarmed in the Experiment Station Building at Purdue University at West Lafayette. Specimens of the April 5th swarm were collected and forwarded to the writer by R. W. Hosmer of the Bureau of Plant Industry of the U. S. Department of Agriculture.

The first out-of-door swarming of *R. flavipes* recorded this year took place in the southeastern part of Indianapolis simultaneously with an indoor swarming at the same locality on April 21st. From the location of the points of emergency indoors and out-of-doors there is no doubt that this swarming was from the same nest. It took place daily between 8:00 and 9:00 a. m. over a period of three days. This swarming followed a heavy rain of 2.3 inches on April 20th and a total rainfall of over 3 inches between April 17th and 20th.

The next out-of-door swarming in Indianapolis occurred on May 26th at 11:00 a. m. and in the same locality, but from a different nest, on June 3rd about an hour earlier. Only a single swarm emerged from each of these nests. The swarming on May 26th was not directly correlated with any rainfall but that of June 3rd followed a heavy shower on May 31st.

Snyder (1) following the phenological work of Hopkins (2 and 3) shows that the first swarming of *R. flavipes* is correlated with the blooming i. e. ripening of the pollen of the large flowering dogwood *Cypocylon* (*Cornus*) *floridum* Linn. This is based on six years' observation. However, in Indianapolis the first out-of-door swarming, April 21st, occurred almost two weeks before dogwoods bloomed and the second and third, May 26th and June 3rd, out-of-door swarms occurred two weeks after all dogwoods had disappeared. At the time of the second and third out-of-door swarming dates, grapes and blackberries were blooming.

No fall swarms of *R. flavipes* were reported this year though in 1919 this occurred in the house where the spring swarming took place on April 21st.

The only swarming of *Reticulitermes virginicus* Banks observed was on July 1st. The winged adults were seen flying across a large vacant lot between 9:30 and 10:00 a. m. It was a clear bright day with a high relative humidity and temperature. This swarming occurred a month after

the last swarming of *R. flavipes* Kollar and at a time when the American Linden *Tilia americana* Linn was in full bloom.

From the foregoing data it is apparent that the time when indoor swarming occurs is independent of out-of-door conditions and is determined largely by the location of the nest in or beneath the building. The location of the nest of course determines the influence that the cumulative mean indoor temperatures and average relative humidity will have on it. Out-of-doors the time of swarming depends on the cumulative mean temperatures and the mean relative humidity.

The swarming of termites in a building should in general be regarded as a danger signal. It is needless to say that it is a great annoyance to have these awkward colonizing adults aimlessly flying into one's face or into any foods that are exposed. Yet during the past season we have found two cases where swarming took place and where careful inspection failed to reveal any damage to the buildings in which it occurred. Likewise, we have found two infestations in buildings from which no swarms emerged. This naturally brings up the question as to the factors that cause a colony to swarm. These factors, though still imperfectly understood, are: (1) the kind of reproductive forms in the colony; (2) the age and size of the colony; and (3) the influence of instinct.

The role of swarming in the life economy of a colony is another point of interest. In the case of early swarming indoors the value of swarming is hard to see as practically all the adults emerging, if they are not killed, perish. This is because conditions necessary for the establishment of new colonies are seldom present. Out-of-doors the opportunities for the founding of new colonies are greater. But even out-of-doors immense numbers of colonizing adults perish. On May 26th practically all termites *R. flavipes* that emerged were eaten as soon as they issued by a large flock of sparrows that gathered for the occasion. In the swarming of *R. virginicus* on July 1st it was observed that adults alighting on the ground were immediately snatched up and dragged off by the workers of the common corn-field ant *Lasius niger* Linn. var. *americanus* Emery.

Termite Injury.

The injury that Indiana termites do is of two kinds, namely that which is done to buildings and their contents and that which is done to living plants. The members of the genus *Reticulitermes* are subterranean insects. Under normal conditions in nature they feed on stumps, logs, and wood debris, straw, manure, and leaves. But with the advance of civilization much of the food of termites has been removed, forcing the insects either to retreat before this advance or to adapt themselves to the new order of things. They have chosen the latter course to a certain extent, at least, as is shown by the injury they do to living cultivated plants and to buildings and their contents. These insects are justly classed among our most destructive wood-borers.

There is one thing that is absolutely essential for a colony of Indiana termites to maintain itself and that is a ready access to moisture. This is obtained from the ground. Given a constant supply of moisture these insects are able to tunnel in the comparatively dry woodwork of buildings

or into its contents a great distance so that the limits of a colony are hard to define. It is therefore apparent that termite injury to buildings and their contents is intimately correlated with the construction of such buildings. This is borne out by the fact that new buildings as well as old ones are subject to attack. As has been said before, the swarming of termites in a building should be regarded as a danger signal though it is not an infallible one, because a building or its contents may be infested and no swarming occur, in which case the hidden work of the insects might escape notice until irreparable injury is done. Some examples of the damage done to buildings in Indianapolis and a fuller discussion of the damage done at the Columbus Public Library well illustrates certain things that should be avoided in the construction of buildings.

The popular cement floor of porches, unless properly constructed, offers a means through which termites may gain entrance to the frame work and weatherboarding of houses. The grout of cinders and gravel are often placed flush against a wooden beam and the cement is brought flush with the weatherboarding. Usually in time there is a decided crack between the cement and the wood, allowing water to enter when the porch is scrubbed or during heavy rains. The cinders and gravel grout are no repellant to the termites as there are usually sufficient holes in the latter through which the termites can work and thus gain entrance to the wood. Three such cases of injury have been observed during the past season.

In the case of the factory building where swarming occurred on March 5th it was found that the floor of the office was laid directly on a bed of cinders and the wooden walls which separated the office from the rest of the building were flush with these cinders. Likewise, the 12x12 untreated yellow pine pillars which supported the roof were set on stones one foot beneath the surface of the ground. Three years previously the floor had been removed because of termite damage and replaced with another wooden floor. It is needless to say that the conditions for termite injury were ideal. Not only the floor but the walls and a number of the pillars were badly damaged.

In a dwelling in the northern part of Indianapolis termites had gained entrance to a "built in ice box", the wood of which was constantly moist and from this source had riddled several of the beams supporting the house. At another place where the weather boarding of the kitchen was flush with the ground this was badly damaged.

At the Columbus Public Library termites did the worst and most extensive damage that has so far been recorded for these insects in Indiana. Three hundred volumes of books were so badly riddled that they were a mere shell. The wooden racks in which they were kept were badly damaged and all baseboards, door casings and moldings on the first floor of this building were more or less infested making their removal necessary. Even pictures in contact with the molding were ruined. This building is of limestone, two stories high, and is what is commonly known as "fire proof" in its construction. It sets on an embankment about three feet high and is so built that the floor of the first story is slightly below the level of the embankment (See Diagrammatic Cross-section of Building, Figure I, A.)

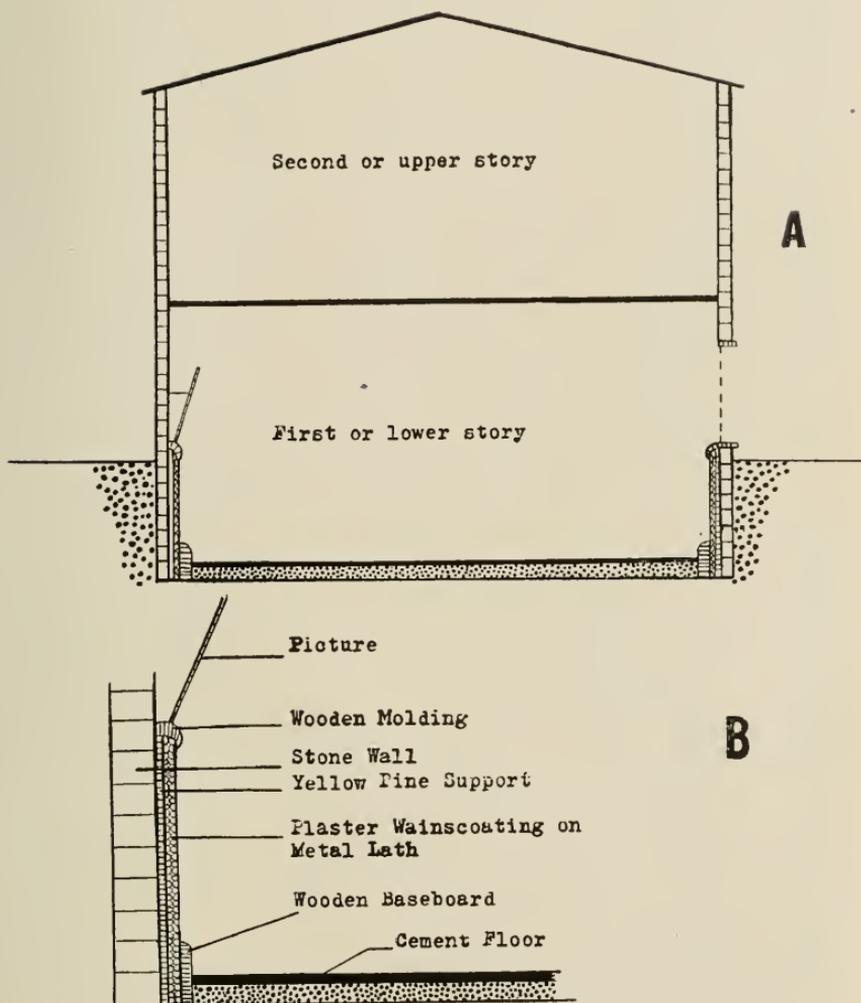


Figure I, A. Diagrammatic cross section of the Columbus Indiana Public Library building showing the relation of the first floor to the ground level.

B. Diagrammatic drawing showing relation of wood used in construction in relation to ground and termite injury. See Plates I and II.

The first, or lower floor has three large rooms which are used for book storage, as well as a boiler room, a general storage room and a book binding room. The upper floor is used for a reading and for the "stack" room.

Originally the floor in the basement was yellow pine laid on joists embedded in the ground so that the floor itself rested on the ground. Likewise, the lower edge of the baseboards and the bottoms of the door sills rested on the ground. There was a wooden wainscoating, about four feet high, around the room. The bottom of this wainscoating rested on the ground. Four years ago this floor and wainscoating were removed because they had "rotted", and there is little doubt that the "rotting" was caused by termites.

As is shown in the diagrammatic drawing, Figure I, B., the wooden floor was replaced by one of cement and a plaster wainscoating laid on patented steel wire lath was used instead of the wooden one. Had the work been done right at that time no further termite injury would have been possible. But instead of eliminating all wood in contact with the ground and bringing the cement floor flush with the plaster wainscoating, unfortunately, as is shown in the drawing, both the bottoms of the baseboards and door sills were left in contact with the ground instead of allowing them to rest on the cement floor. Further, the plaster wainscoating instead of being flush with the stone walls of the building is supported by yellow pine beams in contact with the ground. Some of these beams come in contact with the casings of the windows of the first floor and all of them are in contact with a yellow pine molding that tops the wainscoating four feet from the floor. Of course, the baseboards and door sills were badly damaged (See Plates I and II). By means of the joists supporting the wainscoating as well as the characteristic "covered runways" on the back of the wainscoating the termites had worked into the molding and from it into the pictures and their frames. The bottoms of the wooden bookracks were either in contact with the infested baseboards or their backs were in contact with the infested molding and it was an easy matter for the termites to work into them and from racks into the books.

All the foregoing examples of termite injury were the work of *R. flavipes* Kollar and are based on specimens obtained in each case. In order to identify termites it is necessary that either soldiers or winged adults be obtained.

Nothing is known of the economic importance of *R. virginicus* Banks in Indiana though in other parts of the United States where it occurs its damage is similar to that of *R. flavipes*.

Numerous cases of termite injury to fence posts and boards have been observed and doubtless much of the "rotting" of timber is due to these insects.

Several cases of termite injury to living plants were reported during the past year. But in only one case were specimens obtained. The first case was reported by an Indianapolis florist who advised the writer that in 1919 he was forced to replant a bed of geraniums three times because termites tunnelled each planting within a few weeks after it was set out.

The second report of damage to living plants was reported by Mr. Frank N. Wallace, State Entomologist, on May 15th from Spencer, Indiana. He obtained the workers from a cavity in a living maple tree and observed that tunnels were being made into the living wood.

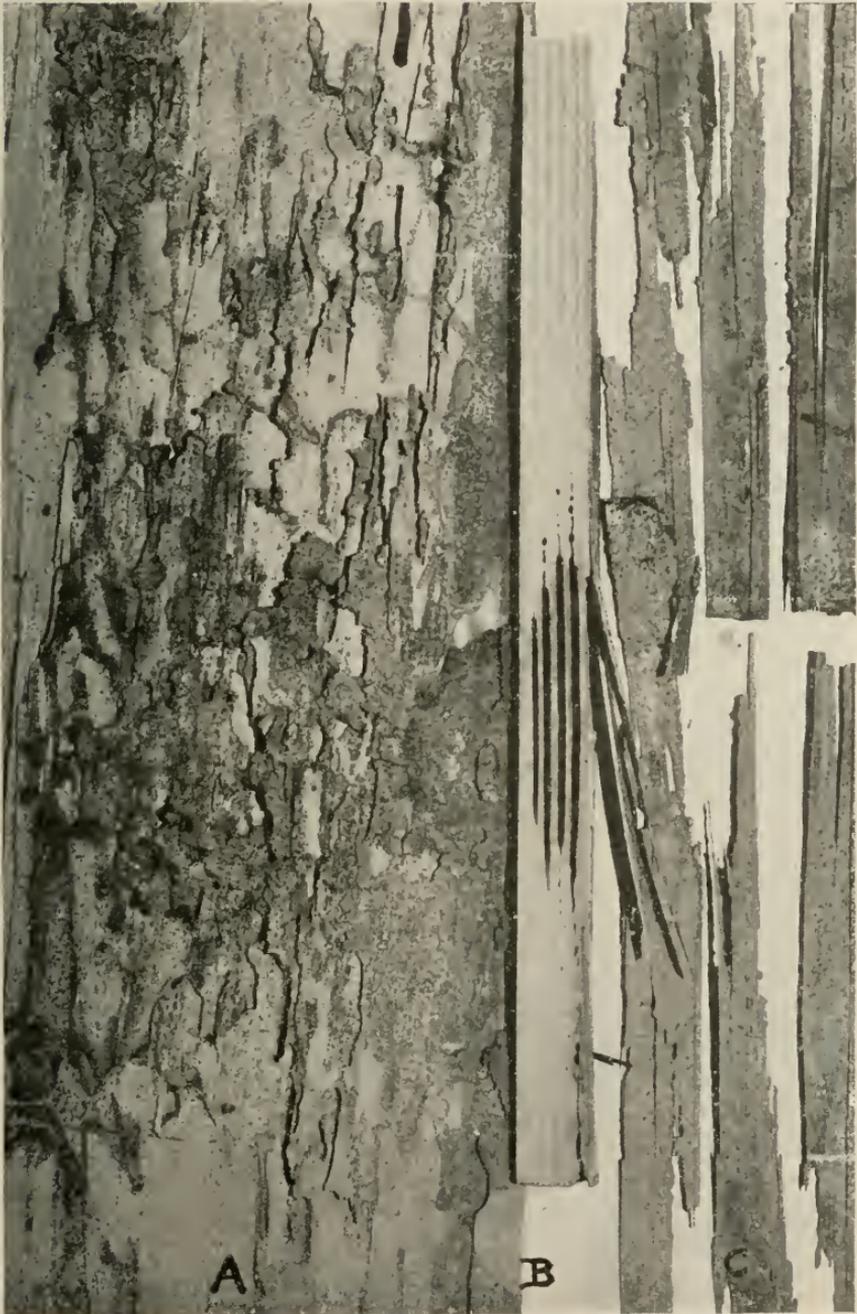


PLATE I.

- A. Termite injury to the upper part of a yellow pine baseboard, the bottom of which rested on the ground. See also Plate II. B.
- B. Piece of straight grained yellow pine molding showing how termites have eaten out the spring growths of wood.
- C. Paper like strips from the bottom of a door casing in contact with the ground.

The third report of termite injury came from Indianapolis on August 27th. A backyard gardener wondering why his sweet corn did not yield as it should dug up some of the plants and found the lower parts heavily infested with termites (See Plate II, B.). Over 150 feet of row were thus damaged. Specimens submitted were *R. flavipes* Kollar.

Taken as a whole over the United States termite injury to living plants seems to be increasing due no doubt to the fact that their homes, such as logs and stumps, are rapidly disappearing because of the practice of clean cultivation. As a result the termites are forced to seek elsewhere for sufficient food and their attacks on living plants are one way that they are meeting the exigency. On the other hand it should be pointed out that keeping areas on which plants are grown free from decaying wood and other debris on which termites can exist is necessary if damage is to be prevented (See Nougareti 4) as such debris is often a source from which they start their attacks.

Acknowledgements.

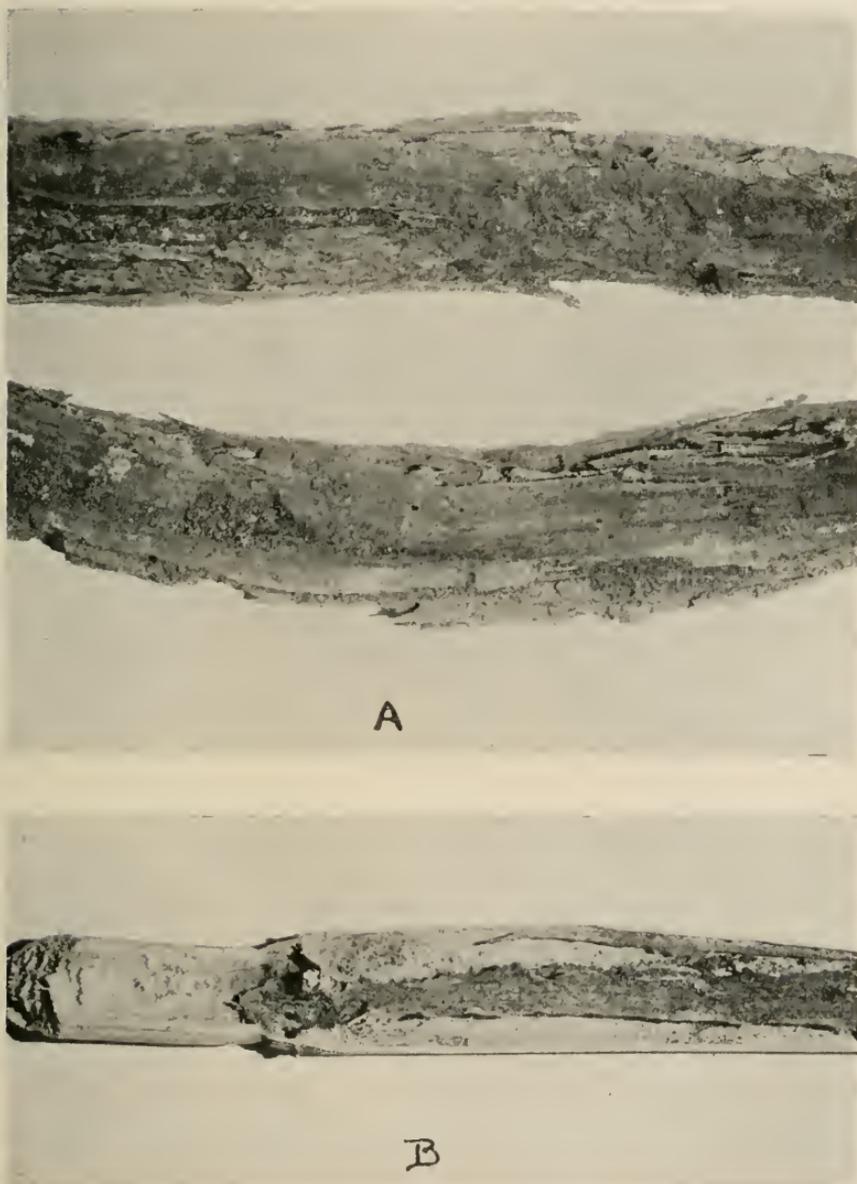
The writer wishes to acknowledge the kindness of Dr. T. E. Snyder and Dr. W. M. Mann, of the U. S. Bureau of Entomology, for identifying or verifying the identification of all termites and ants mentioned in this paper.

Summary.

1. Two species of termites *Reticulitermes flavipes* Kollar and *Reticulitermes virginicus* Banks are known to occur in Indiana. A third species *Reticulitermes hageni* Banks will probably also be found in this State.
2. The interesting phenomenon of the annual swarming of the winged colonizing adults of *R. flavipes* occurs indoors as early as February 29th. Out-of-doors it occurs over a period of over a month, April 21st to June 3rd. The swarming of *R. virginicus* takes place out-of-doors a month later than that of *R. flavipes*.
3. Sparrows and ants have been observed preying on these winged colonizing males and females.
4. Termites damage buildings and their contents and their attacks on living plants are increasing. This is the way that termites are adapting themselves to the advance of civilization which has resulted in the removal of much of their food, such as logs and stumps.

Literature Cited.

1. Banks, N. and Snyder, T. E. A Revision of the Nearctic Termites with Notes on Biology and Geographic Distribution U. S. Natl. Mus. Bul. 108 (Febr. 15, 1920).
2. Hopkins, A. D. Periodical Events and Natural Law as Guides to Agricultural Research and Practice. Mo. Weather Review Supp. No. 9. Weather Bur. No. 643 U. S. Dept. Agr. May 1, 1920.
3. ——— The Bioclimatic Law as Applied to Entomological Research and Farm Practice. Sc. Monthly Vol. VIII, No. 6, June, 1919.
4. Nougaret, R. L. A Termite Pest of Vineyards Mo. Bull. Cal. St. Dept. Agr. Vol. IX, No. 8 (Aug. 1920).



A

B

PLATE II.

- A. Pieces from the bottom of the same baseboard shown in Plate I. A.
B. Termite injury to sweet corn. The fourth node and third internode are shown.

5. Snyder, T. E. Changes during quiescent Stages in the metamorphosis of termites Proc. Ent. Soc. Wash. Vol. 15, No. 4, Dec. 1913.
6. ——— Biology of the termites of the Eastern United States with Preventative and Remedial Measures. Bur. Ent. U. S. Dept. Agr. Bull. 94 pt. 2. Febr. 1915.
7. ——— Termites or "White Ants" in the United States. Their Damage and Methods of Prevention U. S. Dept. Agr. Bull. 333 (Professional Paper) Febr. 1916.
8. ——— White Ants as Pests in the United States and Methods of preventing their Damage. U. S. Dept. Agr. Farmers' Bull. 759 Oct. 1916.
9. Same Title. U. S. Dept. Agr. Farmers' Bull. 1037 June, 1919.
10. ——— Protecting Buildings Against the White Ant. Engineering News-Record, Vol. 84, No. 23, June 3, 1920.
11. ——— The Colonizing Adults of Termites. Proc. Ent. Soc. Wash. D. C. Vol. 22, No. 6. June, 1920.
12. Thompson, C. B. The Brain and Frontal Gland of the Castes of the "White Ant" *Leucotermes flavipes* Kollar. Journ. Comp. Neurology, Vol. 26, No. 5. Oct. 1916.
13. ——— Origin of the Castes of the common termite, *Leucotermes flavipes* Koll. Journ. Morphology Vol. 3, No. 1. Dec. 1917.
14. ——— The Development of the Castes of Nine Genera and Thirteen Species of Termites. Biol. Bull. Vol. 36, No. 6, June, 1919.
15. ——— and Snyder, T. E. The Question of the Phylogenetic Origin of the Termite Castes. Biol. Bull. Vol. 36, No. 2. Febr. 1919.