

THE RED ANT

BY

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PART I. THE NEST.

(With two plates and a text figure.)

Distribution and haunts—General appearance—Characters of nests and byres—Contents of these chambers—Architecture of Nest—Repair of damaged nest—Characters of seamstress—Construction of byres—Bending of a single leaf—Nature of silk—Attention to nest—Loss of life in nest—Defence of nest—Emission of poison—Contrast with Polyrhachis.

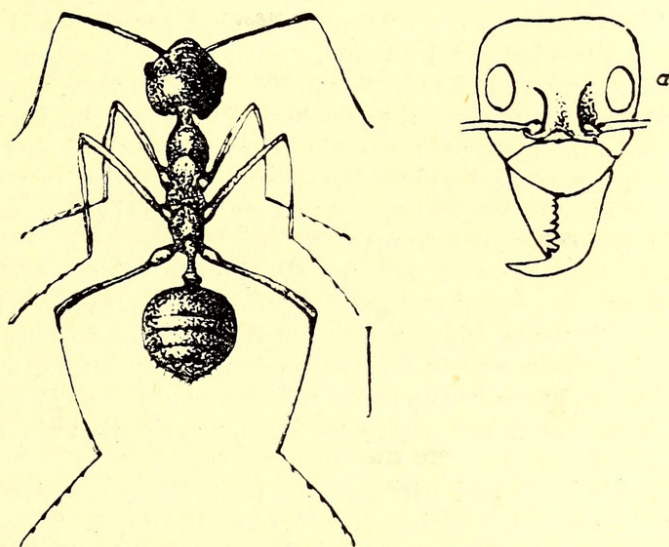
The Red Ant of India, the *Æcophylla smaragdina*, is, with the exception of arid and mountainous tracts, widespread throughout the whole empire. It prefers the moist and well-wooded areas, and is, therefore, more abundant in the southern half of the Peninsula and in the luxuriant vegetation of Ceylon. Eastward it ranges into Burma and Siam; thence through the islands of the Malay Archipelago even as far as the Continent of Australia. In Southern India it abounds in myriads, so much so that the birds in certain districts have difficulty in finding places of security for their nests. In the drier tract towards the north of the Peninsula there is no such profusion of swarms. Nevertheless they establish themselves in suitable localities, and a few miles from my station there was a mango-grove which they had specially selected as a permanent abode. More than half the trees supported their columns, while studded through the luxuriant foliage above were numbers of their leafy nests. Here they were sufficiently abundant for our purpose. We will spend our evenings in the midst of the grove and take note of their peculiar habits and ways.

The grove is a dense and luxuriant plantation which has stood there for many years. Its large full-grown trees are regularly disposed. They stand in parallel well-ordered lines that intersect like a pattern of squares. Many of them bear evidence of the stress of time. Their boughs are knotted where old branches have decayed, and crumbling hollows have found a place in the substance of their deformed trunks. Overhead a dense mass of foliage expands and, in places the widespread branches intermingle so as to unite the adjacent trees. Beneath this superfluous canopy of leaves is a welcome though enervating shade. The long-awaited rains have broken: the fresh green verdure drips with moisture and the air is steamy with the vapid heat. There is a peaceful silence in the grove; the atmosphere is still, as though confined by the dense trees, and a calm oppression weighs upon the body in the midst of the close moisture-laden air.

The voices of the birds ring out from the trees, though themselves unseen in the richness of the growth. We hear the shrill cries of the noisy parrotquets where a flock has alighted on a mass of vegetation and vanished in the cloud of leaves. From another place we hear the soft cooings of the doves or the brain-fever bird uttering its vexatious cry in a mad crescendo note. From a gnarled trunk comes the tapping of the woodpecker, while in the foliage the coppersmith is beating at its forge in a loud and clanging voice. This is the music of the mango-grove, the living sounds that break the silence and accompany our patient hours of study "under the shade of melancholy boughs."

This ant is so conspicuous on account of its colour, it infests the tree in such enormous numbers and it falls on an intruder with such venom and force that it is not likely to be mistaken by anyone who has ever experienced its furious assault. Its chief haunts are the trunks and the branches of the trees. From

there it spreads itself everywhere through the foliage and sends down its columns to explore the ground. A community keeps usually to one tree but, when the grove is young and closely planted, it may spread itself over a number of trees either by climbing across an interlacing branch or by despatching a file over the open ground. In these journeys it often travels a considerable distance; down one branch, up another branch, a column will make the most elaborate excursions throughout the widespread foliage of the tree. It is not a specially active ant. When enraged, it is certainly expeditious enough, but at ordinary times it is often sluggish in its motions, though thoroughly methodical and well organised in its acts. There is no cessation from its continuous labour; night and day its columns are on the move. The heat of the sun does not damp its toil for it is screened by the canopy of leaves; neither does the darkness of night subdue it; indeed after sunset it is specially active, for numbers then pour out from the nest to travel energetically over the tree.



The Red Ant, *Ecophylla smaragdina*
a. Head from front.

Before discussing its peculiar habits I must first describe the appearance of the ant. In colour it is a uniform yellowish red, and is scarcely half an inch in length. Its body is of a particularly elongated shape. It has something the appearance of a knotted cord, being composed of a series of swollen nodules connected by narrow joints. The foremost nodule is the pear-shaped head. It is broad behind where it joins the neck, but in front it evenly narrows to a point which is formed by the projecting jaws. On each side of the middle of the head is the dark conspicuous eye. This is a small and prominent coal-black spot, the only striking point of colour to be seen on the body of the ant. Between them rise the delicate antennae, a pair of slender filiform threads of rather exceptional length. The jaws project from the apex of the pear. In structure they appear as powerful hooks; their opposing surfaces are armed with sharp teeth, and they end in curved and pointed sickles which cross one another in the middle line. Behind the head comes the nodulated chest. It consists of a pair of oval swellings with a constricted part between. It is linked to the head by a narrow neck and joined behind to the front of the abdomen by a thread-like moveable waist. The abdomen, like the head, is a somewhat pear-shaped mass-pointed behind, swollen in front, and supporting here and there upon its surface a scattering of delicate hairs. The legs are particularly long and slender, but are otherwise of the typical appearance and shape.

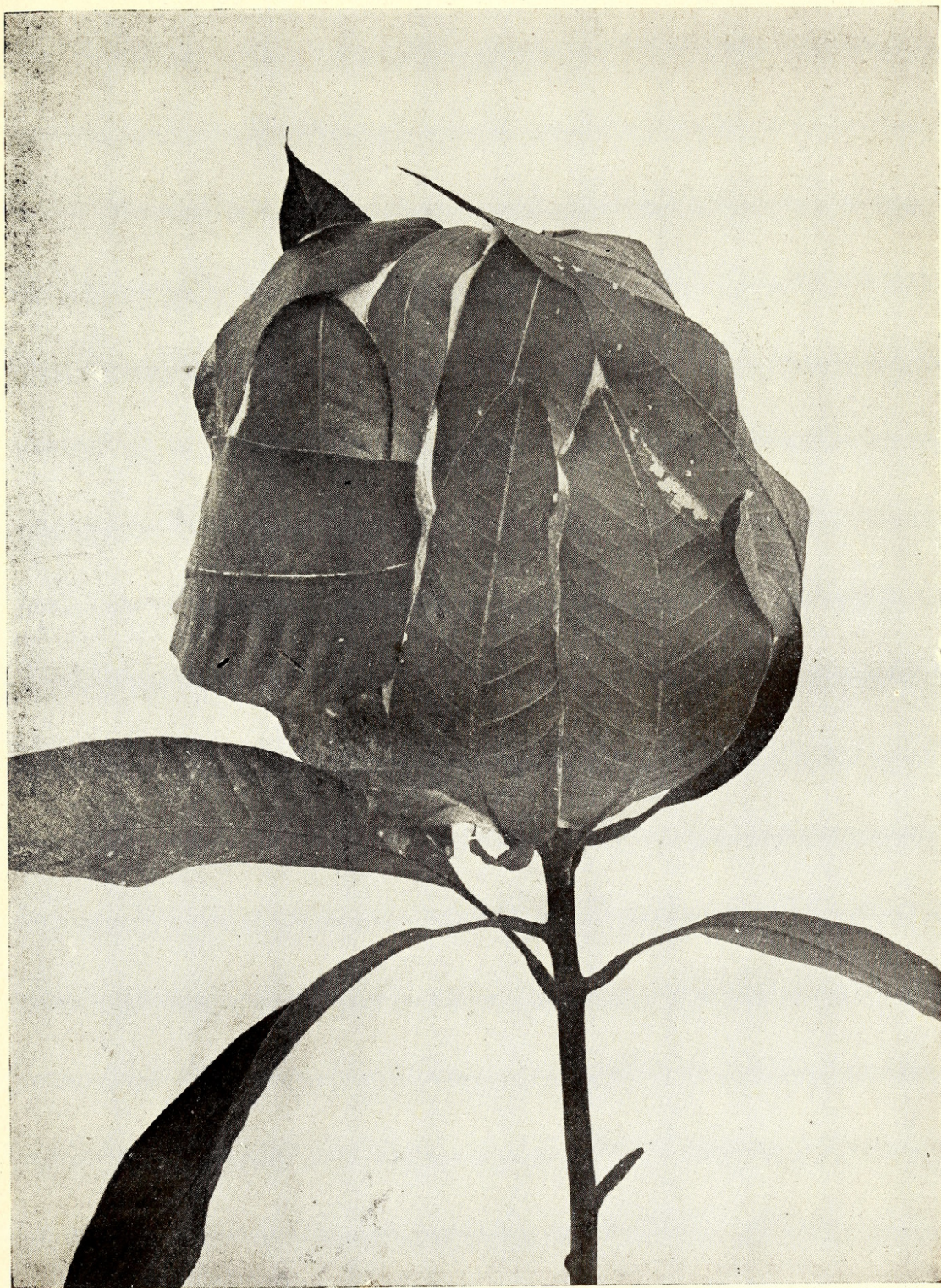
The vast majority of the workers are uniform in size, and at first sight there appears to be no distinction into different types or castes. But in every community there are a few individuals of a specially diminutive size; these are less obtrusive than the ordinary workers since they keep more habitually to the interior of the nests. They are scarcely half the bulk of the ordinary forms but seem to differ in no other way, and they appear to fulfil a special purpose by being retained exclusively for household work.

I will first consider the nests of these ants and the remarkable manner in which they are made. The red ant, unlike the majority of species, never excavates a gallery in the soil. It chooses the foliage as the site for its nest, usually selecting some safe position high up in the thickest leaves. It is wonderfully skilful in its mode of architecture which consists in first bending down the leaves and then uniting their margins with silk. A nest, thus formed, is a bulky object. (See plate). A populous one, when fully constructed, may be as large as a man's head. Some twenty or more leaves may be used in its architecture, but for other nests of less capacious dimensions half that number will suffice. The leaves of the mango are long and narrow, and eight of them bent over so as to lie side by side is common in the smaller nests. In this way, when their edges are linked together, they enclose a pear-shaped space. The base is above at their attachments to the stem; the apex is below where all their tips unite at a common point. The gate of the chamber is very regular in its position. It is always placed at the upper extremity as a perforation in the base of the pear.

The interior is divided into a number of apartments. They have not been constructed on any system; they are merely the collection of chambers and passages that follow from the shapes and flexures of the leaves. But the ants, in addition, build silken partitions which serve as dividing walls, or they may even so dispose of the fabric as to fashion a complete apartment of silk. They never line the internal wall in the same manner as do the *Polyrhachis* ants; they employ their silk as a connecting medium, merely to unite the edges of the leaves.

In addition to this large and predominant nest, there are also a number of subordinate structures scattered irregularly over the tree. These are likewise fashioned out of leaves though on a very much reduced scale. To all appearances they are just miniature nests, though in reality they are not used for the rearing of larvæ; they rather serve as a system of chambers or byres in which the ants confine those cattle that supply them with a rich and valuable juice. The main nest, as I have said, is usually high in the branches where it looks like a large green globular mass firmly fixed to the tree. The byres, on the other hand, may be situated anywhere; in the young trees they are often conveniently built within easy reach from the ground.

An ordinary byre (see plate II) is usually ovoid or somewhat pyriform in shape. Some three or four leaves may enter its construction. They have been neatly turned as to enclose a chamber, and their lines of union are marked on the exterior by a pattern of silken bands. At one extremity there is a single gate, usually situated where the bases of the leaves come together near their junction with the stem. In some byres only a solitary leaf may be employed, and then the apex is drawn down to the base so as to form a somewhat conical cell. There are times when the ants find considerable difficulty in getting the edges of the leaves to join; wide intervals may then be left between their margins, and the ants must supply the deficiency in material by filling in the spaces with silk. Then again there are places where few leaves are available which results in considerable expenditure for the ants. They must then build the chamber unaided by the vegetation and compose it exclusively of silk. This last type becomes a most delicate tabernacle, one with beautifully fine transparent walls through which we can observe the workers in the interior and learn something of the arrangements and economy of the byre.



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NEST OF THE RED ANT (*Ecophylla smaragdina*).



BYRE OF THE RED ANT (*Ecophylla smaragdina*).

This edifice, thus built for the stabling of cattle, is usually a one-chambered cell. But when a number of leaves are employed in its construction, then, like the nest, it may be divided into compartments owing to the enclosure of some of the leaves. Also, on more exceptional occasions, they will come still closer to the elaborate structure of the nest, in that they will weave a special silken partition so as to connect two or more of the walls. Consequently we may regard the architecture of the byre as that of a miniature and less complicated nest.

The ants in their operations so bend the leaves that most of them are sharply doubled near their stems. Nevertheless for a long time they remain uninjured; it is not till they have seen some months of service that they show any signs of decay. While still fresh and green they are in no way conspicuous. A byre just appears like a cluster of leaves and is therefore not easily seen. It is best located through the movements of the ants, by following the advance of a train of workers as they ascend into the smaller branches of the tree.

Let us look into the interior of these remarkable structures and determine the uses to which they are placed. On all occasions there are workers assembled in the nest. Sometimes they appear as a teeming multitude congregated in a solid heap; at other times they spread themselves more evenly through the chambers and move sluggishly over the inside walls. They are mainly engaged in attending on the larvæ, though they also act as an army in reserve to pour from the gateway should necessity require. There is a continuous flow through the aperture of the nest; some are arriving, others departing, there are still others which seem to be permanently imprisoned and never do any outside work. The next most conspicuous objects are the larvæ and the broods of delicate eggs. Every size and age is represented, at least in the suitable months of the year. There are the tiny almost invisible eggs, the oval smooth segmented larvæ, the fragile pupæ, devoid of covering and with all their separate organs distinct. There are some which are bloated to an enormous bulk and look twenty times the ordinary size. These are the larvæ of the future queens of which there may be many in a single nest. The apartments do not serve as separate nurseries either for the occupation of different types of larvæ or for the successive stages of their growth. The young of every kind, of the queens, the males, the ordinary workers of all sizes and all ages, are accumulated indiscriminately in common heaps. The silken partitions which the ants construct often form a soft delicate bag in which a great number of the larvæ are housed. There they may be heaped into a congested mass where no doubt they are most suitably and comfortably lodged within the shelter of so delicate a cell. But they are not kept exclusively in these silken tabernacles; many of them are confined to the ordinary chambers where they lie in contact with the leafy wall.

If we examine the interior during the month of June we are sure to find some of the winged forms inside. The queens are massive ungainly creatures, in colour either a pale brown or a beautiful leafy green. The males are much smaller and darker in appearance, and are often more numerous than the queens. Those insects which serve the ants as cattle are also stabled within. Later I will describe them in sufficient detail, and will just mention here that they are habitually quartered over the walls and partitions of the nest. A variable and miscellaneous collection of insects may also be scattered throughout many of the rooms. These are the victims which the ants have captured and have carried to the nest for food. There may be beetles and bugs of every kind; when the mango is in bloom we will find many lady birds, a few of them occasionally still alive, but the majority quite dead. At this season too there will be tiny hymenoptera and probably a number of fragile flies, for such is the harvest gathered by the ants from the insects that visit the mango when in flower. Bees and moths are also taken in. Ants of other species are most usual in

the cemetery, even the massive soldiers of the ponderous black ant, or more often the powerful *Myrmecocytus* which seems to be one of their most particular prey. Lastly there may be a number of their own dead workers, some of which have probably been dragged in from the exterior, while others are their comrades who have died inside.

The subsidiary chambers that serve the purpose of a byre are much less populated than the main nest. There are always workers in the interior and a variable collection of cattle on the leaves. There is the same miscellaneous accumulation of insects, for the ants will take their captures to either the nests or the byres. Since the byre is not a chamber for the propagation of the ants there as never any mass of larvæ inside. But one or two are usually found in the cavity. It is not their natural and established habitation; they are visitors retained for their architectural powers, the nature of which I will later describe. Some times a few of the well-formed pupæ may also be taken to the byres. They may be found there in an advanced condition of growth when the limbs and antennæ are perfect and distinct and long after that particular period in their lives when they could be of architectural value to the ants. The leafy prison may occasionally be invaded by one of the sexual forms, but this seems to be merely a kind of casual visit from one which has come down from the main nest.

If necessity demands, a byre may be so used as to fulfil the purpose of a nest. Such improvisation must be required only under special conditions as in so unusual an occurrence as this. I removed a nest from its attachments to the tree. By the next day the leaves had become withered and the ants were very dissatisfied with their home. They moved away to a neighbouring branch; there they turned down a single leaf so as to fashion the simplest of byres, and into this they transported their belongings which thus served them as a kind of temporary nest.

I pass now to discuss their most interesting feature, the manner in which the workers bend these leaves and unite the margins with silk. First we must notice that the leaves of the mango lend themselves to the purpose of the ants. The leaves are long and are so attached by their bases as to grow in a circle round a central stem. Moreover they also tend to droop and their tips are inclined to turn in. This results in a radiating cluster of narrow infolded leaves, and such a tuft-like formation is of service to the ants, for when the edges of the leaves are drawn together they will naturally enclose a central space. The ants, having selected the special cluster which they intend to shape into a nest, set about drawing the edges together in a remarkably ingenious way. Let us consider first the simplest condition, where the margins of two adjoining leaves lie only a little distance apart. The workers stretch their bodies across the narrow gap. The margin of one leaf they grip with their mandibles, the margin of the other with the tips of their hind legs, and thus they begin by connecting the margins with a number of living links. Now they commence to pull so as to cause the approximation of the leaves. They all lie side by side, all parallel one with the other, like so many disciplined and well-ordered men that apply their efforts to a common task. In this way they range themselves across the narrow gap. They do not haul irregularly, nor is there anything casual or intermittent in their efforts; they are far too economical to waste their strength or use it in a haphazard way. Like sailors, when they man the yard of a ship, so also do the ants lay themselves across and haul in an even line. The row of mandibles seize hold of one edge, the combined legs take a grip on the opposite edge, and slowly, by the exertion of a steady strain, they brace together the margins of the cleft. As the edges come closer and closer to one another the bodies of the ants become too long for the gap. As a consequence they adjust the position of their legs; they take a series of purchases further and further back and each time strain in a little more. At last they haul in to the full extent and the fissure is completely closed.

The particularly elongated structure of the ant naturally facilitates this peculiar task. A worker, when stretched to the full extent, measures from its jaws to the tips of its hind legs a distance of nine-sixteenths of an inch. Leaves which are further apart than this cannot, therefore, be drawn together without the employment of some additional aid. The workers cannot stretch across the gap and, as a consequence, they adopt the following method in order to increase the length of their reach. Two workers link themselves together by one taking hold of the other by the waist. In this way they almost double their original length and are able to span the gap. Often the interval is of a varying width, being narrow in one place and broader in another; the ants will then adjust themselves accordingly so that single workers strain where the fissure is narrow and linked individuals where it happens to be broad. Should the distance require a still greater stretch, then three, or even four, of them may join together in order to approximate the furthest leaves. It is thus by the exertion of a steady strain that the ants draw together the margins of the leaves, but they could never effect such wonderful results did they not all combine their individual efforts so as to act as one common team. And if the leaves are beyond their reach, then they have at hand an excellent resource; they join themselves together into a living chain by which they can extend to the most distant parts.

Separate groups of workers may at the same time be employed at different parts of the nest. And the leaves, while in the process of being braced together, are often drawn round so as to envelop other leaves, and these latter will then act as a series of walls which divide the chamber into subsidiary cells.

So much for the drawing together of the margins. I now come to the method by which the workers unite the edges with silk. While the leaves are being held in close apposition and the workers are still in their position of strain, an ant appears with a larva in its jaws which it intends to employ for the generation of the silk. A most remarkable operation now takes place, though it is very similar to what I have described in the case of the *Polyrhachis* which constructs another type of byre. The worker holds the larva by the back about one quarter of its length from the anterior end. The head of the larva thus projects in front while the rest of its body is tucked away beneath the worker's chest. The larva is then lifted from side to side, and is gently applied to the edges of the leaves along the line where their margins touch. Its movements are perfectly regular and precise, they are almost mechanical in their even rhythm. It is an oscillating motion like that of a pendulum; the swings bringing the larva to opposite sides of the junction, and whenever it is made to touch the edge of a leaf it anchors a filament of silk. This remarkable spinster seems to understand what is required; it never neglects to affix its filament, nor does it expend its efforts in needless contortions when it is not thus wonderfully employed. It even seems to co-operate with the wishes of the worker, for at every touch there is a bending of its head, a voluntary effort on its own behalf to emit the slender thread.

The threads are thus spread from side to side, and the leaves are joined by this extraordinary process, the ants making use of their own young to generate the connecting lines. The threads are composed of the most delicate of filaments, being quite invisible to ordinary observation without the aid of a powerful lens. But as the threads increase in number by the larva superimposing layer upon layer, a pearly skein of silk becomes apparent which binds together the edges of the leaves. This type of workmanship is tedious and slow, and it needs many larvæ to produce sufficient silk. The application is made both from within and without. At one time we see the larva manipulated from the interior, then it is transferred to the outside and made to operate in a similar way. Thus are the leaves more firmly united since the line of junction is secured on opposite sides. And all the time that this operation is in progress the workers are maintaining their strain on the leaves. They dare not let go in the early

stages ; if they did so, then the leaves would spring asunder and tear apart the slender threads. The workers must retain their unremitting tension until the larvæ have manufactured a sufficiency of silk to keep the edges of the leaves in place.

It is truly a remarkable and fascinating sight, and an excellent example of united effort directed to a common end. There is first the line of workers that throw themselves across the gap and close it with a uniform strain ; there is second the supporter of the living burden adjusting and controlling the flexible loom ; there is lastly the larva, an unconscious seamstress which supplies the machinery for the manufacture of the threads. There can be no more ingenious mode of architecture nor any finer example of the division of labour in all the many and varied operations of ants.

The ants employ a similar mechanism when they wish to repair a damaged nest. Thus it is easy to arrange for the inspection of their operations. It is only necessary to tear apart two adjoining leaves and wait for the workers to restore the breach. After the first mad burst of excitement has subsided, they will range themselves across the artificial rent ; one or more larvæ will be brought to the scene, and the operation continued as above described. Even if a jagged and irregular breach is made by a piece being cut out of the leafy wall, this too will be taken in hand until it is satisfactorily secured. But in this case it is a more tedious and difficult procedure and results in a more lavish expenditure of silk. For this is not a matter of just connecting edges which have been accurately drawn into place. There is a permanent loss of leafy tissue and the ants have to replace the deficiency in material by spreading out a sheet of silk. Consequently they can no longer apply the larva in the same even rhythmical way. They anchor the filaments at irregular points, yet so carefully adjusting them in accordance with requirements that in the end they construct a uniform sheet.

Let us glance for a moment at this wonderful seamstress. In appearance it is like a small segmented maggot, white and fleshy, and about one-eighth of an inch in length. It is of a narrow elongated conical shape with its mouth situated at the pointed end from where the filaments of silk escape. The other extremity is blunt and rounded, and the entrails can be seen as a dark patch visible through the transparent skin. When extracted from its worker, it rests absolutely motionless ; its pointed extremity is gently hooked, but it makes no effort to emit the silk. Though active enough in its workers' jaws, yet when taken away and placed by itself it is as inert as a dead thing. But its silk-producing mechanism lies latent in it waiting for the gentle pressure of the jaws to set the machinery at work.

The jaws of the ant are well adapted to sustain it ; their dentated edges grip it on either side and their terminal sickles, turned in below, serve to support it underneath. They cling to their burden with an unrelenting vigour ; nothing will loosen the hold. I sever the worker's body in half, but still the jaws remain fixed around the burden and the front half of the ant tries to carry it along. The worker is particularly careful of its charge. I disturb the nest while operations are in progress ; the main body emerges in an angry swarm, but the worker employed with the silk-producing larva hurries away to the safety of the nest. The ants may battle with whatever arrives ; the larvæ must be kept secure. I removed the larva from its operating worker and placed it again on the nest. A second worker immediately seized it, but made no attempt to use it for the generation of silk. A third then took it over from the second, and, without any endeavour to make it spin, carried it to the interior of the nest. I repeated the experiment with a somewhat similar result. Thus I conclude that the duty of manipulating the larva is not one that any ant is ready to perform, it is rather the single and particular business of the special worker which has undertaken the task.

The byres are constructed by a similar method to that employed in the architecture of the nest. It is thus unnecessary to describe the usual type in which the leaves are united side by side. But there is one example which deserves more attention, namely the chamber which is fashioned out of a single leaf. This mode of architecture puzzled me much. Though at first sight it appeared extremely simple, being composed of just one single bend, yet I could not understand by what particular mechanism the ants were able to so flex the leaf as to draw down the apex until it touched the base. A leaf of the mango is six or eight inches in length; it is long and narrow and somewhat oval in shape, being pointed at either end. Now the ants have to double this elongated leaf, to bend it acutely across the middle so as to fold it into half its length. From where do they obtain their points of purchase, for this seemed to be quite a different operation from that of merely closing a gap.

But I found that the ants very easily performed what seemed to me a rather difficult feat. They commenced operations at the apex of the leaf. One of the workers, the most important individual in this strange machinery, first proceeded to the extreme tip. It grasped the point of the leaf in its jaws; a second worker then took hold of the first worker's waist; a third fastened itself to the second, and so on until a chain was formed of half a dozen ants which extended from the tip along the mid-rib of the leaf. Then they all began to pull together; it was a tug-of-war against the rigidity of the leaf, a struggle in which the worker at the tip bore the full force of the strain. But soon the tip began to bend; this was the most flexible part of the leaf and it slowly gave way before the efforts of the team. As it bent down, the line of workers retired along the leaf so as to enable them to take a purchase further back and thus secure the full benefit of the heave. But though a chain of workers could thus bend the tip, it was insufficient to flex the main body of the leaf. It was necessary now to supplement their efforts in order to advance the work. The necessary assistance was ready at hand waiting for the opportunity to come into use. This opportunity had now arrived, for, as soon as tip was slightly bent, a number of other workers immediately advanced and grasped the margin on either side of the tip. Some pulled merely as individuals, others converted themselves into living chains like the one which stretched down along the mid-rib of the leaf. Thus although greater effort was demanded as the flexure increased, yet more and more workers could come into action as the leaf continued to be turned down. In this way the operation rapidly advanced, and the increasing numbers coming in on either side soon overcame the resistance of the leaf. In fifteen minutes they had completely bent the structure so that the two extremities almost touched one another and the apex was in contact with the base. The more familiar operation then immediately followed. The workers aligned themselves along either side; then, all together and in perfect order, they drew the separated edges into place, and very soon the larvæ arrived in order to finally secure them with silk.

Thus are the ants prepared for all ordinary contingencies. Their simplest plan is to draw leaves together, but if necessity requires they can bend one on itself, and under circumstances more extreme, when no foliage is available, they can fashion their chambers exclusively of silk.

The expenditure of silk in the architecture of these nests must often be very great. This is specially so when the foliage is scanty. I recall one nest as large as a man's head which contained only the thinnest scattering of foliage and looked like a huge white ball upon the tree. The stress of weather too increases their expenditure by necessitating frequent acts of repair. The wind must occasionally wreck their workmanship, for I have seen the leaves torn asunder as a consequence of a heavy gale.

Let us look more minutely at the silken tissue before leaving the architecture of these nests and byres. I examine the fabric on the microscopic stage. I

see a vision of marvellous complexity, an infinitely delicate entanglement of lines. Each separate thread is a slender filament, sharp and clear and exquisitely fine. All are interlaced into a sinuous tangle; the threads are bent into gentle curves, they touch one another, adhere to one another, they cross, they intertwine and are all closely and neatly interwoven into a fabric of the finest stuff. But it is the closeness of the texture and the multitude of the filaments which most impress us in this silken layer. They make us realize the tireless labour of the larvæ and give to the mind a more clear perception of the exquisite precision and accuracy of the work.

The ants are naturally very attentive to an edifice which has cost them such labour to build. A number of them always remains on the exterior; these are the guardians, prepared, if necessary, to make an immediate attack. Others, which are entering or leaving the gateway, can also lend their aid. But the main body remains in the interior and pours forth only when specially summoned by those on duty outside.

I placed some sticks and pebbles on the wall of the nest, but the ants would not permit of this intrusion; they quickly took hold of these foreign materials and immediately threw them to the ground. Similar objects which I pushed into the interior were also ejected without delay. Even so nauseous a substance as a nodule of camphor was seized by a pair of valiant workers and with difficulty forced through the gate. In the same way they eject all useless materials which result from the natural economy of the nest. For example, the wings and the indigestible remnants of their captures are methodically thrown out. I placed a worker of the same species, though from another nest, on the outside of one of these byres. In an instant it was seized; one took it by the head, a second by the tip of the abdomen, while the others gripped it all round by the legs, and, though an insect of their own species, yet, being a stranger, it was quickly put to death.

For some reason there is a considerable loss of life in the interior of many of these nests. I have often found the remains of dead workers within, usually a miscellaneous accumulation of their fragments collected in some corner of the wall. In one nest, which I kept suspended over water, I observed that a worker frequently came forth carrying the remains of a comrade in its jaws. One would have a leg, another an abdomen, a third a portion of the head and chest, and these they would drop a little distance from the gateway so that they fell into the water beneath. By evening the water was strewn with fragments, so that for some reason a systematic destruction was occurring in the interior of the leafy nest. It may possibly have been increased by the artificial conditions which resulted from removing the nest from the tree. Nevertheless I have so frequently found dead workers in the interior that it would seem that, as these nests are so rich in eggs displaying such profusion of generative power, so also is there evidence of that strict mortality which this lavish procreation must necessarily demand.

The care which the ants bestow on their habitations is best indicated by their manner of defence. If we climb into the branches so as to approach the nest we will meet a daring and most virulent attack. The foliage becomes suddenly alive with ants, a maddened swarm of ferocious workers pouring from the leafy nest. The sentries on the exterior are the first to be aroused; nothing can approach without alarming them, and they call out the swarm from within. First they erect themselves on their hind legs, their red bodies quivering with anger, their forelegs shaking, their antennæ trembling, they look the embodiment of furious rage. Then they rush forward to make the attack while at the same time the immense army pours out through the narrow gate. They race along the branches that descend from the chamber and, with jaws wide open and poison-glands in readiness, they fall on whoever has disturbed their peace. With bodies erect they throw themselves on the intruder; they come rushing



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