Household pests and household remedies / by W. R. Boelter.

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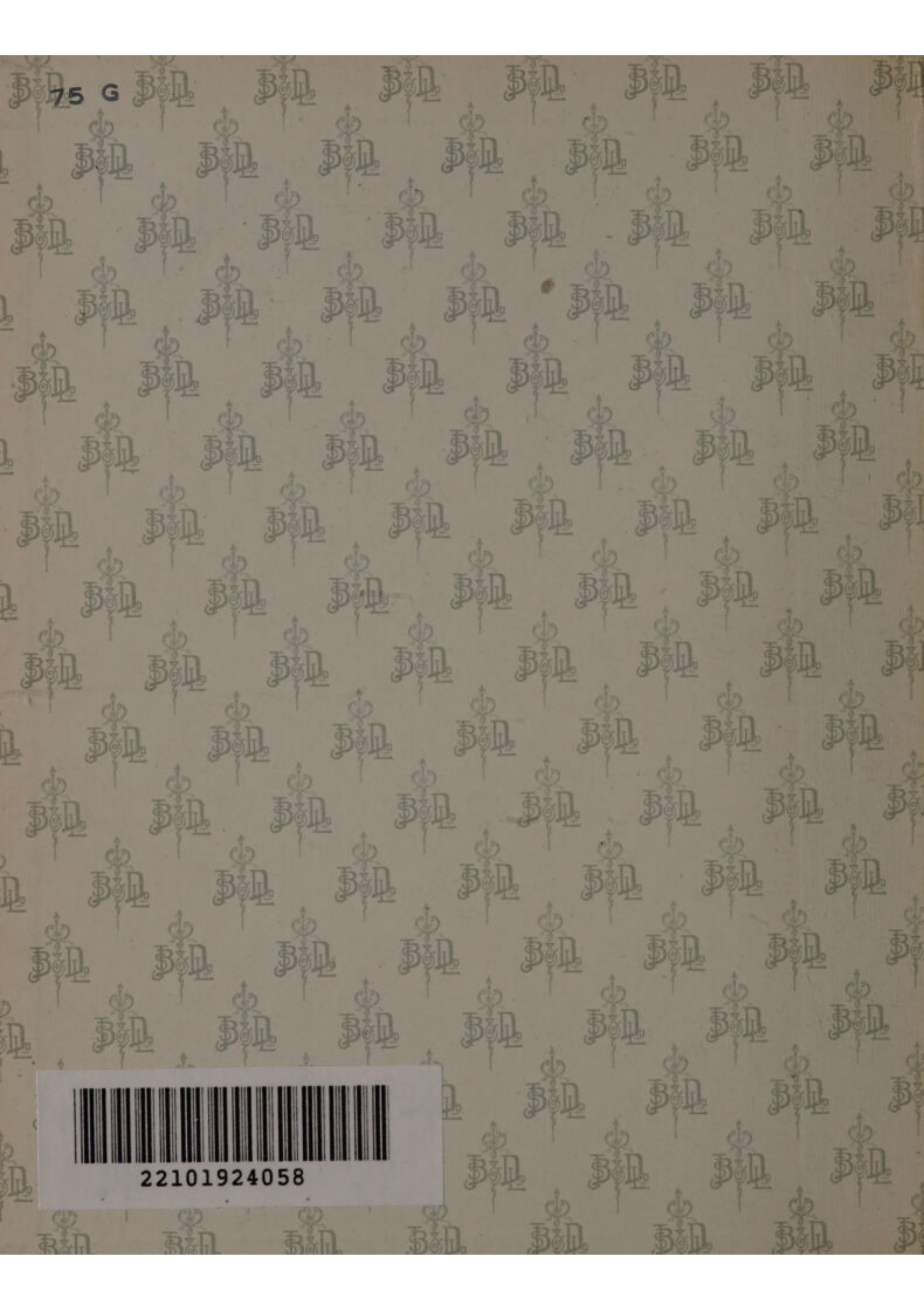

HOUSEHOLD PESTS AND HOUSEHOLD REMEDIES

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AND

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BY

W. R. BOELTER

Author of "The Rat Problem"; "A World's War against the Rat"; "A Lesson in Economic Zoology," &c.

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CONTENTS.

CHAPTER V.

CHAPTER VI.

CHAPTER VII.

CHAPTER VIII.

CHAPTER IX.

CHAPTER X.

CHAPTER XI.

CHAPTER XII.

CHAPTER XIII.

CHAPTER XIV.

LIST OF ILLUSTRATIONS.

HOUSEHOLD PESTS AND HOUSEHOLD REMEDIES.

INTRODUCTION.

In the universal struggle for existence, the war of Parasite *v.* Man is the phase which is the least creditable to us. Though man has emerged by gradual stages from savagery to all that the culture of the twentieth century implies, he has proved quite incapable, however humiliating it may sound, of defeating the parasites that prey on him and his: to-day, as in prehistoric times, he is still acting on the defensive, and vermin still the attacker, gaining ground day by day. During the last two centuries at least three pests, formerly unknown in Great Britain, have infested the entire country. In London and other large cities the vermin army is encamped in compounds, *alias* slums, whence all the power of the Public Health Act has been unable to dislodge it. The material loss alone caused by all our ectoparasitic enemies exceeds by far £100,000,000 a year. No one in a position to know denies that at least three-fourths of this huge loss is preventible by national efforts. There are thousands of places in London where food is purveyed, among them a great public institution, where it is found utterly impossible to protect food against contamination by rats, mice and cockroaches. By selecting one house each in twelve streets in the East

End of London, putting into them twelve respectable artisan families as tenants, and asking that they keep their houses and themselves permanently free from vermin, we should be setting a task which they would be powerless to perform, even with all the resources of their Medical Officer of Health at their back, except at a ruinous expense. The very poor in Great Britain may obtain temporary relief from vermin by availing themselves of the provisions of the Verminous Persons (Cleansing) Act ; to be permanently free from vermin they must become and remain criminals, for the English jails are models of cleanliness.

* * * * *

All these facts are either well known or verifiable by reference to the authorities concerned. They have been pointed to in numberless articles, lectures, and speeches by men eminent in Preventive Medicine or Economic Biology, caused a temporary shudder, and been promptly forgotten. Even the knowledge that Germany, with comparatively poor sanitary laws, has not a single slum, whilst Great Britain, with the most perfect Public Health Acts known, and a sanitary service which in its *personnel* is superior to that of any country, owns an immense area of verminous slums, has failed to bring about a change in the methods of using two perfect instruments.

The material loss caused by vermin is described in all text-books and cyclopædias as "enormous," "immense," "beyond belief," and by similar phrases. A few

years ago I set myself the task of proving, if I could, the "case against" one kind of vermin, the rat. First in articles, and afterwards in my monograph on "The Rat Problem," I showed that the loss of food and material caused by the rat in these islands exceeded each year £15,000,000. Whilst formerly any statement concerning the danger and loss to the community arising from the presence in its midst of the rat was received, in the words of Sir James Crichton-Browne, with "monosyllabic ejaculations" couched in the plural form of this quadruped's name, my estimate was regarded by every leading newspaper and periodical in Great Britain and the Colonies, if erring at all, as erring on the right side. The success of my book proved clearly that both my estimate and the opinion that this loss is preventible are generally accepted. They were made the basis of the Rat Act which was recently introduced into Parliament, and, as I have good reasons for believing, will be added to the Statute Book within measurable time.

* * * * *

Since my treatment of the rat problem appealed to critic and reader alike, I have followed the same lines in this book which deals with that class of vermin described as household pests. In the first place, I am considering the whole problem of man's ectoparasites—using the term in its literal sense—both from the economic and hygienic standpoint. Of other writers, some have confined themselves to the purely economic side, whilst others take cognisance of vermin only in so far as they are of

pathogenic interest. In order, therefore, to hear the full indictment one had, as it were, to attend in two courts. Such treatment has its obvious defects. The "man in the street," who is the final arbiter to decide whether the present slovenly skirmish against parasites is to be replaced by a determined war *à l'outrance* is notoriously unwilling to "put himself out." He wants a case placed before him "in a nutshell," plainly and forcibly, and if convinced he may, and frequently does, rouse himself from indifference to energetic action.

In the second place, it is necessary to tempt him into reading a book on such unsavoury subject as vermin before we may attempt to reason with him. Hence arises the difficulty of steering between the Scylla on the scientific and the Charybdis on the popular side. Since only one out of more than eighty critics who reviewed "The Rat Problem" deplored my having spoiled "a good and useful book by mixing up the scientific with the popular side," I am emboldened to pursue the same plan in the present book. I have, in fact, endeavoured to make it as interesting as I could. Because we are all, in one way or another, familiar with household pests, it has been unnecessary to give a minute description of their anatomy, but I have, on the other hand, tried to give a complete historical sketch of their misdeeds perpetrated on man, going back to the earliest records.

But even vermin is not entirely bad. Whilst preparing this material I found, hidden away in "odd corners" of old books and MSS., a mass of what I would like to call "vermin lore." A little of it is

given in this book, and I may some day publish the whole of my harvest in order to show how intimately man's domestic, social, political and religious life has been bound up with vermin. To my mind there is no doubt that the presence of vermin, and the resultant war of Parasites *v.* Man, has been one of the greatest forces operating for the progress of mankind. To give only one proof: all Public Health Acts, Preventive and Tropical Medicine, in fact the entire science and art of medicine except surgery, find their very origin in the anti-parasitic efforts of prehistoric man and the animal before him.

Added to this lore are many recipes taken from old medical books, the chief ingredients of which are household pests dead or alive. Mediæval physicians were in the habit of prescribing vermin, in particular bugs, lice, rats and mice, for nearly every ailment, from leprosy to toothache; and so strong was the faith in the efficacy of the nauseous potions and mixtures that it has remained in force in certain parts of Great Britain up to the present day. On the principle of "the more nauseous the medicine the better the result," live lice on bread and butter are still swallowed in parts of Gloucestershire as a specific against jaundice.

Whilst the physicians were prescribing vermin as medicine, others, the forerunners of the modern economic zoologist, compiled lists of "infallible remedies" against vermin. The two books on that subject published in England about 1680 are translated from Zedler,[1] who, in

[1] Universal Lexikon.

his turn, quotes from Hohberg and Krafft. The latter wrote a book in two volumes, which led to the formation of a "Society for the Extermination of all Vermin" in Central Germany. The English society of that name has, therefore, been anticipated by nearly two hundred years.

* * * * *

Each chapter concludes with a mention of such remedies as are in my opinion most suitable. The best of these are the natural enemies of the various pests. Chief among them are sunlight, fresh air, soap and water, and elbow-grease. Then there are specific enemies, such as the hedgehog for the cockroach, fungus (*Empusa muscæ*) for the fly; owls, kestrels, and weasels for rats, mice and voles. If we were to conduct our defence against vermin intelligently we would, of course, first of all find out who are our natural allies, and then co-operate with them in the most thorough manner. But acting unintelligently, we have, though in a very real state of war, only a very limited knowledge of the life habits of either our enemies or our allies. Hence we kill hedgehogs "because they milk the cows" (!), plead for mercy for the rat and fly "because they are useful as scavengers" (!), and shoot our most powerful allies against the rodents, the kestrel and the owl. Owing to this insensate proceeding on our part it has come about that the rat has increased to such enormous numbers and has become so powerful that it levies toll where and when it likes; and it is literally true to-day that the people of Great

Britain are no more able to prevent the rats from inflicting this damage than to stop a conflagration with a penny syringe. The grim American saying that the "ant is the ruler of Brazil" is true, in paraphrase, for Great Britain, for here "The Rat is Master."

* * * * *

As I wrote "The Rat Problem" with the object of making propaganda for the passing of a Rat Law, so my object in writing this book is to arouse an agitation for the conduct of this war on the lines on which war must be conducted unless it is to end in disaster. All wars require money, thought, organization and discipline. Money is being literally poured out by us in this war, but it is mis-spent; of the other three requisites there is no vestige.

What we need is a Minister of the Common Weal. According to the estimates of Curtis, Miss Ormerod, Theobald, Collinge, myself and others the economic losses caused in this country by vermin exceed in the aggregate annually £100,000,000. At least 75 per cent. of that huge loss is preventible. The injury to health and life caused by vermin cannot be expressed in terms of £ s. d., but must nevertheless swell enormously the debit side. How do we at present try to prevent this loss?

There is first of all the Board of Agriculture, which deals with vermin noxious to agriculture—excepting rats and mice—and with the prevention of the spread of anthrax, cattle plague, foot-and-mouth disease, glanders and farcy, mange, pleuro-pneumonia, rabies,

sheep-pox and sheep-scab, and swine fever. Most of these diseases are contagious, and due to a germ. In spite of the most elaborate arrangements made for the prevention of the spread of these diseases, they have not been abated a jot. In these arrangements the rat is not included. But the rat is ubiquitous and can make its way everywhere. All the germs of the bacterial diseases have been found on rats. But though the farmer regards the rat as his worst enemy and many pathologists are agreed that the rat is a potential agent in the dissemination of various diseases, including swine fever, the Board of Agriculture does not regard the rat as vermin, either on economic or pathologic ground, and leaves it entirely alone.

* * * * *

Opposite the Board of Agriculture in Whitehall is the Local Government Board. In this great building there is one office where the destruction of rats is regarded as one of the most vital objects of modern civilization. Consequently, the Port Medical Officers are waging war against the rat literally night and day, because it has been proved beyond any doubt that the rat is the principal agent in the distribution of bubonic plague. But this department knows of, and deals with, only one species of vermin, the rat.

From another office at the Local Government Board another class of Medical Officers of Health is directed, those stationed in places that are not ports. Whilst their colleagues in ports hate the rat with a deadly hatred

and persecute it persistently, those officers in "non-ports" are instructed to regard every household pest as vermin, or a nuisance within the meaning of the Public Health Act of 1879, *excepting the rat* (*and the mouse*). Furthermore, as regards lice, their status in law is one of considerable difficulty, for sometimes they are vermin, sometimes they are not. If they are found in a house, and in sufficient numbers, they are regarded as vermin, and may be dealt with as a nuisance; but if they are found in millions on a tramp they are not vermin: a tramp, being a freeborn Britisher, has under the Verminous Persons (Cleansing) Act the undeniable right to carry about as many pediculi as he likes to keep him company, and he may also shed them as he moves about among his non-verminous fellows. But if he takes off his over-populated under-garment and deposits it on a chair or floor, the pediculi on it at once become "vermin" and liable to be destroyed, if seen by a Medical Officer of Health, merely because they are now on a stationary object and no longer under the protection of a circum-ambient freeborn British tramp.

* * * * *

The grotesque nature of this organization of war becomes at once apparent if we imagine a similar state of affairs in a war of Man *v.* Man. Conceive General A. at Hastings seeing an invading force embarking, and noticing that they are infantry, telling his army "not to trouble," as the infantry of the enemy does not come into his department, but into that of General B. Of course,

the enemy, with the proverbial rudeness and unfairness of enemies, refuses to accept this arrangement and attacks, inflicting heavy loss. And, however incredible it may sound, in the war against vermin this "sort of war" is going on in Great Britain and, Ireland every day in the year, with the result that we suffer an incredible loss.

A rat may be either deadly vermin, or "a kind of" vermin, or no vermin at all, according to its being observed by a Port Medical Officer, a Medical Officer of Health, or an Inspector from the Board of Agriculture; vermin on sheep (*e.g.*, scab) or on gooseberry bushes (*e.g.*, mildew) render the farmer liable to prosecution by the Board of Agriculture official, whilst the vermin on the labourer who attends the sheep or burns the mildew d gooseberry bushes are not "on his beat"; and, finally, lice are vermin (*i.e.*, vermin is vermin) when in a state of rest, but lice are not vermin (*i.e.*, vermin is not vermin) when being carried about.

* * * * *

To alter this, to substitute order for chaos, intelligence for stupidity, and an organization of victory for slovenly little skirmishes, we need a Minister of the Common Weal, a department of the Common Health and Wealth. It would deal with the destruction of all vermin and take over for that purpose the functions now not discharged by the Board of Agriculture and the Local Government Board. It would organize the war through officers who had been trained in warring

against every kind of vermin : in other words, scientists and practical men who understand both the economic and hygienic side of the vermin problem. It would act upon public opinion through the Press and by lectures held in every town and village, and thus gradually mobilize an enormous army of willing fighters. It would bring in, and pass, with an educated public opinion behind it, a law ordering the destruction of all vermin, either for economic or hygienic reasons or for both, and then carry out the law to the letter. It would secure the best expert advice in the destruction of vermin or the protection and breeding of natural enemies, and thus complete an organization which must eventually bring about an enormous reduction in the number of vermin, and thereby a corresponding decrease in the pecuniary loss, and an increase in public health. That this is no idle dream, that vermin can be exterminated to the incalculable advantage of the common health and wealth, is shown by the success achieved by the Americans in Havana, where they stamped out yellow fever, and in the Isthmus of Panama, where they stamped out malaria and yellow fever by exterminating the mosquitoes. All that is needed in the wish and determination of the " man in the street " to be " Master in his own Land." At present " Vermin is the Ruler."

W. R. B.

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CHAPTER I.

The Ant.

The name "ant" is a contraction of the old-fashioned "emmet," from the Anglo-Saxon "ætette," which means "diligent," or, according to other interpreters, "a gnawing insect." Ever since man began to observe them, ants have been regarded as models of

ANTS.
M., Male. F., Female. W., Worker.

industry: "Go to the ant, thou sluggard," we read in the Bible,[1] "consider her ways and be wise"; and in the philosophy of the people of all lands, the proverbs, we find innumerable allusions to the ant and her never-ending work: "An emmet may work its heart out, but it cannot make honey," is an Italian saying. "None

[1] Proverbs vi. 6.

preaches better than the ant, and she says nothing," says the German proverb.

The first detailed description of the ant we find in the venerable and quaint Bestiary, the Physiologus.[2] It informs us that :—

"*The ant has no strength, but does not surrender itself to laziness. . . . It has three wisdoms—the first : when it walks in single file it carries a grain in its mouth, and those that have none say not to the others, 'Give me your grain,' nor do they take it with violence, but they walk by themselves and in quietness. And the second—when the ant gathers the corn into the earth it always divides one grain into two lest when the winter comes it become moist and sprout, and the ant die of hunger. Further, in the days of the harvest the ant goes far out into the field and climbs up to the ears to fetch down a grain, and she first smells the stalk and knows by the smell whether it is barley or wheat, and she leaves the barley and climbs up to the wheat, for barley is the food of beasts.*"

Herodotus, to whom we are also indebted for some remarkable information in natural history, speaks of "a desert in Northern India where the ants are as large as hares and foxes." They brought from the earth the auriferous sand which was given to 'the gryphs, which are sacred to the sun and guarded the gold.'

The species of ants that are to be found in Great Britain cannot be justly regarded as harmful as long

[2] Physiologus. Translated from the Syriac by F. Hommel, 1877.

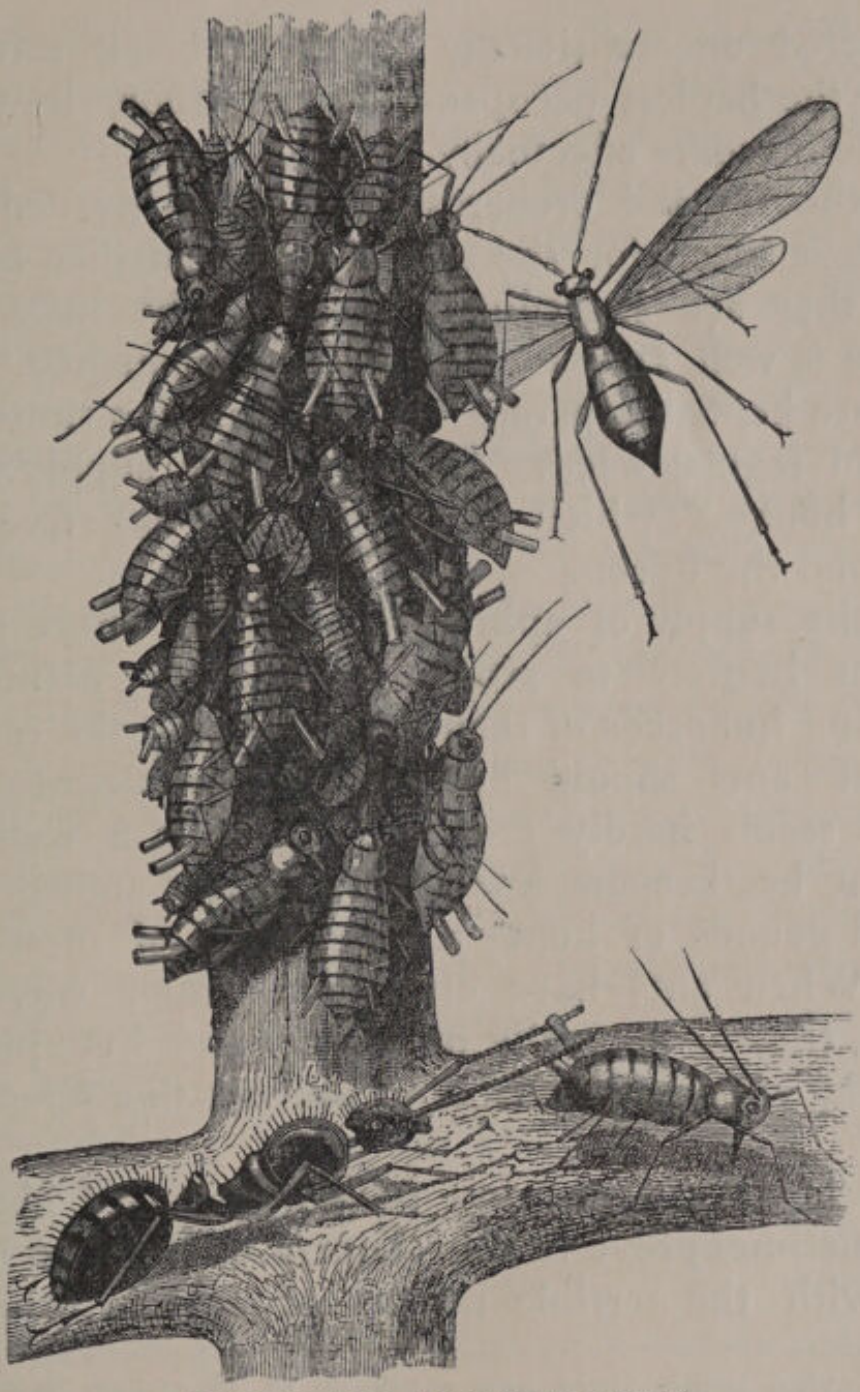
SECTION OF AN ANT-HILL (RED WOOD ANTS—*Formica rufa*).

as they remain in their proper sphere. The common Yellow Ant, *Formica flava*, does some little harm, it is true, by raising over its nest a small, dome-shaped grass mound, which often forms a serious obstacle to mowing, but it compensates the farmer by thoroughly ventilating the soil. The Red Wood Ant does nothing but good by destroying untold numbers of certain insects and their larvæ which cause great injury to pine woods; they vary their diet occasionally with a frog or mouse.[3]

Even the little Black Ant, *Lasius niger*, which is chiefly found near human habitations, is harmless enough as long as it stops outside. Unfortunately, it has a keen scent for sweet vegetable substances, such as fruit, honey, jam, syrup and sugar, and when it has once found its way to the larder it becomes an intolerable pest. All the inhabitants of the nest seem to attack the newly discovered food store *en masse*, swarming over every article of food on the shelves and rendering it unfit for human consumption. They bore and tunnel into bread and meat, become stuck in the jam or honey,[4] or are drowned in the liquids. As fast

[3] It is a trick of the trade of naturalists to use ants for skeletonizing mice and small birds; they enclose the carcase of the animal of which they wish to obtain the skeleton in a perforated box near an ant-heap, and in a few days they will find every particle of flesh and gristle removed and nothing but a polished skeleton left. (Figuier.)

[4] The ant's fondness of honey is responsible for the great Zedler's statement that "Ants often generate from a slice of rye bread spread with honey." This idea of the spontaneous generation of vermin is found in all nations. In the Bible we read (Exodus viii. 16): "And the Lord said unto Moses, say unto Aaron, Stretch out thy rod and smite the dust of the land, that it may become lice throughout all the land of Egypt. And they did so. . . ." Greek and Roman writers thought that mice were generated out of the mud of the Nile.



APHIDES AND ANTS (MAGNIFIED).

as the spoiled food is replaced, the fresh food is again attacked by the ants, whose name seems to be billion, and many a cottage and bungalow are, during the summer

surrendered unconditionally to these black tormentors, because the hapless occupants do not know how to deal with the invaders effectually.

Hothouses and orchards are usually invaded by ants in the first place for the sake of the plant-lice of whose honey they are exceedingly fond.[5] The little Yellow Ants, as is well known, actually have plant-lice "cows." These are kept in separate "stables" in the subterranean nest, and regularly fed. In return they supply the ants with "honey" which is chiefly used for feeding the young and the queen.

If the supply of aphides should run short the ants will not hesitate to attack the potted plants, often destroying hundreds of them by devouring the roots.

That ants should be able successfully to invade apiaries seems hardly credible, but it is a well-known fact that bee-keepers lose through them annually many hundred pounds of honey and hundreds of thousands of bees. When ants have once found their way into a beehive, they live royally on honey and live pupæ, the bees being apparently unable to prevent this piracy.

But however annoying such invasion of black ants may sometimes prove in this country, it is not to be compared with the terrible ravages of ants in other parts

[5] In Ceylon some years ago a plague of plant-lice in the coffee plantations was exterminated by ants which had been specially introduced for that purpose. When the object had been achieved the ants, in their turn, were destroyed by the planters.—In China gardeners employ a species of ant for the purpose of protecting the orangeries against other insects.

of the world. There is a grim American saying to the effect that "the ant is the ruler of Brazil." One of the most awful pests in the Tropics is the blind Driver Ant. They attack *en masse*, and kill even large animals, directing their attack first upon the eyes. The dread of them is upon every living thing. Their entrance into a house is soon known by the simultaneous and universal stampede of rats, mice, lizards, cockroaches, and vermin of all sorts. "When they are fairly in, we give up the house," writes Bates,[6] "and try to await with patience their pleasure, thankful, indeed, if permitted to remain within the narrow limit of our beds and chairs."

"Where the Driver Ants go the whole world is set in commotion, and every creature toils to get out of the way. The main column of the army moves forwards in a given direction, clearing the ground of all animal matter, dead or alive, and throwing out here and there a thinner column to forage on the flank. They overcome every obstacle in their blind march, and even form 'animated suspension bridges' over broad streams. Though useful as scavengers, their unchecked multiplication may result in fearful ravages. A hundred and sixty years ago vast hordes of these ants appeared in the island of Grenada, and did terrible damage to the sugar plantations. They descended from the hills like torrents, and the plantations, as well as every path and road for miles, were filled with them. Rats, mice, and reptiles of every kind became an easy prey to them, and even birds,

[6] "Naturalist on the Amazon."

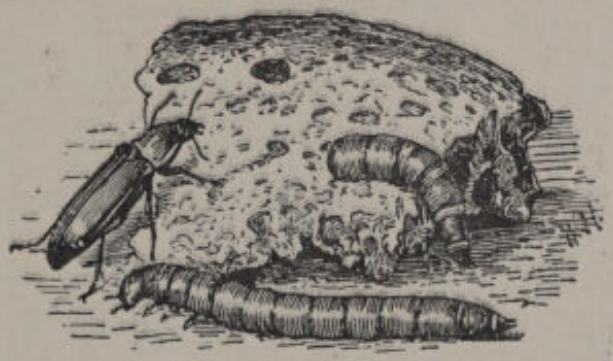
whenever they lighted on the ground in search of food, were so harassed as to be at length unable to resist them. Streams of water opposed only a temporary obstacle to their progress, the foremost rushing blindly on certain death and fresh armies instantly following till a bank was formed of the carcases of those which were drowned, sufficient to dam up the waters and allow the main body to pass over in safety. Even fire was tried without effect. When it was lighted to arrest their route they rushed into the blaze in such myriads as to extinguish it." A reward of £20,000 was offered in vain for an effectual means of destroying them; but in 1750 a hurricane, which tore up the canes and exposed their habitations to a deluge of rain, freed the island from this plague.

The Sugar Ant in the West Indies often destroys whole sugar plantations. By way of revenge the negroes there live during the greater part of the year on these ants, which they catch, make into a dough and preserve in bags.

"The ants are a people not strong," say the Proverbs (xxx. 25), but a few years ago they were powerful enough to take possession of a house in Newcastle so completely as to compel the owner to destroy and rebuild a large part of it in order to get rid of them. Having been brought over in timber that had subsequently been used in the construction of the house, these foreign ants multiplied in the safe retreat of beams and boards in an appalling manner, invading every room and rendering the house uninhabitable. Every known remedy was tried, but without avail. Finally, as a last

resort, all the suspected timber was taken out, and with it the ant plague disappeared. A second and larger attack was reported from Newcastle quite recently. This time a species of foreign ants had taken possession of a whole row of cottages, and all attempts made by the tenants to dislodge them proved unsuccessful.

So-called "ants' eggs," that is, the pupæ of the Red Wood Ant, are sold as food for goldfishes and cage-birds, and in pheasant-rearing districts gamekeepers are instructed to break up the "ant-hills" so that the pheasants



MEAL-BEETLE (*Tenebrio molitor*) AND ITS LARVA. THE "MEAL-WORM," A SUBSTITUTE FOR "ANTS' EGGS."

may get at the "eggs." This is an instance of that "penny wise and pound foolish" policy of man which we may trace right through the chapter of economic zoology. In order to obtain a pennyworth of immediate benefit man will destroy dozens of ants in embryo which, if they had been left to live and develop, would have destroyed thousands of injurious larvæ and caterpillars, and thus saved from destruction timber to the value of many pounds. In Prussia, Bavaria, Wurtemberg, Mecklenburg, Oldenburg, and Coburg-Gotha the gathering of

"ants eggs" is an offence punishable by a heavy fine. In a report issued by the Administrators of the State

DAMAGE DONE TO A PINE-TREE BY THE PRINTER-BEETLE AND ITS LARVÆ (*Bostrychus typographus*).

Forests in Prussia the remarkable decrease of damage done to pine-trees is ascribed to the protection granted

under this regulation to the Red Wood Ant. If, instead of robbing the Wood Ant of its young, man would look for the larvæ of the meal-beetle, he would obtain an equally suitable food for his pets, and at the same time do twofold good by destroying an injurious, and protecting a useful, insect. Moreover, if he cares to take the trouble of fitting up a very simple apparatus he may always have fresh worms to give to his birds and fishes. All that is necessary is in May or June to get a tin biscuit-box, put into it a few soiled rags, a piece of rotten wood and a crust of bread, and cover them well with equal parts of bran and flour ; procure from a baker or flour merchant a few meal-beetles and "meal-worms," put them into the tin, put on the lid and keep the tin always in a warm place, summer and winter. After a few months, and for ever afterwards, unless the "breeders" are left to die from cold, there will be an ample supply of "meal-worms" even for a good-sized aviary.

In medicine ants were formerly used for curing various ailments. The London Pharmacopœia of 1796 says that : "*Ants are hot and dry—by their sharp scent wonderfully refresh the spirits ; the greater, or winged, with a little salt, cure the psora, or scab, and leprosie.*"

Zedler[7] says that "*ant liquor—a decoction of winged ants—cures the stone ; outwardly it helps suffusions of the eye, cures the itch, and dissipates corns and warts. Ants made into a salve with salt cure leprosy and itch and drive away*

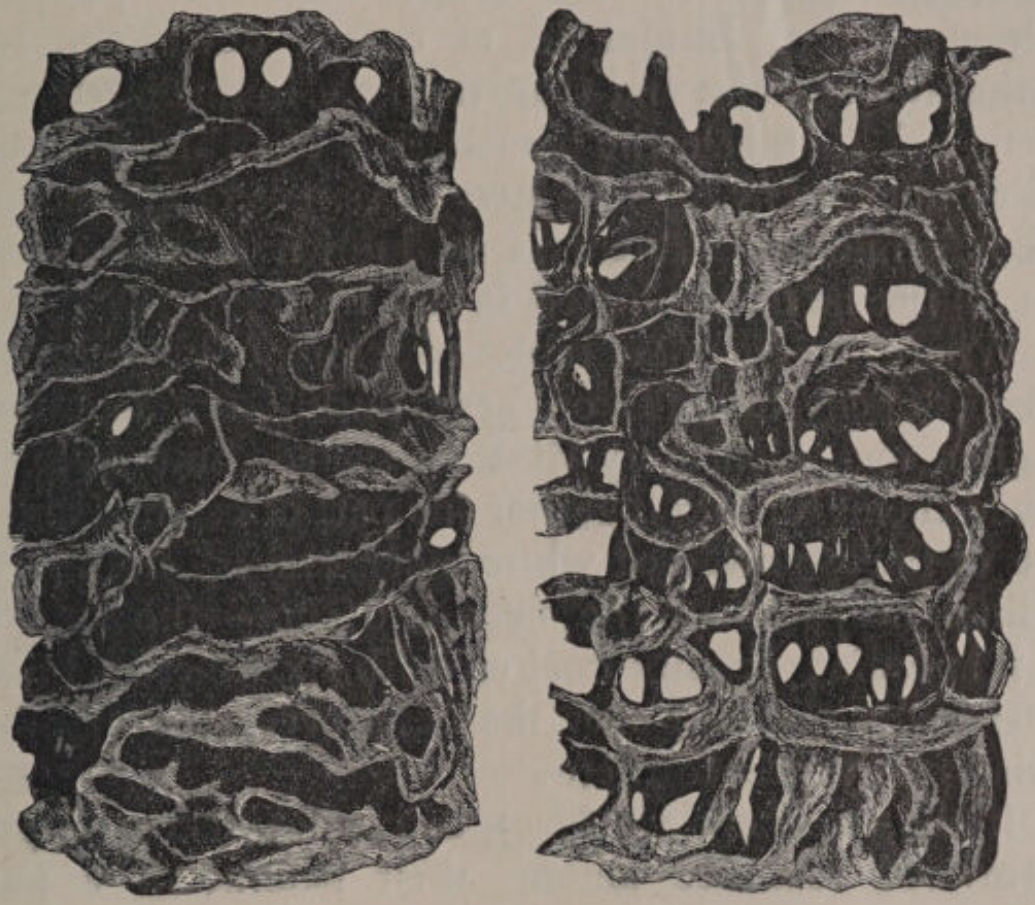
[7] "Universal Lexikon," Leipzig, 1743.

freckles. Ants' eggs crushed, put on wool and in the ear, cure deafness. An ant-hill put into a bath cures gout, lameness, and paralysis."

Formic acid which takes its name from the Red Wood Ant from which it was first distilled, is the basis of chloroform, a preparation that has been the means of alleviating an untold amount of human suffering. "Spirit of ants (10 parts of fresh bruised ants, 15 parts of alcohol and water equally mixed) will cure gout and rheumatism." "Ants' eggs mixed with the juice of onions and dropped into the ear" were an old Scotch "certain cure" for deafness. "The Russians," says Hudibras, "give as physick to their soldiers purging comfit and ants' eggs." In "A Thousand Notable Things" we read that "a bath wherein emmets and their eggs have been stamped or sodden doth quickly heal an old and almost incurable joint sickness." Robert Lovell said (1661) that "nightingales use ants when they are sick." About the sixteenth century the winged ant was a favourite ingredient in love philtres. This tincture, dropped in the homœopathic manner into wine, or mixed with food, was supposed to "have a wonderful effect in arousing the tender passion, even with the coldest heart."

When ants cease to interest us on account of the lore woven around them, but become a subject of the most urgent interest as a household pest, we get a miniature picture of the terrible war going on between vermin and man; for to get rid of ants—even of the compara-

tively harmless species found in England—is one of the most difficult tasks in vermin destruction. If ever by any chance in any village or town a plague of black ants should spread from its source in one house to the rest of the inhabited places, it would entirely paralyse all human work and render life in such place impossible. The lesson



SECTIONS OF NEST OF THE YELLOW ANT.

to be learned from such a reflection is that war against vermin must be waged on our part in the most determined manner, with the most effective means, and begun as soon as the first outposts of the vermin enemy are noticed.

When a place is threatened with an attack by ants, our first duty is to find their main burrow, or nest, if possible. Having done so, any of the following recipes will be found effective in exterminating them :—

Make holes in the ant-hills or burrows, 6 in. deep and 1 ft. apart, with an iron or zinc tube fitted with a wooden stake. Withdraw the stake and pour one tablespoonful of bisulphide of carbon down the tube. Withdraw the tube and stop the hole immediately. Be careful not to inhale the gas arising from the chemical, and do not let any light be near it, as it is both poisonous and inflammable. There is no known species of ants that cannot be exterminated in this manner.

Where it is undesirable to employ bisulphide of carbon, open the hills or nests during dry and warm weather and plentifully dust air-slaked lime over and around them; or mix together one part of calomel and ten parts of finely powdered white sugar, and lay the mixture in little heaps about the nests and runs—the ants will eat it and die ; or mix coal oil with six times its bulk of water and sprinkle it over the nests every few days after having partly opened them.

If the attackers are black ants, a few leaves of green wormwood scattered among their haunts, or a putrid fish placed on the nest will soon drive them away. If ants infest a greenhouse, put a piece of camphor of the size of a filbert nut into 2 quarts of hot water. When cold, apply to pot and other plants, and the ants will be driven off without injury to the plants. It should, however, be remembered that whilst these two

remedies are beneficial to the individual, it is not in the interest of others that plans should be adopted which merely succeed in driving the plague from one place to another. The object of all war is to kill the enemy, not to let him "run away that he may fight another day."

If the nest cannot be found—as often happens in the case of black ants—warfare on man's part will be restricted to preventing the ants from invading our houses, and killing them off by means of "isolated actions." To achieve the former there is nothing better than to sprinkle powdered borax about their suspected lines of communication between their nest and the pantry or greenhouse. It may be added here that in any house or shop where plenty of powdered borax is placed, two or three times a year, into cracks and crevices and holes, no vermin of any kind will ever gain a foothold. A surgery in the East end of London which drew an unlimited supply of cockroaches from an underground bakehouse on one side, of mice from a grocer's shop on the other, and occasional bugs and fleas from the general store of Bethnal Green, is now a vermin-free oasis in a district where vermin are "innumerable like grains of sand in the desert."

For killing off the outposts of ants, no matter how numerous, nothing will excel the old-fashioned household remedy of well coating with treacle the inside of a number of glass jars and placing them about the runs of the ants. Their unerring instinct leads them to this rich store of sweetness, and soon the inside of the jars

becomes a squirming, wriggling mass of ants. Rescue parties despatched from the main army become similarly engulfed, and the sending of reinforcements goes on until the ant army has been completely annihilated by treacle. As I have never noticed in experiments of this kind that a queen was trapped, but as, on the other hand, the ant plague was invariably stamped out by determined warfare with these weapons, it is probably right to assume that the ants recognized their complete defeat and that the few remaining stalwarts removed their queen and young brood to a safer abode.

Since termites have advanced from their home in the Tropics as far as France, having been brought to French ports on ships, it behoves us to be prepared for the day when this country, too, shall be invaded by the insect which is at present doing incredible damage in many parts of the British Empire.

"No one," says Figuier :[8] "is ignorant of the enormous destruction which the termites cause to the works of man.[9] Invisible to those whom they threaten, they push on their galleries to the four walls of the houses. They perforate floors, beams, and the woodwork of the

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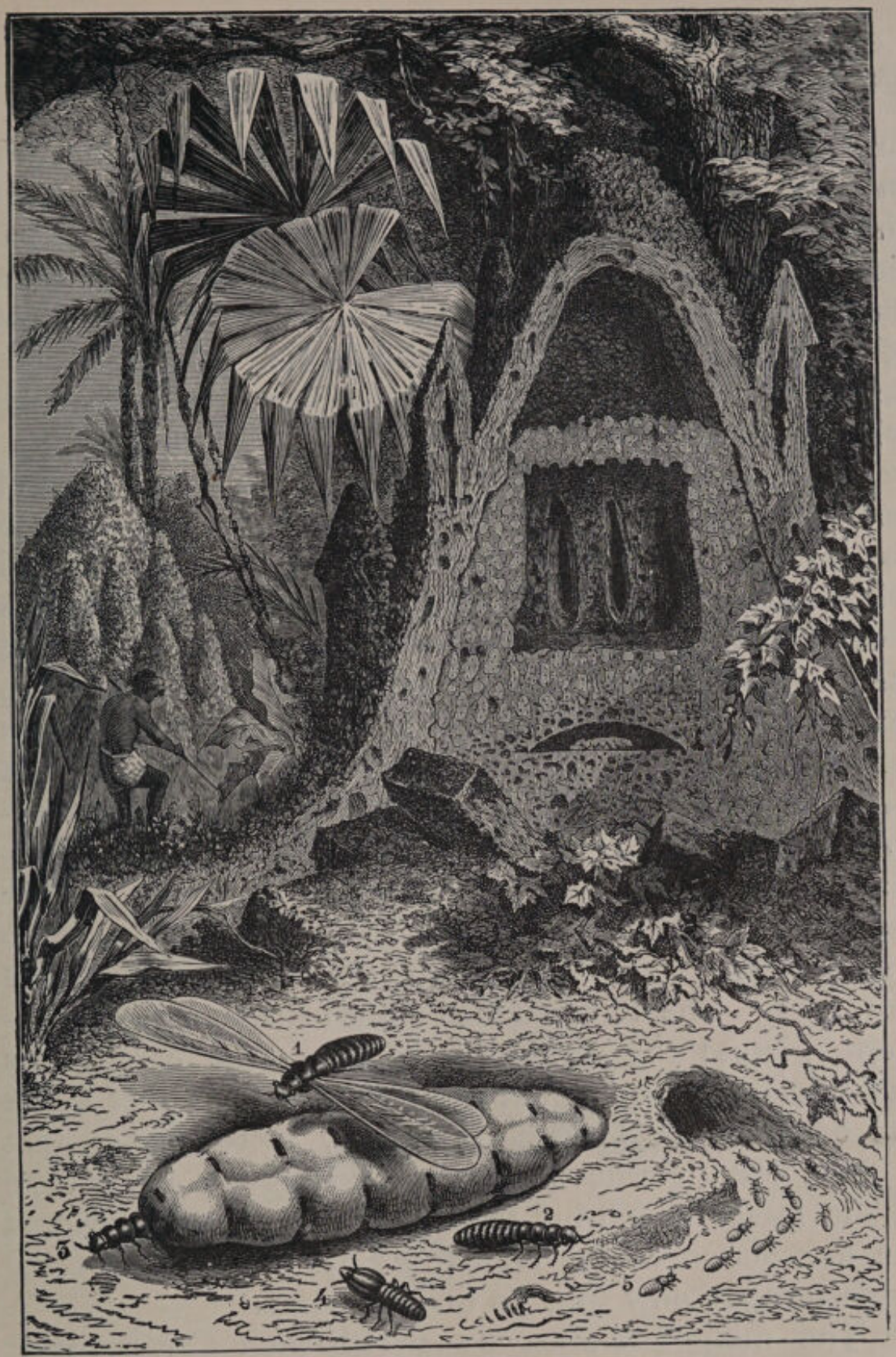
[8] "Insect Life."

[9] Their terrible destructiveness was so well known to the Jews that it is mentioned several times in the folklore of the Talmudic literature. Thus it is related in Ber (54b) that when Og, King of Bashan, took up a mountain of three parasangs in extent in order to bury under it the entire camp of Israel, God caused the white ants to bore a hole in the rock so that it would slip over the head of Og and remain fastened upon his neck.



NEST OF THE WHITE ANT (*Termes bellicosus*) IN CENTRAL AFRICA.
1, Male. 2, 4, 5, Neuters. 3, Pregnant Queen.

furniture, leaving always the surface of the object attacked in such a manner that it is impossible to be aware of their hidden ravages. They have been known in one single night to eat away the whole inside of a table, leaving nothing but the shell, and devour the contents of a trunk placed upon the table. On account of the devastations which they occasion, Linnæus has called the white termite "the greatest plague of the Indies."

Though there exist in France two native species of termites—one, a little black insect, common enough in the moors of Gascony, the other, the yellow-necked white ant, which lives in the interior of trees and does a great deal of mischief, it was proved beyond doubt that the insect which caused so much havoc at La Rochelle, where many houses were completely undermined by these terrible insects, belong to the exotic species, which must have been unfortunately imported into France by a merchant vessel. At La Rochelle these insects took possession of the Prefect's house and of the Arsenal. There they invaded offices, apartments, court and gardens. One fine morning the archives of the department were found destroyed. The termites had mined through the woodwork, pierced the cardboard, eaten up the parchments and official papers, but left in every case the upper leaves and edges of the leaves. It was by mere chance that a clerk, less superficial than his colleagues, raised one of the leaves which hid these *débris*, and thus discovered the destruction of the archives. All the papers of the Prefecture are now shut up in zinc boxes."

The method chosen by the French Government,

and found successful for getting rid of the ants at La Rochelle, was injections into their nests of chlorine gas. Pure chlorine killed the termites instantaneously ; when mixed with nine-tenths of air it suffocated them in half an hour. The most suitable time for attacking the termites is the period of their reproduction, so as to destroy the pregnant females.

Apparatus for injecting chlorine and other gases are made by one English and one German firm, and since both systems have been found to be uniformly successful, even the dreaded termites have ceased to possess any terror for those residing in termite-infested countries, as long as their destruction is undertaken with the determination to persist in the work until there is an end of the pest.

CHAPTER II.

The Bug.

"Would you let a bug escape you because it did not bite you?"
—Tamil Proverb.

To paraphrase an old saying: "There be land-bugs and water-bugs." Of land-bugs there are about 8,000 species, but water-bugs are not so numerous; two well-known species of these are the Water Boatman and the Water Scorpion.

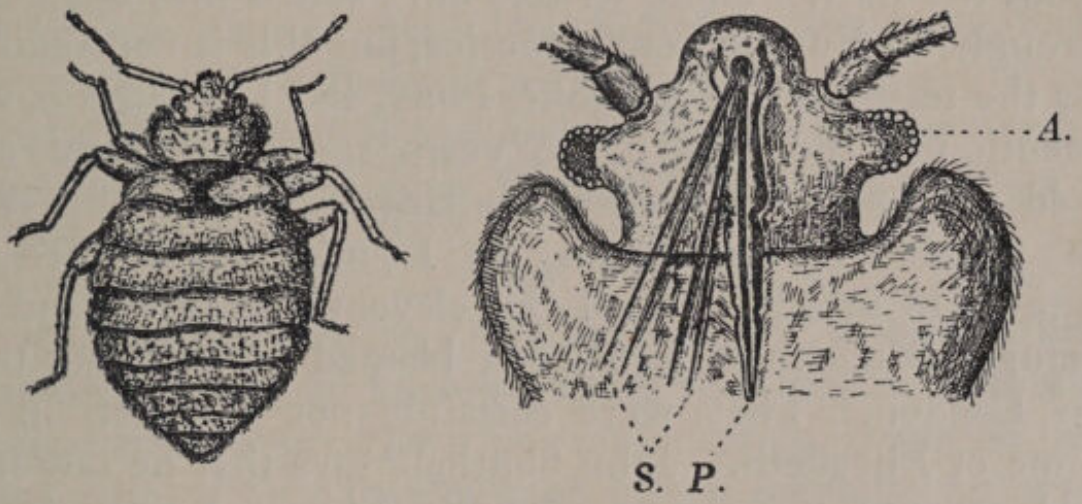
The bug which is of special interest to us is the Bed-bug or Wall-louse, one of the most objectionable parasites of man, abounding in dirty houses, especially in towns. Having a flattened, thin body, of about $\frac{3}{16}$ in., and a brown colour, they can easily conceal themselves during the day in crevices and holes, or hide in beds, woodwork, and behind paperhangings. At night they come out to feed on the blood of sleepers. Though they distend themselves when opportunity offers with the blood of their victims, they are not by any means gluttonous insects; on the contrary, their sobriety is remarkable. It is only after a prolonged fast that they bite animals, and a French observer has stated that bugs can live a year, or even two, without food.[1]

For their business as blood-suckers bugs have been provided with a special piercing and sucking apparatus.

[1] Figuier, "Insect Life."

The lower lip (the beak) forms a kind of gutter in which are placed the upper and under jaws, which have in the course of the evolution of the bug assumed the shape of spines. When not in use, this apparatus is turned back against the under side of the body, where it is protected against injuries. Poisonous saliva, which flows into the wound, causes inflammation and swelling.

Having only wing stumps, and being therefore unable to fly, Nature has made recompense to the Bed-bug for



THE BED-BUG (*Cimex lectularius*), SEEN FROM ABOVE. ON THE RIGHT, HEAD GREATLY MAGNIFIED.
A, Eye. P, "Beak." S, Spines. (After Schmeil.)

this loss by giving it a loathsome stench as a protection against enemies that would like to eat it. It is curious to note that after the death of a bug this disgusting odour completely disappears.

The female bug is said to lay eggs four times between March and September, and each time about fifty. The eggs develop to maturity in about eleven weeks. As bugs, in contrast with other vermin, can endure a

considerable degree of cold, and as apart from the cock-roach they do not appear to have any natural enemy which preys on them, it will be understood how easily bugs with their great fecundity may become an intolerable and almost ineradicable pest, if prompt and determined measures are not taken as soon as they have somehow been brought into a house.

Like some other pests, the Bed-bug has come to us from the East. Some writers have stated that bugs were brought to Europe from America, but this is contradicted by the testimony of Aristotle, Pliny, and Dioscurides, who mentioned the bug 2,000 years ago. Aristotle even told us that "Bugs arise spontaneously from the sweat of people" (!) According to Leunis,[2] bugs were not known in Strasburg until the eleventh century; and the refugee Huguenots have been blamed for bringing them to London. They were certainly not common in the time of Elizabeth. John Southall[3] says that he saw in an old account, "*that soon after the Fire of London, in some of the wood-built houses they were observ'd to appear, and were never noted to have been seen in the old, tho' they were then so few as to be little taken notice of: yet as they were only seen in the Firr-Timber, 'twas conjectur'd they were then first brought to England in them; of which most of the new houses were partly built, instead of the good oak destroyed in the old.*" And, "*though not one seaport was free from them, in inland towns they were hardly known.*" Nevertheless,

[2] "Synopsis des Thierreichs."
[3] "A Treatise of Buggs," 1730.

about 1650 bugs appear to have been so numerous that there were numerous bug-destroyers in London doing a lucrative trade. Not so long ago one firm held the title of "Bug destroyers to Her Majesty and the Royal Family." Mayhew relates that at the time of the Peace celebrations this firm had an illuminated sign which read: "May the destroyers of Peace be destroyed by us, Tiffin and Sons, Bug destroyers to Her Majesty."

Southall published in his "Treatise of Buggs" a list of the charges made by him for destroying bugs. For "cleaning a Bedsted with moulding Tester, Wood Head-Cloth, Head Board and its Furniture" he charged 10s. 6d., a "Four-post Bedsted" 6s., and a Chest of Drawers 5s.

In the country the "Harvest-bug"[4] often becomes a serious pest. It burrows under the skin of its human victim and raises a red pustule, causing irritation and great pain. This troublesome insect prevails, however, only in the hot summer months. "When it swarms," says Gilbert White, "it reddens the nets of warreners, and its bite throws the men into fever."

A terrible pest in India are the flying bugs, "enormous and fœtid." Night is the time of their activity. Warm countries generally have bugs of great size and beauty; but touched or irritated they "exhale an odour that, once perceived, is never after forgotten."

A winged bug as large as a cockchafer lodges in the

[4] The larval form of *Trombidium holosericum*.

thatch and roofing of houses in Chili, and sallies forth at night, like the Bed-bug, to suck blood, of which it takes as much as a common leech.

In olden times it was thought that the bug, in common with the rest of vermin, possessed certain medicinal properties, and thus we find a great number of recipes for many illnesses in which this disagreeable insect plays a prominent part. The old Roman physicians gave crushed bugs to rouse patients from lethargy. Dioscurides ordered that seven bugs should be taken "internally against the quartan ague before the fit comes on," and Avicenna, who introduced the fashion of gilding pills, prescribed bugs for the quartan fever and hysterical affections. The "Anglo-Saxon Leechdom" abounds in prescriptions of this kind, and various mediæval physicians insist upon bugs being taken alive: "five for tertian fever, seven for the quartan ague and palsie, nine for leprosie," and eleven for a certain unmentionable disease. Zedler says[5] that: "*Seven bugs in a hollow bean drive away the four days' fever, the great Gesner[6] himself witnessed such a cure.—The three days' fever is cured by taking bugs in garlic and wine, or in soft-boiled eggs.—Squash bugs against the nose of epileptics and they will be cured.—To take off leeches, put bugs into vinegar and pour on a heated brick—the smoke will drive them away.—Six to seven bugs cure sleeping sickness.—Bugs with honey will cure deafness.*"

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[5] "Universal Lexikon," 1743.

[6] Gesner, "The Newe Jewell of Health," 1576.

There are many allusions in literature and proverbs of all countries to bugs. Charles Lamb, in his essay "The Old Margate Hoy," speaks of fishes and quaint monsters to which all that is terrible on earth—

"be but as buggs to frighten babes withal."

There is a vulgar saying: "As snug as a bug in a rug." "Rug" here is a Danish word, meaning a rugged, shaggy dog. The "Bug Bible" had this name bestowed upon it because a passage in Psalms xci, 6, was rendered as: "The bug that destroyeth at noonday." It is said about the coriander—a common plant of our hedgerows—that the green herb and seeds stink intolerably of bugs. The term "bug" occurs five or six times in Shakespeare's plays, but as synonymous with bugbear and not as applied to the bug.

So objectionable was the word "Bugg" as a patronymic to a family of that name in one of the eastern counties that they changed it by deed-poll, selecting the name of Norfolk Howard. This explains why among the tramp fraternity bugs are called "Norfolk Howards."

An old book on the destruction of vermin[7] records

[7] "'The Vermin Killer, being a complete and necessary Family Book.' London: 1665." In the chapter on bugs the compiler says:—

"Bugs, to Prevent Breeding.

"Bugs are not only become troublesome at *London* but are got into some *Countries;* They proceed from old Feather beds, whereupon has long laid sick and sweaty people, which produces putrified Smells and Vapours; so do close Press Beds that have not the advantage of the pure Air; as also close Rooms, where the Air wants free Egress and

hundreds of "infallible remedies" against "any kind of vermin whatsoever." After having mentioned some thirty or forty "unfailing recipes against the bug," the writer concludes: "But the best of all is to open the window and let fresh air come in," and (he adds naïvely) "shake the bedcloths *twice* a week."

This mediæval compiler felt, what we all know to-day, that the main object of hygiene is not so much to destroy vermin when it has infested a place, as rather to prevent

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Regress, from these Causes bugs proceed; and also Consumption, Weakness of the Back, and such like Diseases that People little think of.

"And if you observe, you shall never find these Creatures in Shops, or where no Beds have been put.

"One way therefore to prevent them, is to wash your Rooms, and keep them very clean, and keep your Windows open in the Day time, that the Air may come in, and in the Morning lay open your Bed cloths that the Air may come in and the Sun suck up the Moisture contracted in the Night time. This is a great preservative against all Vermin, as also of your Health."

Then follow twenty-one "infallible recipes," such as:—

"Take sprigs of Fern, and lay upon the Boards, kills them. Mix tar with the juice of wild Cucumber, then anoint your Bedstead with it, it kills them. Powder of Squils, mixed with Wine vinegar, rubbed into the Bedstead with a Spunge, kills them.

"Rabbets' Guts boil'd in Water, and set under the Bed, kills them.

"Wash the room with Onions boiled in soap and steep the Rind of green Walnuts in Water 3 or 4 days and wash the Room with it twice a week.

"Hang a Bear's Skin in your Room, and they will be gone.

"Get a trap about a yard and a half long or more, and a half a Yard in depth, put it at the Head of your Bed, in the morning they will creep into it, take it into your Yard, knock it and they will drop out, so you may kill them. They are made of Wickers, by Basket makers.

"To conclude: Let your Rooms be kept clean, set open the Windows when you rise, and lay your Bed cloths open 4 or 5 hours: and 'tis the only way to prevent both Bugs and Fleas."

vermin from infesting a place at all. Towards that end we have at our disposal several vermin deterrents and vermin destroyers that are always effective and never fail. The supply of one is free, gratis, and unlimited—fresh air. Another—sunlight—is not always to be had in these islands, but should be used freely and unsparingly whenever there is a supply of it. Another great remedy against vermin, soap and water, is not to be had free, but should in my opinion be supplied gratis, at any rate, to every denizen of slum-land. The destruction of vermin is a war waged on behalf of the whole community, and it seems to me that the very least the community can do is to supply with the necessary ammunition those who are bearing the brunt of the attack literally by day and night.

When bugs have invaded a place, the fumes of sulphur, or the use of mercurial ointment and corrosive sublimate, are all excellent means for killing them. Pyrethrum, a species of camomile found in many gardens, reduced to powder and blown into the furniture and woodwork, will also get rid of them. Finally, powdered borax is as effective against bugs as against nearly every other kind of vermin.

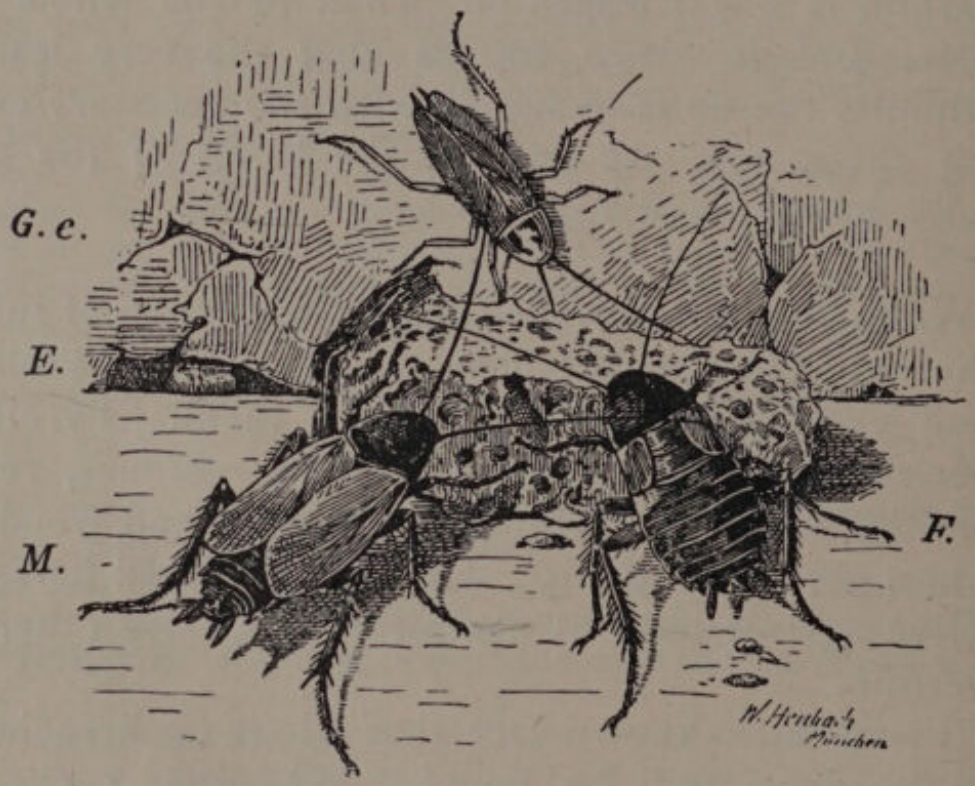
It is a little-known fact that where cockroaches are, there no bugs will be found. Whenever cockroaches are introduced into a bug-infested place, they will at once begin to kill them off.

CHAPTER III.

The Cockroach.

"The cockroach is always wrong when arguing with a chicken."
—Spanish Proverb.

The Cockroach belongs to the large order of insects which includes locusts, grasshoppers, crickets, earwigs,



COCKROACHES (*Periplaneta* [*Blatta*] *orientalis*).
M, male. F, female. E, in a crevice of the wall, egg-parcel. G.c., German cockroach, (*Blatta germanica*).

and others. Its name comes from the Spanish *cucaracha*, "wood-louse." The French call it *bête noire*. Though

in England it is often spoken of as a black-beetle, cockroaches are in no sense beetles.

Being, unfortunately, a very common household pest, they are too well known to require detailed description. The egg-laying process of the female cockroach is interesting. She is furnished with two egg-laying tubes, in each of which she gradually forms a cocoon, consisting of a peculiar hard capsule and containing usually sixteen eggs. These she carries about for a long time, but eventually attaches them by a sticky substance prepared by herself to some suitable object. When the larvæ are hatched they soften the edges of a side-slit made by the female cockroach in the enclosing capsule, and emerge through this into active life. They are said to moult seven times before becoming quite adult, in the fifth year of their life.

The commonest species in Great Britain was brought to this country within the last 200 years, probably from Asia, whence also came the bug and the rat. The American Cockroach probably found its way in bales shipped from America to England. The German Cockroach, another species found here, was once very troublesome, but seems to go to the wall before the common cockroach. One is here reminded of the fact that the so-called old English black rat has been all but exterminated in this country by the brown rat, which came to us from Asia. Another kind of cockroach which is sometimes met with in the North of Scotland, and occurs commonly in the woods of North and Central Europe, is especially important in Lapland where

it sometimes does great injury by devouring the winter stores of salted fish.

The largest form known is a native of South America, and very abundant in the West Indies. It measures about 3 in. in length and does great damage.

The cockroach is one of the most ancient pests of man, remains of it having actually been found in Silurian strata. Horace, in one of his poems, accuses the cockroaches of eating clothes like moths. The poet-naturalist Chamisso relates that sailors having opened some barrels which should have contained rice and wheat, found them filled with cockroaches. It is possible that these insects may do some little good as scavengers, being voracious feeders on both animal and vegetable substances, but as they do not confine themselves to refuse, and as the juices of the mouth leave a disgusting smell on the objects over which the insects pass, they soon become quite intolerable, especially in hotels, restaurants, bakehouses, mills, breweries, hospitals, and on ships. They sometimes attack sleeping persons and, like the loathsome rat, will even gnaw the extremities of the dead. Like the rat they will eat anything which their powerful mouth, consisting of three pairs of jaws, will enable them to bite. They are particularly fond of beer and of boot-blacking, and if undisturbed will make a meal of a boot, leather and all. It is principally in hot countries that cockroaches do the greatest damage. In the Antilles, where they are a terrible pest, it is affirmed that in one single night they can bore holes through trunks, cases, and bags, and destroy objects which were supposed to be in perfect safety.

The ancient and mediæval physicians employed cockroaches in their prescriptions, and modern chemistry has proved that in some cases they were not far from the truth. When they gave an oily decoction made from cockroaches for the cure of warts, boils, scaly eruptions, and sores we do not quite perceive their wisdom, but the ancient recipe of powder made from roasted cockroaches for dropsy has been revived in modern times with great success. Dr. Bogomoloff, of St. Petersburg, treated several cases of dropsy and Bright's disease with doses of powder prepared from cockroaches, on account of the antihydropin which they contain, and was uniformly successful. Similar good results have been reported by other physicians.

In a house or place where there are dark and stuffy corners and cupboards, many cracks and crevices, and scraps of food left lying about on floors, cockroaches find a perfect paradise, and will grow and multiply in spite of all the insect powder ever made. On the other hand, if the presence of cockroaches is not desired, it will be necessary to remove all those conditions which are favourable to their existence. Izal powder placed into crevices and cracks, and behind skirtings inhabited by them, and around the grates and stoves, will make the place most objectionable from the cockroach's point of view, and incidentally kill off all their young brood, excepting the eggs. A glazed or enamelled basin, baited with treacle and reached by the cockroaches on pieces of wood resting with one end on the

side of the basin, will trap them by the hundred, as they are unable to get out of the basin. Poultry and owls are very fond of them and will eat them greedily. A species of wasp, with a scientific knowledge of meat-preserving, lays in a stock of cockroaches, which it has previously rendered insensible by stinging them. Then the female wasp lays her eggs, and when the larvæ are hatched they have ready at hand a larder full of scientifically preserved "fresh cockroach."

"Hedgehogs are not killed with a fist."
—GERMAN PROVERB.

A relentless natural enemy of the cockroach is the hedgehog. This exceedingly useful animal is but little known in towns, but familiar in country districts throughout Great Britain. It is characterized by the short and almost imperceptible neck, pig-like snout, from which it derives its popular name, and also by the shortness of its limbs. Exclusive of the short naked tail, which measures about $1\frac{1}{4}$ in., an average-sized hedgehog is about 10 in. in length. It is of nocturnal habits, feeding by night and sleeping during the day. On the approach of danger it usually rolls itself into a ball, presenting at every point numerous spines of defence. When rolled up, the head and feet are tucked inwards so that only the spines are exposed, and it requires a bold dog or fox to attack a hedgehog when in this condition.

Hedgehogs date from a remote antiquity, and it is doubtless due to this protective armour of spines that animals of such low organisms and of such comparatively

large size have been enabled to survive without resorting to the protection afforded by a subterranean or aquatic mode of life.[1] In the country hedgehogs are

HEDGEHOG AND YOUNG (*Erinaceus europæus*).

accused of two crimes: eating eggs of game and milking cows.[2] That they will occasionally vary their diet with

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[1] Lydekker, "Royal Natural History."

[2] "Hertfordshire hedgehogs are proverbial, plenty being found in this highly woodland country, where too often they suck the kine, though the dairymaids conne them small thanks for sparing her pains in milking them."—LOVELL, "Panzoologica Mineralogia," 1661.

a pheasant's egg is no doubt true, but an examination of their excreta proves that beetles of all kinds form a very considerable part of their diet. As to hedgehogs milking cows, this interesting bit of animal-lore has been so firmly and religiously preserved that only quite recently the English Board of Agriculture gravely and solemnly stated in one of its official publications that there was "no foundation for this statement."

The "Physiologus," the source of many quaint statements concerning animals, says :—

"*The Hedgehog is like unto a circle . . It goes out into the vinyard and throws down the grapes, and it robs sorely and spears the grapes with its spines, and goes to his young who eat, and it has nothing left for itself.*"

Nothing is relished more by a hungry gipsy than a fine fresh hedgehog baked in a coating of clay. When the hedgehog is "done" the prickles come away with the baked clay, and the flesh is said to be most delicious. It is a remarkable fact that these animals are proof against poisons of every description, neither prussic acid, arsenic, opium, corrosive sublimate and other deadly drugs, or even the venom of the adder, being capable of hurting them.

There seems to be no doubt that the hedgehog's real vocation in life is to be our ally in the extermination of cockroaches and other vermin ; for if fed occasionally with flesh it will not only quickly rid a place of cock-

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[8] See footnote, p. 22.

roaches, but also of mice and even of rats. It is within my personal knowledge that a certain large hotel in London was cleared of cockroaches by four hedgehogs; previous to their "appointment" to the job a professional beetle-destroyer had been employed, at a wage of £52 per annum, to exterminate the cockroaches, a task which it was either beyond his resources, or outside his intentions, to achieve during four years of work.

Knowing how very objectionable cockroaches are, and what hedgehogs are capable of doing in the way of killing them off, I think that the owners of bake-houses, restaurants, and other places where food is prepared or purveyed would be well advised to keep a hedgehog as soon as traces of cockroaches are noticed. It will be both cheaper and more effective than the use of most of the preparations sold for the extermination of cockroaches.

CHAPTER IV.

The Cricket.

We have already seen that Crickets belong to the same order of insects as cockroaches. The House Cricket, *Gryllus domesticus*, with which we are here concerned, is common throughout Europe. Occasionally it wanders out of doors and adapts itself to a life in the open. But usually it hides in nooks and crevices, and loves the neighbourhood of the fire, especially during winter. Its merry chirp-chirp had become the symbol of the home long before Dickens wrote his "Cricket on the Hearth." Its German name is *Heimchen*, which means "little home pet." The Spaniards are so fond of crickets that they keep them in cages like singing birds. Superstitious people believe that the chirping of a cricket is a sign of death, but to the ordinary sensible person the chirping of crickets means that the place infested by them is not kept as clean as it should be.

Without the heat of the fire the cricket becomes more or less dormant in winter. It remains quiet during the day, but at night goes about in search of bread-crumbs and other scraps of food, both animal and vegetable. For the sake of food and warmth it often frequents bakehouses.

The cricket is not loathsome like the cockroach, nor

so voracious, and does therefore but very little actual damage in private houses ; but it becomes often a terrible nuisance on account of its penetrating chirping noise. Where its presence is not desired it may be got rid of by the measures advocated against cockroaches.

It seems, however, highly undesirable that crickets should be permitted to exist in bakehouses, and as the hedgehog never fails in exterminating them at least

THE HOUSE CRICKET (*Gryllus domesticus*).

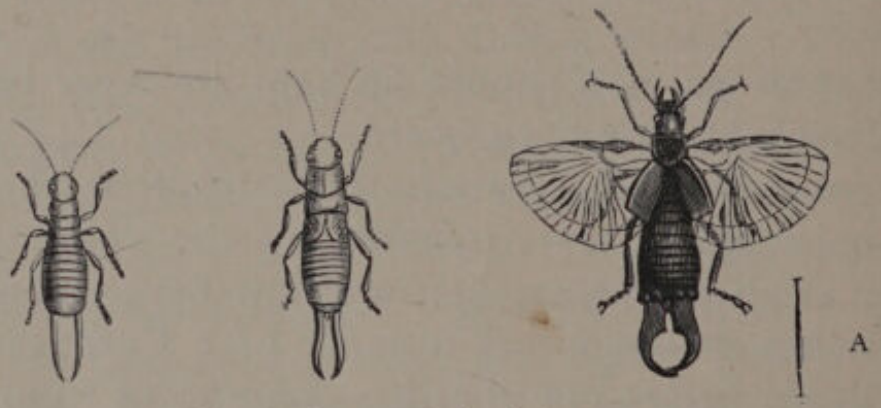
one of these animals should be kept in every bakehouse where crickets have been heard.

From recent observations it seems that the cricket is being gradually exterminated by the common cockroach ; at all events, crickets are now never found where cockroaches are—another instance of a European species going down before one that has come to us from Asia.

CHAPTER V.

The Earwig.

Though looking very fierce and bold in its coat of armour and with the terrible shears, the earwig is rather a harmless insect which feeds on vegetable matter, by preference sweet fruit. But when, as it sometimes happens, there has been "a good season for earwigs,"



COMMON EARWIG (*Forficula auricularia*)—LARVA, PUPA, IMAGO.
A, natural size.

they become great pests in gardens and greenhouses, and even in the house itself.

It seems a real pity that the earwig does not stop in its proper place, which is the plants and flowers and fruits we do not want, for it is a clean little fellow, and as dainty in its food and ways as any fine lady. It may sometimes use the pincers at the end of his body to

frighten away some of his enemies, but they are really intended for services of a far more peaceful nature. Under the short wing-cases the earwig has two large wings which are carefully folded down, but which the earwig is unable to spread by means of the muscles of the neck. When, therefore, it wishes to fly it turns its long, slender body until the pincers reach the wings, and then takes them out of the case, much as a lady takes her walking clothes out of the wardrobe.

Contrary to popular belief, expressed for all time in its name,[1] the earwig never crawls into people's ears in order to do all kinds of mischief. How that belief arose is difficult to say, but a few hundred years ago it was so firmly held that the medical writers of that time have given us dozens of recipes "for getting earwigs and other worms out of the ears."[2] The belief seems to be universally held. In Germany the earwig is called Ohrwurm ("ear-worm"), in France, "perce-oreille" ("pierce-ear"), and the Armenian name also means "ear-enterer."

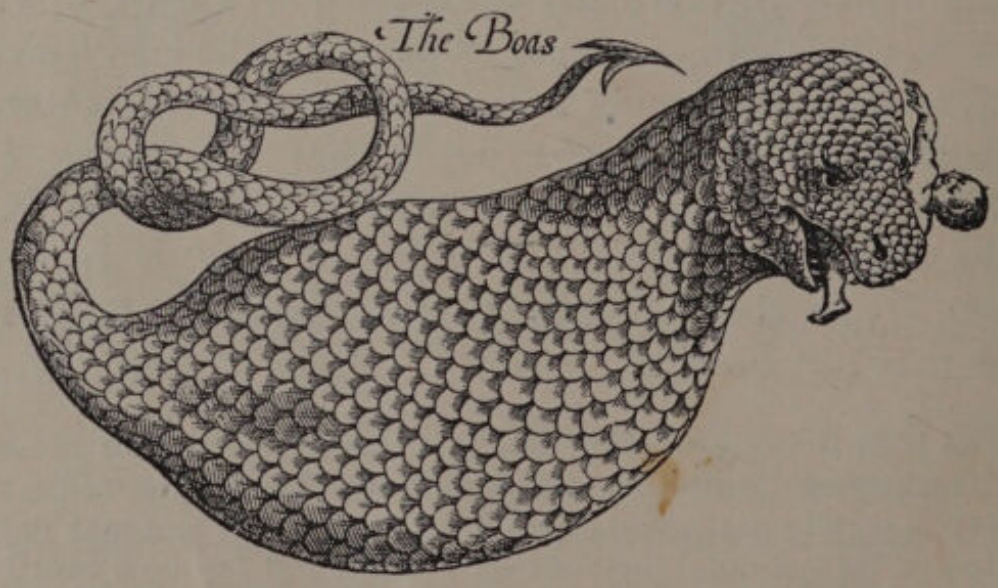
Robert Lovell in 1661 wrote that "*Earwigge being boiled in common ale, and then used to the arteries in the temples and wrists, they cause a feaver and so cure convulsions.*" In the "*London Pharmacopœia*" (1696) it is stated that: "*Earwigs, if dryed and finely powdered, and*

[1] The libel is aggravated by the fact that "earwig" has become a name for a prying, insinuating informer or tale-bearer.

[2] "If an earwig has crawled into a patient's ear let him take Papaver somniferum, tie a handful thereof over the ear, and tap on a board held before the other ear until the earwig comes out."—"Utrechter Arzneibuch."

mixt with hare's urine, and so put into the ears evening and morning, they do cure deafness."

When earwigs become too numerous, and thereby qualify for being treated as a household pest, the best way to get rid of them is to fill a number of very small flower-pots with dry moss or hay and put them, inverted, on shelves in the greenhouse (leaving sufficient space at the bottom for the earwigs to crawl in) or on sticks in the garden. In the morning the pots should be collected, the moss with the earwigs that were attracted by the shelter and darkness thrown into boiling water, and the pots filled once more. This process should be repeated until earwigs have ceased to be a pest.

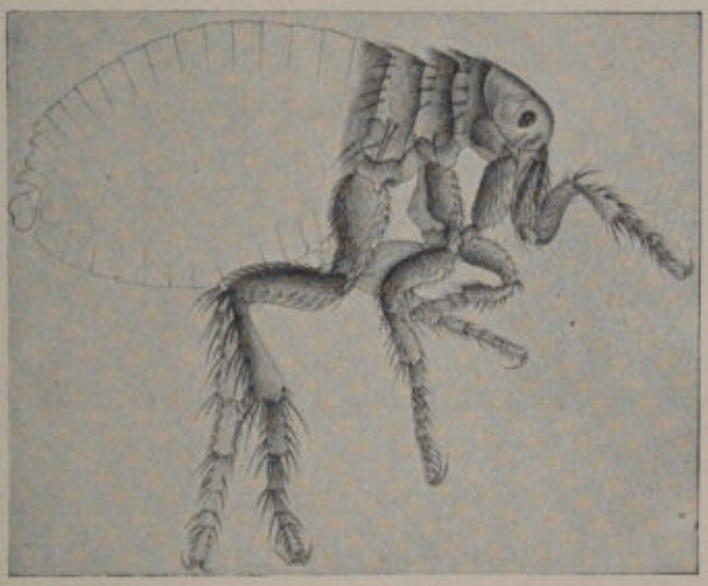


CHAPTER VI.

The Flea.

"The fatter the flea, the leaner the dog."—German.

Fleas are insects belonging to an order of which the Common Flea is the classic example. Like all blood-suckers, it possesses a mouth adapted for piercing and



FLEA (*Pulex irritans*).

LARVA OF FLEA, ENLARGED.

sucking, which, together with the long strong legs, particularly the powerful hind legs, provide it with a pumping apparatus of tremendous force. It has no wings, but, being unsurpassed as a jumper, can afford to be without them.

The female flea lays her eggs in the crevices of the floor, or in the fur or feathers of the animal infested.

The footless larvæ live on the decaying particles of plant or animal food swept into these cracks, or on the half-digested blood which forms the excrement of their parents, "thus demonstrating the tendency on Nature's part," says Gosse sagely, "to save all material possible and make every fragment useful." The female flea will also feed the larvæ by disgorging into their mouths the blood with which she is filled. In summer the entire development of the Common Flea occupies about a month.

DOG-FLEA (*Pulex serraticeps*).

All fleas live on warm-blooded animals, and the numerous species are more or less strictly confined to their various furred and feathered hosts.

During recent years it has been proved, in the course of investigations into the spread of the bubonic plague, that the rat-flea plays a sinister *rôle* in the dissemination of this terrible scourge. Using the rat as its host and means of conveyance, the flea sucks with the blood of a plague-stricken native the bacillus of bubonic plague and

transmits it afterwards, when once more hungry, as often as not to a healthy native. Thus it is by the co-operation of rat and flea that the plague is spread far and near and demands every year thousands of victims.

Though there is but little danger of the plague ever coming to this country, there are other diseases in the spread of which the agency of the flea is being more and more clearly recognized, and the destruction of fleas becomes therefore an important matter.

Where there is plenty of fresh air and scrupulous cleanliness fleas cannot live and thrive; but if a house has been infested, their demise may be accelerated by the use of insecticides, the modern substitute for the old-fashioned fleabane and wormwood. According to Tusser—

> "While wormwood hath seed, get a handful or twaine
> To save against March, to make fleas to refraine;
> Where chamber is swept and wormwood is strewn
> No flea for his life dare abide to be known."

Books of the 16th and 17th centuries are full of quaint prescriptions against fleas. Thus we read: "*Take a wooden basin or earthen pot, besmear it with foxes' fat*[1] *and put*

[1] An old "hunting story" says: "Many hunters know that foxes, which are proverbially full of fleas, have a clever way of getting quit of them. The fox gathers some handfuls of wool from thorns and briars, and wrapping it up, holds it fast in his mouth, then he goes by degrees into a cold river, and dips himself down by little and little. When he finds that all the fleas have crept so high as his head for fear of drowning, and ultimately for shelter crept into the wool, he barks and spits out the wool full of fleas, and then very froliquely being delivered from their molestations, he swims to land." This is a little more doubtful even than the story told of Christina, Queen of Sweden, who is reported to have fired at the fleas that troubled her with a piece of artillery still exhibited in the Royal Arsenal at Stockholm.

it into the bed and all the fleas will creep into it. Then throw it away." Other ancient recipes are : "*Boil Lavender and Wormwood in Vinegar, and sprinkle your Blankets with it ; Or Savory laid in your Chambers kills them.—Fleawort well dry'd and put into a Bag with Holes in it and placed about your Bed kills them.*"—Agrippa says that "*Goats Milk and Lye sprinkled about the Rooms is an infallible Remedy.*" —"*Blood of an Ox mixed with the Soot of a Chimney and rubbed on the inside of an earthern Pot, all the Fleas will come into the Pot in a day or Two.—Take the Decoction of Thistle and Coloquintida, Bramble or Colewort leaves, and sprinkle about the House : drives them away.—Anoint a Stick with the Grease of a Hedgehog, and lay it in the Rooms and all the Fleas will gather and stick to it.—Take the blood of a bare or bager, and put it under the bed and it gathers the fleas to it, and they die immediately, approved Pliny.*"

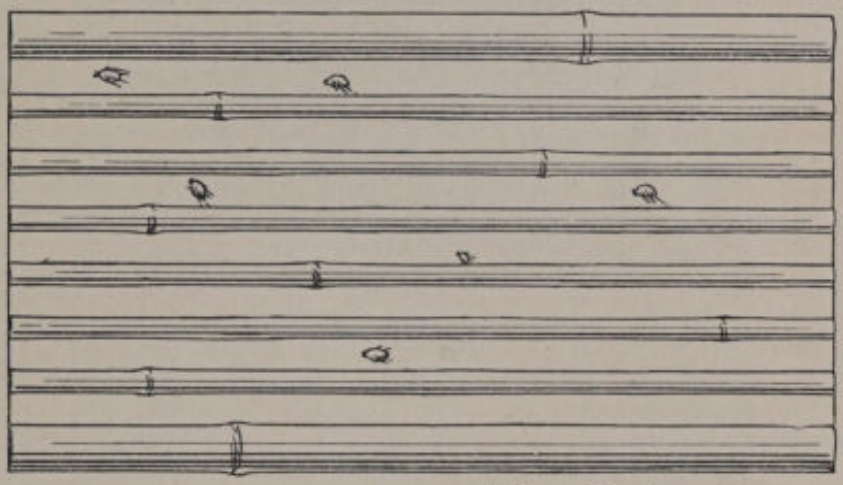
A curious recipe is one used in parts of Kent, where it is firmly believed that if the doors of a house are kept shut on March 1 the house will be immune from fleas for a twelvemonth.

Zedler[2] describes a flea-trap, "*ein dem Frauen-Zimmer bekanntes und sehr dienstliches Instrument. It is made of ivory, round, perforated, and contains in the centre some cotton-wool. It is very serviceable against attack by these stinging animalculæ which seek moisture from woman. Item, a little square of flannel, by which they capture these artful guests and black passengers.*"

Flea-traps are to-day in use in some parts of China. Probably the long flowing garments have something to do

[2] "Universal Lexikon."

with the fact that these contrivances are still a necessity even among the upper classes. They are described as small pieces of cardboard smeared with scented bird-lime, and fitted with five or six strips of bamboo. The fleas are caught in the bird-lime between the ridges, which prevent at the same time the clothes from coming into contact with the bird-lime. When the traps are full, they are thrown away or burnt. The Esquimaux have a flea-trap made of reindeer hair.



CHINESE FLEA-TRAP. (After Sambon.)

Another species of flea, the chigoe, "jigger," or tick, is happily not a British pest, but is very abundant in the West Indies and on the West Coast of Africa, where it often becomes a terrible plague. Its popular name, "Sand-flea," indicates that it lives chiefly in sand, but it is nevertheless essentially a parasite of man, for it is always found near human habitations.

The chigoe is somewhat smaller than the common British flea and has no jumping legs, but relishes, like

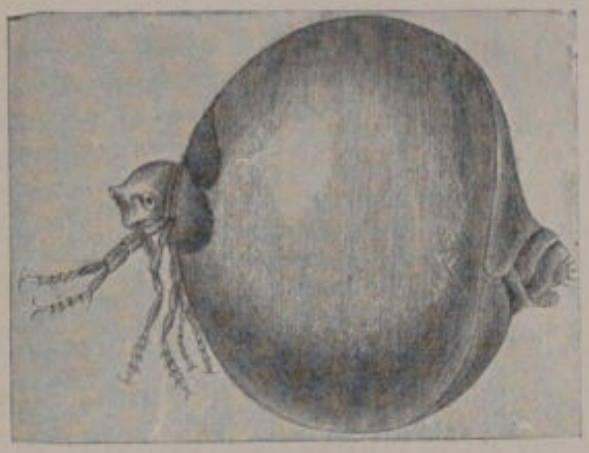
the British species, the blood of mammals, especially of man. As in the case of other vermin, the main trouble with the "Sand-flea" arises from a habit of the female. When the time arrives for her to do her duty as a mother of future generations of "Sand-fleas," she looks most naturally for a safe and quiet breeding-place. This she finds under the skin of animals, and particularly on

CHIGOE, OR JIGGER (*Sarcopsylla penetrans*).
Young female, highly magnified, after Moniez.

the feet and under the toe-nails of man. There the tiny flea swells under the pressure of the growing eggs enormously, reaching the size of a pea. It keeps up communication with the outer world by means of its breathing tube, at any rate as far as the supply of fresh air is concerned. At the end of a week the eggs are

ready to be liberated into the outer world and to be hatched there, for the larvæ do not live on man.

The entrance of the female chigoe into the skin is marked by a tingling and itching sensation, and premature attempts to dislodge the intruder often lead to ulceration. Negroes suffer least from chigoes, for they



CHIGOE, OLDER FEMALE (ENLARGED).

have learned that if they bear a little pain patiently for a week they may then gently remove the "Sand-flea" with its whole offspring and feel no further discomfort.

A preventive remedy much in use among the white inhabitants in the West Indies is to wash the legs and feet with tobacco juice, or to wrap the feet in tobacco leaves.

CHAPTER VII.

The Fly.

"The busy fly is in every man's dish."—Spanish Proverb.

"A certain city was infested by poisonous serpents that killed all they fastened upon; and the citizens, thinking them sent from heaven as a scourge for their sins, kept praying that the visitation might be removed from them, until scarcely a house remained unsmitten. At length, however, the eyes of the people were opened; for after all their prayers and fastings they found that the eggs of the poisonous serpents were hatched in the muck-heaps which surrounded their own dwellings."—Eastern Fable.

Properly only the insects belonging to the order of the Two-Wings are flies, but the name is so widely used in compound words, such as may-fly, butterfly, dragon-fly,[1] that it has come to mean popularly any insect that flies, just as "worm" is used popularly for any insect that crawls, and "beetle" for any insect that runs.

The flies which are of interest to us here are *the* fly—the deadly house-fly, as it has been called—the bluebottle fly, the gnat, and the mosquito.

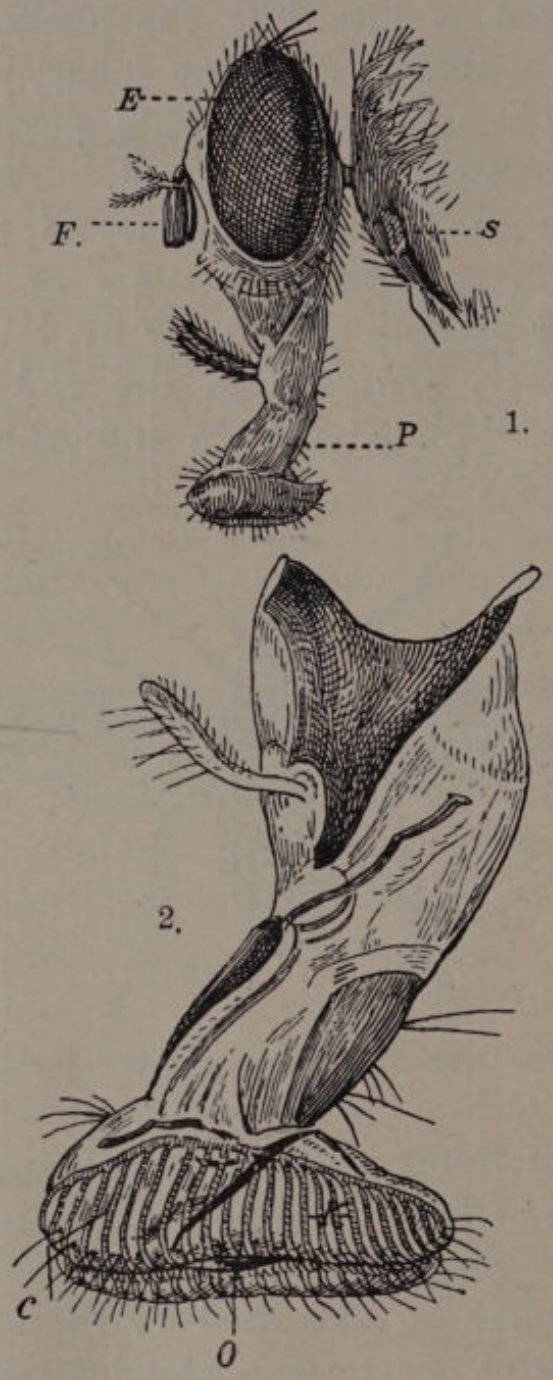
The appearance of the house-fly is too well known to need description, but its proboscis is such a wonderful instrument that it is well worth a few words. This apparatus is formed by several parts of the mouth which fold together like a tube. If it is not in use it is drawn in to protect it against injury. Though the

[1] The "Spanish fly" is a beetle; the "black beetle" is not a beetle, but a bug.

fly cannot pierce or bite, like the gnats, but only suck, it is nevertheless able to consume sugar, bread, and other solid food. This is, of course, only possible when these are previously dissolved in a liquid. The liquid which flows from the proboscis is saliva. If a drop of this saliva came into contact with sugar or bread it would permeate it and become lost to the fly. To prevent this loss, the proboscis broadens at the end into two large pads—like the "plate" of an indiarubber stamp—in

THE HOUSE-FLY (*Musca domestica*), WITH EXPANDED WINGS.

which there are numerous narrow canals. Along these canals the saliva flows through minute outlets upon the surface of the pads which it covers with a film so fine that it cannot be absorbed by the food about to be eaten. But a tiny particle of food is dissolved in the saliva, and no sooner has this been done than it is sucked up by the proboscis. The fly cannot therefore eat food that may not be dissolved by its saliva.



THE HOUSE-FLY (*Musca domestica*).

1, Head and anterior part of thorax (15 diameters). 2, Proboscis (30 diameters). *S*, Stigma in thorax. *F*, Feeler. *E*, Facetted eye. *P*, Proboscis. *C*, Cushions or pads traversed by canals. *O*, Opening of the proboscis.

The fly is doubtless the most ancient of all the parasites of man. Comparative anatomy tells us that primitive man was endowed with a cutaneous muscle—vestiges of which we still find in modern man—which had the function of contracting and creasing the skin to chase away the flies, as we see every day in the horse.

Among the Phœnicians, Baal-zebub (the Beelzebub of the Bible) was the god of medicine, the arbiter of health and disease, and the averter of flies. The Jews, with their innate love of punning, changed Beel-zebub,

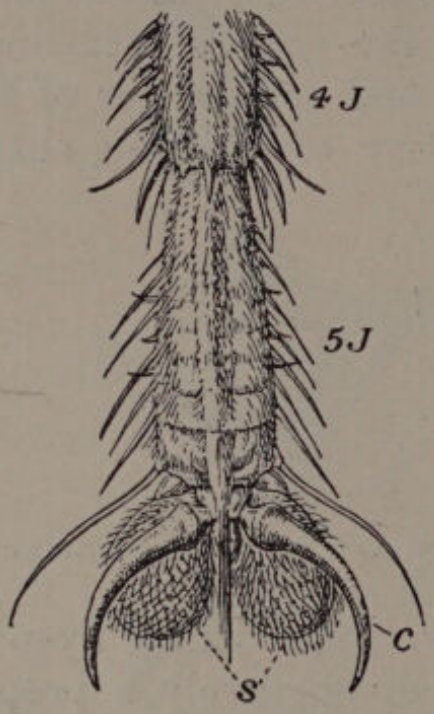
Silver Coin of Aradus, with a figure of a Fly.

SILVER COIN OF ARADUS, WITH A FIGURE OF A FLY.[2]

the lord of flies (*i.e.*, the defender from flies), into Beelzebul, the lord of dung: truly a prophetic pun when we remember that flies are now known to breed chiefly in dungheaps. According to Exodus viii. 21-24: "There came a grievous swarm of flies into the house of Pharaoh, and into his servants' houses, and into all the land of Egypt: the land was corrupted by reason of the swarm of flies." In Eccles. x. 1 we read: "Dead

[2] "Among the Egyptians the fly was used as an honorary emblem and applied to certain decorations bestowed for the reward of military honour, apparently as the Order of the Fly: it was then made of gold. Small flies of steatite glazed were used for necklaces."—WILKINSON.

flies (zebubim) cause the ointment of the apothecary to send forth a stinking savour." A fly found in a meal was regarded by the ancient Jews as sufficient grounds for a divorce. They were permitted to kill Egyptian flies even on the Sabbath day. In Palestine flies were such a scourge that public prayers were ordered to be



FOOT OF THE HOUSE-FLY.
4*J* and 5*J*, Fourth and fifth joints. *C*, Claw. *S*, Suctorial pads.

said against them. "The evil spirit," says Eccles. x. 1, "lies like a fly at the doors of the human heart."

Among the Greeks, Zeus was also called Apomyios, the Averter of Flies. In Egypt the peasants have for at least two thousand years been known to be subject to a virulent kind of eye disease, so rampant that nearly every second person is affected. It is quite a common

occurrence to see children with their eyes surrounded with scores of black flies. There are so many that it is quite a useless effort to attempt to drive and keep them away.

There is a large class of people always ready to champion, from misunderstood humanitarian motives,[3] the cause even of vermin that are convicted carriers of disease. They denounce the killing of rats as "wanton

P. *L.*

L, LARVÆ, AND *P*, PUPA, OF THE HOUSE-FLY (MAGNIFIED).

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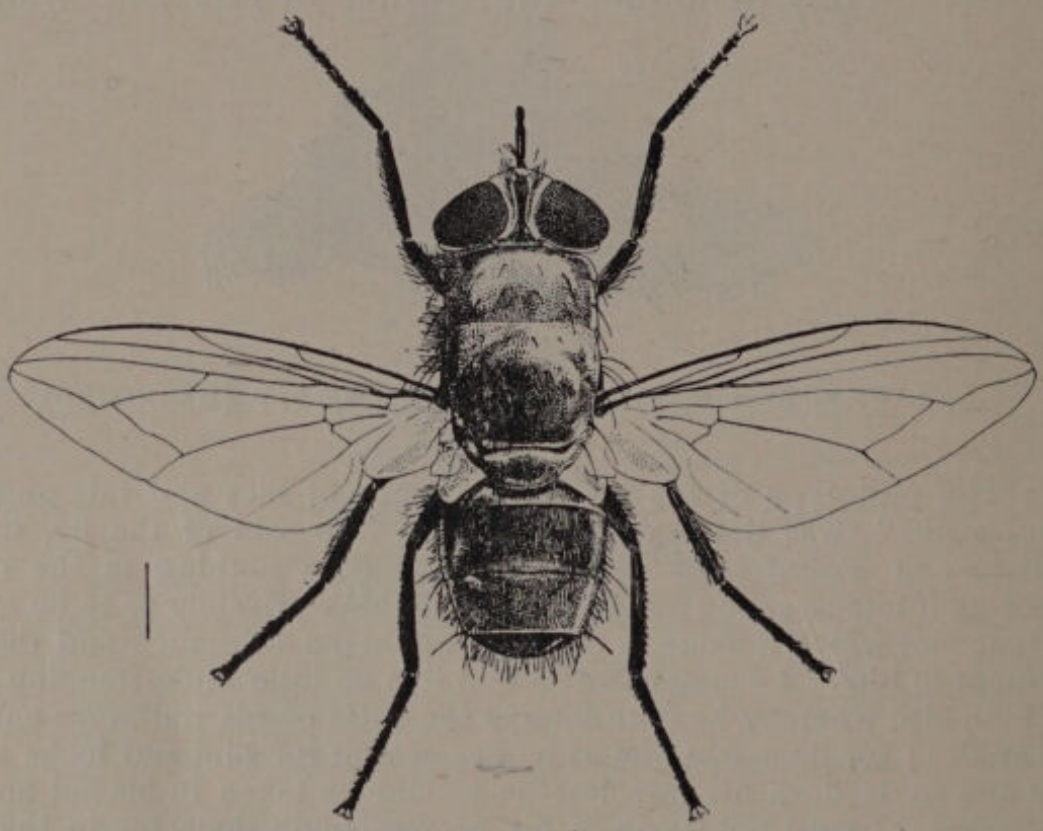
[3] The prototype of the modern "friends of flies and rats and *hoc genus omne*" was the egregious Topsell, who said of the fly, in his "History of Four-footed Beasts": "He does nothing in the dark, counting it unbeseeming for him to do anything privately or to be guilty of that fact which if done in the light would be a disgrace and disparagement to him. I can assure you that it is no little understanding that he hath also whereby he doth escape the wiles of his traitorous enemy, the spider; for he marks him as he lies in wait for him and looks upon him and so declines his fare lest he should be taken in his net and so destroyed. I must not speak of his prowess and valour, for in that he may seem to surpass man himself. Homer, the Prince of Poets, when he did endeavour to set forth and commend the gallantry of the bravest nobleman did not compare his strength to that of the lion, leopard, wild boar and the like, but to the undaunted courage and confidence of the fly, who, although he be ever so often repulsed and beaten off, comes on again, and bites as close as he did before; yea, such a strength he hath with him that he will not wound only the skin of a man, but that of an ox or a horse; yea, the elephant also when he gets between the wrinkles of his skin will shrewdly vex him, and according to the bigness of his snout gash and wound him."

slaughter of a useful member of the community," and deplore the destruction of flies because "they dispose of a mass of putrefying matter." That the fly in the course of its grub stage eats a good deal of vegetable and animal matter in decay is no doubt true, and it is useful on that score ; but it has been proved time and again



THE GREENBOTTLE FLY (GREATLY MAGNIFIED).

that flies caught on the dining-room table are often loaded with disease germs[4] which they had gathered on a previous visit to a sewer-grating or a dungheap.

[4] Dr. Daniel Jackson, who had been commissioned by the Merchants' Association of New York to investigate the causes of the prevalence of intestinal diseases in New York, found on one fly 6,600,000 bacteria.

The Common Blow-fly or "Bluebottle" is only less dangerous to the human race in that it is not so numerous as the "deadly House-fly." Everyone has seen it and heard its loud buzz, for in the summer it is abundant throughout Britain. Apart from its filthy habits, which it shares with the House-fly, the female "Bluebottle" will lay her eggs only on flesh, and being endowed with a remarkable sense of smell, she will enter a house and make her way to the pantry with unerring instinct. The so-called "Greenbottle" is one of the prettiest, but probably the foulest, of a race, among the members of which there is not much to choose, for it is chiefly seen on excrement, whence it makes occasional excursions to shops, pantries, and dining-rooms.

In view of the knowledge which we now possess concerning the *rôle* played by the fly in the spread of summer diarrhœa, enteric, typhoid, and cholera, the destruction of these dangerous insects becomes a matter of urgent importance, for it seems obvious that if we can lower the death-rate by preventing the germs of infectious diseases from being deposited on our food and that of our children, it is our plain duty to take such measures as would bring about the extermination of flies, if that be possible. And that would appear to be not only the duty of each individual, but of the whole community.

But what happens actually? During the summer months hundreds of thousands of householders find that in spite of the most energetic use of the various "fly remedies" they cannot obtain more than temporary relief from the fly plague—as fast as one army is

exterminated another takes its place, being recruited from the innumerable fly-breeding places carried on with the sanction of man ! In other words, whilst as private individuals we act as rational beings—by waging a determined war against flies, killing them with every weapon

Photo by R. Newstead.

MASS OF LARVÆ IN STABLE MANURE (NATURAL SIZE).[5]

available—as a community we act irrationally by providing suitable fly-nurseries, in the shape of uncovered refuse bins, heaps of horse manure, and house refuse, dirty

[5] The illustrations on pp. 76, 77, are from photographs published in Professor R. Newstead's excellent monograph on the fly (embodied in a Report to the City of Liverpool).

cowsheds and stables, jam factories, and glue and size factories devoid of the most elementary sanitation.

The manager of a certain jam factory in London once complained to me that his life was made unbearable by the flies that were infesting every inch of the factory and

Photo by R. Newstead.

MASS OF LARVÆ SEPARATED FROM STABLE MANURE (NATURAL SIZE).[5]

his private house. He told me that in the summer during the various processes of manufacture flies would be "worked up" by the thousand, in spite of what he called "every possible precaution." He added that he would never again eat jam, "not for a five-pound note."

This factory consisted of various buildings, in one of which were the stables. In front of the stables was a large heap of horse manure which had, according to the manager's statement, remained undisturbed about three weeks. At my request a stable lad brought two lots of manure, about a teacupful each, taken at random from just beneath the surface at the two ends of the heap. In one lot I counted before the eyes of the astonished manager one hundred and two, in the other, forty-nine larvæ, chiefly of the House-fly. Because this man, or anyone else connected with his firm, did not know that horse manure should not be permitted in towns to remain longer than ten days—the time required for hatching the eggs of the fly—flies were bred on the premises wholesale, and not only had the manufacture of jam in consequence been carried on under the most disgusting conditions, but the lives of the employees and of the people residing in the neighbourhood had been made a misery, to say nothing of the probability of injury to the health of many children and adults.

It would be well if in the interest of the community at large one or two public-spirited citizens would, during the summer, take proceedings against the owner of any stable against whom it could be proved that he had permitted horse manure to remain beyond the incubation period of the House-fly. I have shown elsewhere[6] that whilst the framers of the Public Health Act did not actually mention the fly among the "nuisances and

[6] "Vermin and the Law," *Journal of the Incorporated Society for the Destruction of Vermin*, 1909, No. 2.

injuries to health," the law contains ample clauses under which proceedings may be instituted against any person responsible for a "nuisance from flies."[7] A few cases of that kind heard before the magistrates in half a dozen of our large cities would do an incalculable amount of good.

In the meantime there is a large scope for individual work in limiting the spread of the fly pest. There are four rules of a preventive nature which should be rigidly enforced in every household :—

(1) Leave no food uncovered ;

(2) Leave no breadcrumbs or scraps of food about anywhere ;

(3) Take care that the dustbin is always well covered ; and

(4) Take care that the sinks, drains and closets are always well flushed and disinfected.[8]

If you prefer tainted food, if you wish to expose the members of your household and yourself needlessly to the danger of infection by germs deposited on your food and drink by flies : if, in short, you desire to make your house as attractive as possible to flies, then do not trouble about any of these laws. If, on the other hand, you do not care for flies to settle on your food or face, fresh from a visit to the privy or a repast on the "dainties" in the

[7] Dr. Hamer, of the London County Council, has made two reports to that authority, entitled "The Nuisance from Flies."

[8] There can be no doubt that if the treatment of fæces in particular and other decomposing matter generally, with a powerful disinfectant and germicide, such as Izal or similar preparations, were made obligatory, the resultant destruction of disease germs would of necessity be followed by a striking decrease in the number of cases of zymotic diseases.

drains, and wish to make your house as uninviting to them as possible, then enforce these rules.

If all your neighbours and their neighbours carried them out, most of the manufacturers of "fly remedies" would have to go out of business; but fortunately for them, there is no near prospect of the community understanding that it is more sensible and cheaper to prevent a plague than to stamp it out after having permitted it to spring up. We are therefore in this position: that we first breed flies and then set about to exterminate them.

There is quite a large variety of means for the destruction of flies. Of these the fly poisons were once in general use. They were usually powders or papers containing arsenic, and sweetened in order to attract the flies. But being often put to improper use, a substitute was found in paper which had been dipped into a sweetened solution of quassia. Such papers are equally effective in killing flies and have the added advantage of not being poisonous.

But there is an objection to this kind of fly-paper: the flies are not killed immediately, but are able to fly a short distance, when they drop "all over the place," so that sideboards and other furniture are often covered with dead flies. For this reason "fly tapes" and "fly reels" are preferable in houses. They are usually tapes of paper, or reels of string, or cardboard smeared with a sticky substance, such as honey-gum, which attracts the flies by its sweetness and retains them by its sticky

nature. Such fly-catching devices are easily "home-made" with birdlime and treacle,[9] but are almost as cheaply, and certainly in a much neater form, made by various manufacturers. In my experience these fly-tapes and reels, if changed when required, will keep a house perfectly free from flies if the four great rules of prevention are observed.

Sometimes it happens that for one reason or another "fly-papers" are not capable of coping with the fly nuisance. Some years ago I was consulted by a restaurant keeper in the City of London who told me that the flies were slowly but surely ruining him. A confectioner on one side, with a sugar-boiling kitchen at the rear, a fruiterer on the other, added to the facilities for breeding or attracting flies provided by his restaurant, provided such an enormous army of flies that even an expenditure of as much as thirty shillings a week for fly-papers of all kinds did not seem to affect their numbers

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[9] Mayhew tells us ("London Labour and the London Poor," 1861) that "the street-sellers of fly-papers make them of old newspapers or other waste paper, no matter how dirty. To the paper they apply turpentine and common coach varnish, and occasionally they dash a few grains of sugar over the stuff when spread upon the paper.

"Last summer I was informed there were fifty or sixty persons selling fly-papers or beetle-wafers in the streets, some of them boys, and all of them of the general class of street sellers, who 'take' to any trade for which 1s. suffices as capital. Their average earnings may be estimated at 2s. 6d. per day, about half being profit. This gives a street outlay, say, for the 'season' of ten weeks, of £375, calculating fifty sellers.

"A few of these street traders carried a side of a newspaper, black with flies, attached to a stick, waving it like a flag. The cries were: 'Catch'em alive! Catch'em alive for a half-penny!'"

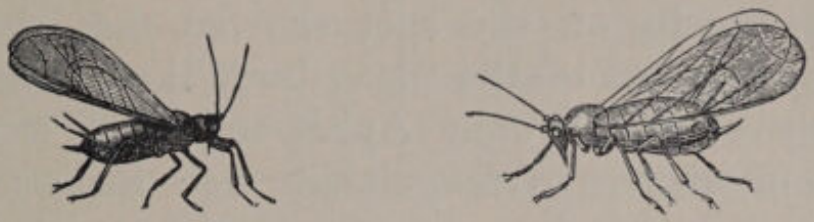
in the least. At my suggestion he had fitted along the walls of his large dining-room and the kitchen (which was on the same floor), at a height of 6 ft., a trough, with a 2-in. mouth, and 2 in. deep. Attached to this trough was a miniature rack, such as we see in railway carriages, but with the net made of fine wire gauze. The trough was filled with a solution of one part of formalin to eight parts of water. The results were astonishing. At the end of four hours there were hundreds of dead flies in the trough and the rack, with a noticeable decrease in the nuisance. At the end of a week the fly pest had been completely stamped out, for in spite of the various attractions provided in the restaurant and by the neighbourhood I could on the seventh day only count about a dozen flies in the kitchen and the large dining-room.

It should be added that the mixture must be renewed every two days. Formalin containing 40 per cent. of formic aldehyde costs a shilling a pound. Instead of this trough, plates and saucers may be used and placed in convenient spots, out of the reach of domestic animals.

Apart from insect-eating birds, whose work seems, however, to have no more effect upon the House-fly pest in the rural districts than the cat or dog have, with their occasional snap after a fly, upon the problem in towns, there is one powerful natural enemy of the fly, with whom man should ally himself without any more delay. This is a fungus (*Empusa muscæ*) which causes every year fearful ravages among flies. There is no doubt that if

we fought the fly as intelligently as the American Government, for instance, fought a similar pest some years ago we should meet with the same gratifying success.

At that time the citrus industry of California was threatened with ruin : a species of plant-lice had been



WINGED APHIDES, OR PLANT-LICE (MAGNIFIED).

accidentally imported into the United States ; and, finding the conditions in the orange orchards of California highly favourable, because of the abundant food and the absence of their most powerful natural enemies, and therefore multiplying at an appalling rate, caused such devastations

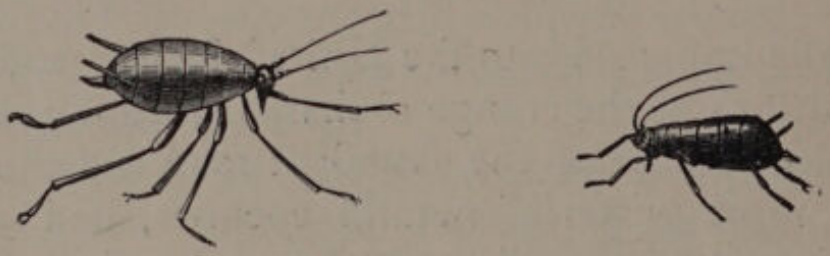
LADY-BIRD.

LARVA OF LADY-BIRD.

in the citron and orange plantations that their owners stood face to face with bankruptcy.

However, one of the planters refused to be beaten by a mere plant-louse, even if there were millions of it. He found, after patient investigations, that this aphis

had been brought over from Australia with some imported young orange trees. But in Australia the Woolly Aphis, as this plant-louse is called, was not a pest. Therefore, he argued, the food and climate being the same, the plant-louse must in that country possess some natural enemies strong enough to keep it in check. At this stage he succeeded in interesting his Government, and researches made on the spot showed that there is in Australia an insect of the "lady-bird" kind which preys exclusively on the Woolly Aphis and keeps it down to harmless numbers. Arrangements were made for breeding these insects in large numbers and distributing them



WINGLESS APHIDES, OR PLANT-LICE (MAGNIFIED).

by the tubeful to the planters who needed them. No sooner had a consignment of these official "plant-lice destroyers" been liberated when they settled down to their task of devouring aphides, "stopping neither on Sundays nor legal holidays." In the end the aphides were destroyed and the citrus industry was saved. As to the "lady-birds," they decreased in proportion as their food supply became less; liking no other food than plant-lice, they have now in many districts in California practically died out.

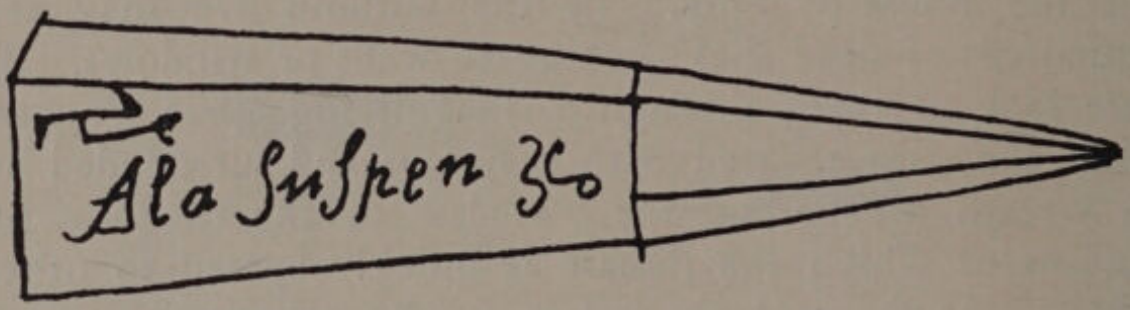
We might with advantage take a leaf out of the book of American scientists and fight the fly pest in the same intelligent manner, especially as a precedent for scientific warfare instead of haphazard measures already exists. We use to-day in many towns in Great Britain a species of bacteria for destroying the bacteria of putrefaction in sewage, and further employ another kind of microbe for setting up in rats and mice a disease which kills them by the thousand. There is therefore nothing novel or startling in the suggestion of using to our advantage a powerful weapon with which Nature herself has provided us. This fungus is a deadly enemy of the house-fly, and of the house-fly only. In the autumn we may see hundreds of dead flies sticking to walls or windows. If we look at them through a magnifying glass we find that they are covered with a fungus and surrounded by a wreath of spores—the "seeds" of the fungus—by means of which the disease is quickly spread to other flies. As far as I am aware, no experiments have so far been made with a view to ascertaining whether this fungoid disease can be bred, "bottled," and supplied to order; but since science has been able to supply us with "rat and mouse disease" by the half-crown—or, in scientific language, provide cultures of a bacillus which, eaten by rats and mice with their food, will set up in them, and in these animals alone, a disease from which they quickly die—I see no reason why this principle should not, and could not, be applied to the destruction of flies.

In mediæval times flies appear to have been a terrible

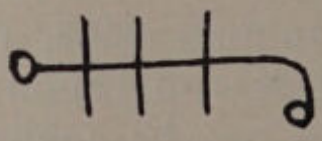
pest, judging by the allusions to them in many writings and the number of recipes mentioned.

The two quaintest "remedies" known were prescribed by the celebrated Theophrastus Bombastus von Hohenheim, who called himself Paracelsus — Greater than Celsus—and was professor of medicine at Basle University about 1526. This great physician said in the treatise "Against Flyes" (Turner's translation) :—

"*These creatures do much infest men's houses in summer time, and do corrupt and putrifie meat; to drive them away do thus: make a coffin of steel, and upon the coffin engrave these signs which you see in the figure following :—*



"*And upon the coffin, from the separation of the said signs and words, let there be engraven three lines tending towards the cusp: one in the new moon, the second in the full moon, and the third in the new moon again. Afterwards, under the conjunction of* ♄ *and the* ☽, *write the words and signs following :—*

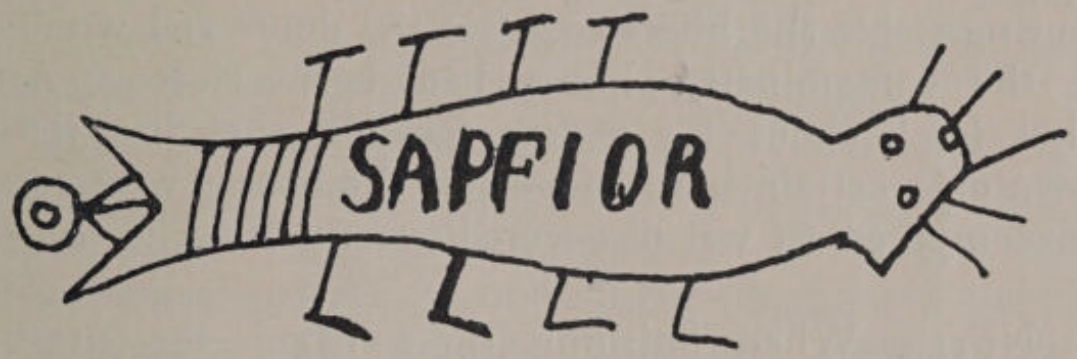


"*If you fix this upon the wall of an House, and draw a Circle round about it with Chalk, about the compass of*

a round table, all flyes that are thereabouts will enter within the circle, and there remain, until you take the steel away: and then they will flie away, vexing men as at first."

And in his "Second Treatise of Celestial Medicines, | containing | the Mysteries of the Signes | of the Zodiack," he says under *Scorpio*:—

"*The Seal of Scorpio must be made of pure Iron in the day and hour of Mars, when the sun enters Scorpio, which happens about the* 12, 13, *or* 14 *day of October. . . . . Let it be engraven as this Figure.*



"*Let there be affixed a ring of pure Gold to the Tayle thereof, that it may be worn hanging about The Neck with the Head downwards. It is a certain remedy to drive away all Flies from the Bed where it is hanged.*"

As to the uses of dead flies, the "Gothaer Arzneibuch" of 1538 tells us that: "*If a worm or spider has stung thee, catch a fly and squash it on the wound and no harm shall befal thee.*"

Zedler tells us that "*the heads of flies with juice of fig-leaves make the hair grow. The wings given, three to five, in fresh water cure epilepsy. Distilled in water they cure deafness, but one must catch them in the autumn, and*

keep them in a pot in the earth and distil in winter, else they are no good."

I will conclude this chapter by relating the only case on record in which live flies did useful work :—

It was stated in the *Lancet* (1886) that in the town house of an American gentleman offensive smells seemed to rise from the floor in one of the rooms. After every ordinary means had been tried for locating the source of the smell—short of taking up the whole floor—an appeal was made to the taste of the fly for carrion. Accordingly two "bluebottles" were brought from a neighbouring stable and liberated, after the doors and windows of the contaminated house had been closed. After "buzzing" about for a few seconds, the flies settled down on a certain spot, and when the boards were raised a decomposed rat was discovered exactly underneath.

NOTE.—When finishing these pages for press I received from a foreign scientist a culture of bacteria which, according to him, create a deadly epidemic among flies, that carries them off in enormous numbers. As up to the time of writing (end of June) there has been an almost entire absence of flies, owing to the exceptionally cold and wet weather, I have been unable to ascertain by experiment whether these bacteria will do in England what they are said to have done on the Continent.

CHAPTER VIII.

The Gnat.

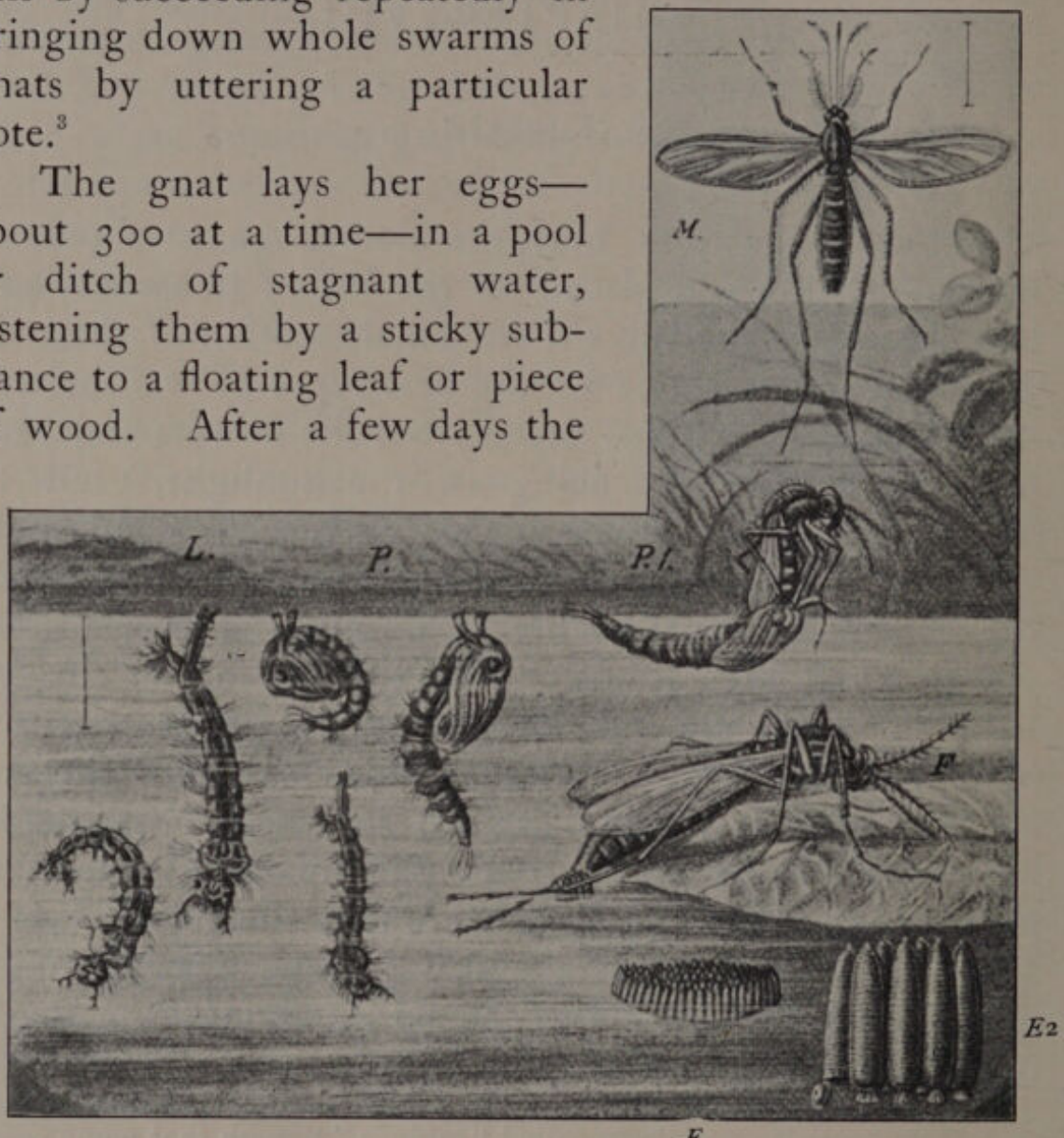
It seems a pity that the dainty gnats[1] should be labelled vermin and placed on the list of household pests just because of the sins of the female section of the tribe. The male gnat is one of the best types of well-behaved insect-hood: "He sips nectar from the flowers and passes his days in joyous dancing in the sunlight," but the fierce and vicious female spends all her days and nights in chasing man and animal, and levying upon them a toll of blood. For having upon her the care of providing many generations of young gnats, so that the gnat tribe shall not die out, she must have more nutritious food than the delicate nectar of flowers. This she finds in the blood of mammals, and for sucking it she has been endowed with an extremely complex instrument[2] for piercing and sucking, which aroused the admiration of Pliny about 2,000 years ago. The peculiar humming noise is produced by the female in flying, the deeper note being due to the rapid vibration of the wings—

[1] Gnats are also popularly called "midges," though that name should be reserved for the *Chironomidæ*, a family of gnats which do not possess their formidable weapons, and are quite harmless.

[2] "The point of the finest needle," says Réaumur, "compared with the sting of the gnat is the same as the point of a sword compared with a needle."

computed at 3,000 a minute. It is thought that this sound serves to attract the male, and Landois has proved this by succeeding repeatedly in bringing down whole swarms of gnats by uttering a particular note.[3]

The gnat lays her eggs—about 300 at a time—in a pool or ditch of stagnant water, fastening them by a sticky substance to a floating leaf or piece of wood. After a few days the



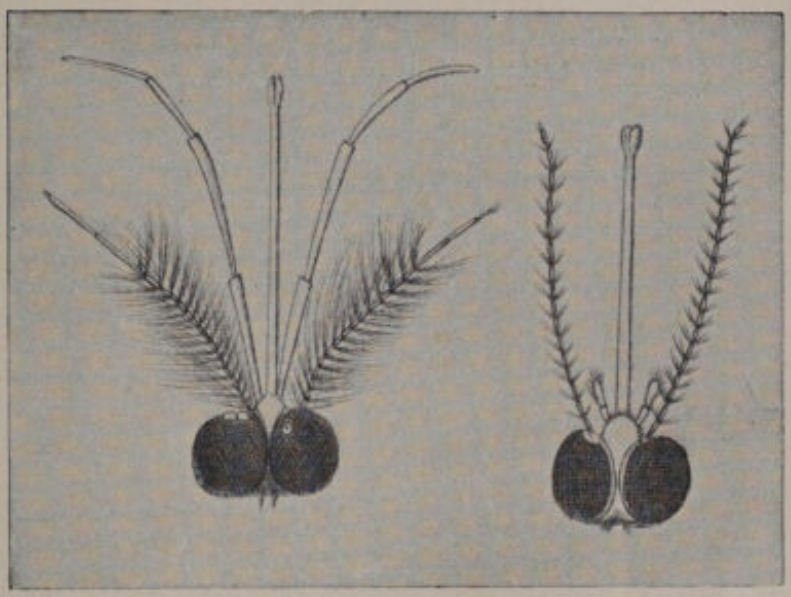
THE GNAT (*Culex pipiens*) AND ITS METAMORPHOSIS.

M, Male. *F*, Female, *E*, Eggs (magnified). *E2*, Eggs (greatly magnified). One egg is hatched, the lid at the bottom being open. *L*, Larvæ. *P*, Pupæ; from the pupa P1 the perfect imago is just emerging. The lines near *M* and *L* indicate the natural size (Schmeil).

[3] Figuier, "Insect Life."

larvæ are hatched. They are about $\frac{1}{2}$ in. long, quite black, and remarkably quick. Swimming usually at the surface of the water, head downwards, and breathing-tube sticking out of the water, they dart away like lightning on the slightest commotion. The pupal stage is also passed in the pond.

There is little lore to be found in ancient and mediæval books concerning the gnat, probably because it was re-

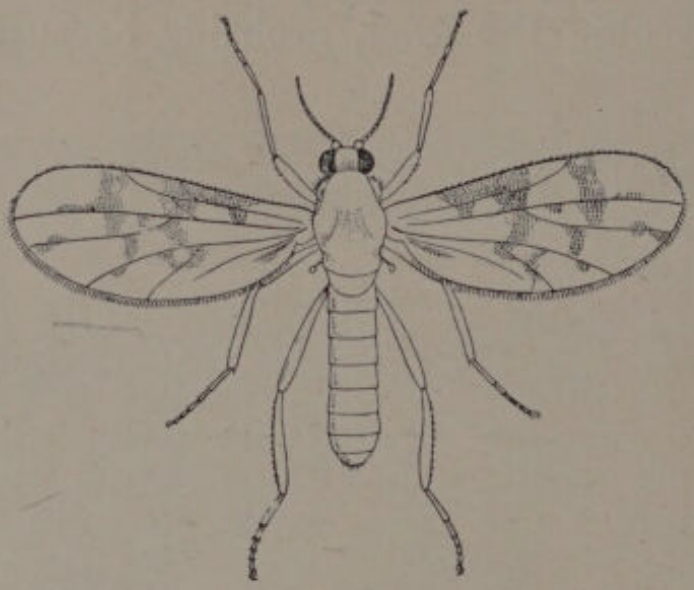


HEAD OF A MALE AND OF A FEMALE GNAT (CULEX).

garded as very insignificant. The expression "to strain at (*i.e.*, out) a gnat and swallow a camel" shows that this insect was looked upon as something almost beneath notice. In all the books on the subject there is also recorded only one "remedy" against gnats: "*Balls made of new horse-dung*," says the author of "The Vermin

Killer,"[4] "*and laid in a room attracts them, that they are less troublesome—by this means you may overwhelm them with a basin, and keep them there.*"

Gnats are not as numerous to-day as they used to be. It is recorded that in the year 1736 an alarm of fire was raised in Salisbury because vast clouds of smoke seemed to be pouring from the spire. This "smoke" was found



THE MIDGE (GREATLY ENLARGED).

to be enormous columns of gnats swarming round the cathedral spire.

The cause of the decrease is chiefly to be found in the fact that with the growth of towns and villages, and of sanitation, innumerable little pools and ditches have been filled up, and the gnat has thus been robbed of countless secluded breeding-places, and compelled to

[4] London, 1680.

lay her eggs in ditches less sheltered, more populated, and therefore containing many deadly enemies of the gnat.

The Fens are the only district in Great Britain—low-lying and full of ponds and ditches as they are—where gnats are often so abundant that the inhabitants are forced to use "curtains" and such other means of protection against them as are used in hotter countries against the more dangerous mosquito.

If a law were passed to-morrow ordering that all pools, ditches, and ponds not required for watering cattle or other specific purposes are to be filled up, that measure would not only bring about an enormous reduction in the number of gnats, but also in that of many other insects and their larvæ, which now reduce the farmers' crops probably by one-half and cause great injury to their stock.

CHAPTER IX.

The Louse.

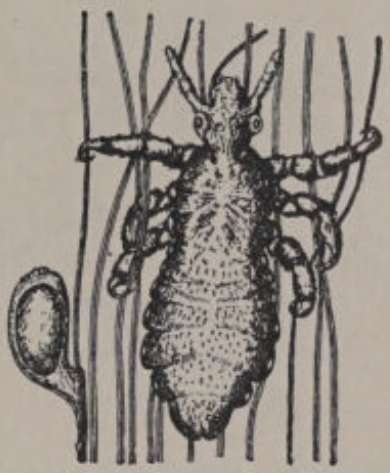
Lice are undoubtedly the most disgusting and injurious insects preying upon man. Happily, his restless fight against this parasite has been so far successful that

HEAD-LOUSE, MALE, 15/1.

it has been isolated, and is now kept confined in compounds, as it were ; for in Great Britain it occurs almost exclusively in slums. There are three species of this parasite: the head-louse, which lives on the head, eyebrows, armpits, and other hairy parts of uncleanly persons ; the clothes-louse, which lays its eggs between the seams

of garments, and is only found sucking on those parts of the body not covered with hair; and the crab-louse.

All lice are wingless. In order to be able to attach themselves to the hair of the host, the lowest joint of the feet forms a hook. The head-louse gums its eggs (nits) to the hair of its host by means of a sticky substance, which it prepares for that purpose.



HEAD-LOUSE CLINGING TO THE HAIR BY MEANS OF ITS FOOT-CLAWS. ON THE LEFT, EGG GLUED TO A HAIR.

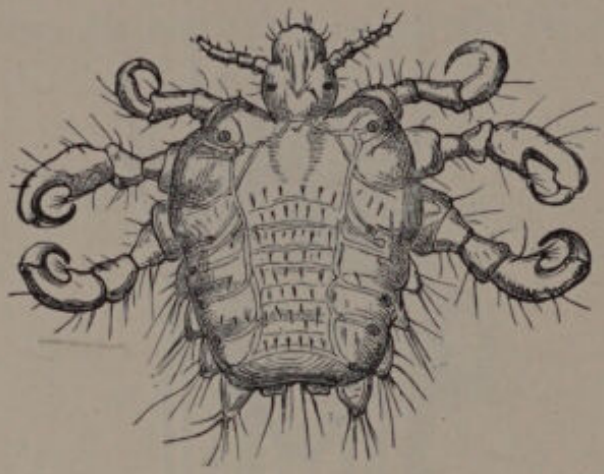
Leeuwenhoek calculated that in two months two female lice could produce ten thousand. Other naturalists have calculated that the third generation of a single individual can amount to 125,000. Their enormous rate of increase no doubt led to the belief that they were generated spontaneously.

In olden times lice[1] must have been a terrible plague.

[1] There is reason to believe that the plague of lice mentioned in Exodus viii. 16-18, was really a plague of gnats, as the Hebrew word *kinnim*, used on that occasion, would seem to indicate.

Several famous persons are reported to have died from the results of being heavily infested with lice, among them Scylla, the dictator, King Antiochus, the two Herods, the philosopher Plato, Valerius Maximus[2] and Philipp II.

By the Egyptians the louse was regarded with such horror that, according to Herodotus, the priests were compelled to shave off all hair in order to remove



CRAB-LOUSE (*Phthirias inguinalis*) (ENLARGED).

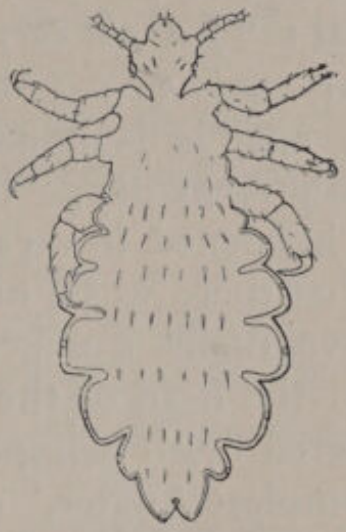
every possible danger of their becoming infested with this loathsome parasite.

According to Kirby and Spence[3]: "Lice are eaten by the Hottentots and natives of the Western Coast of Africa, who, from their love of such game, which they

[2] Kirby and Spence place these minute but disgusting insects in the very front rank of those which inflict direct injury upon man. They say that "for the quelling of human pride, and to pull down the high conceits of mortal man, this most loathsome of all maladies, or one equally disgusting, has been the inheritance of the rich, the wise, the noble and mighty, and in the list of those that have fallen victims to it you will find poets, philosophers, prelates, kings and emperors."

[3] "Entomology."

not only collect themselves at headquarters, but likewise employ their wives in the chase, have sometimes been called Phthirophagi—lice-eater." A curious piece of vermin lore is recorded about Hardenberg, in Sweden. When a burgomaster had to be chosen, the candidates sat round with their beards upon the table, in the centre of which was placed a louse, and the one in whose beard it took cover was thereby made magistrate for the ensuing year. Hunt, in his "Romance of Cornwall," tells us



CLOTHES-LOUSE (*Pediculus vestimenti*), FEMALE, 15/1.

that "to find a single louse on one's linen is a sign of sickness; to find two indicates a severe illness; and if three lice are discovered together within a month from that date it is a token to prepare one's self to die." To-day we should merely take it to indicate that the host of those lice is a fit subject for availing himself without delay of the provisions of the Verminous Persons Cleansing Act.

In mediæval books on medicine we find the usual crop of recipes prescribing lice against many ailments. The "Anglo-Saxon Leechdom" contains dozens of such recipes. Platerus, professor of medicine at Basle about the end of the sixteenth century, declared that "*if eleven live lice are eaten by a person in the jaundice, they will be of great benefit to him, and he will be cured.*" "The London Dispensatory" (1695) says that "*They are eaten by rusticks for the jaundice and consumption.*" In "Rare Secrets of Physicke,"[4] collected by the Countess of Kent, we read that: "*For the cure of sore eyes take two or three lice out of your head and put them under the lid.*"

Lice as a remedy against jaundice are recommended in Dorsetshire at the present day, "to be taken on bread and butter." It so happened in a case recorded in *Notes and Queries* (1859) that there was a difficulty in obtaining the medicine, but eventually the zealous village doctor procured them from the head of the schoolmistress, and they were administered with complete success. Izaak Walton, in "The Compleat Angler," says: "It is thought that the Jews, or some spirit worse than they, first told us that lice swallowed alive are a certain cure against the yellow jaundice."

In Morocco, lice are to-day a universal remedy against the ague. Taken in large doses they are regarded as an unfailing specific.

Old medical books are full of recipes for killing lice; among them are the following:—

[4] London, 1654.

"*Boil Rats-bane in Spring-water, then when it is pretty well boiled rub a little of it about the scabby and lousy Head, then put on a Cap, and tie it on close. Use this with Care, for it is the strongest Poison imaginable. Butter unsalted boiled with Pepper to a Salve. Stavesacre mixed with Oyl. Juice of Broom mixed with Oyl of Radish or Mustard. Aramanthus boiled in Lye Olibanum and as much Swines Grease, Salt and Water, Vinegar and Onion, Allom and Aloes.*

Warm May Butter and Quicksilver in a luted pot of Loam, steep in this a small Linen Cloth, sew this into a piece of Silk, and hang it about the neck, often times found certain by Dr. Thomson."

Against nits are recommended Beeswax, Olive oil and Stavesacre Orpiment, Saltpetre, Louse herb Oil and Vinegar.

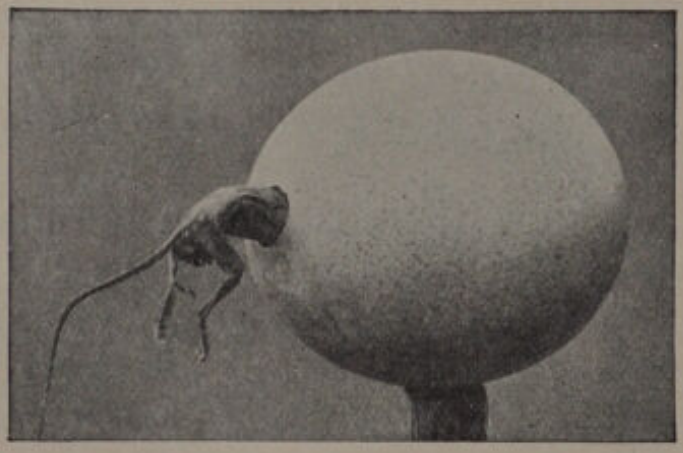
"*If a flea or louse is in the ear,*" the "Gothaer Arzneibuch" tells us, "*put some of your fæces into the ear, so that the animal will walk into it, and in that manner leave the ear, or pour some of your own urine into the ear and the animal will die.*"

In the same book there is also an incantation against the woundworm (the larva of the fly): "*I forbid thee, in the name of God, by the Gospels of the Sundays, thou shalt not gnaw the bones, inflate the veins, drink the blood, before thou sayst the words which John spoke when he put on his mantle when baptizing the Holy Jesus that was the holy Our Father, as truly shalt thou die.*"

To-day we regard it as an easy matter to destroy head and body lice, the old hospital joke of the parson who read the lesson: "Forty years have I been grieved with

this generation," and inadvertently scratched his head, notwithstanding. If children have become infested, a thorough wash with Jeyes' Fluid will invariably destroy the lice and their eggs. The head should afterwards be well combed with a narrow comb. A mixture of oil of lavender and oil of turpentine an equal parts is an equally efficacious but less convenient remedy. Oil kills the lice by obstructing their breathing tubes.

In cases of severe infestation it is advisable to use mercurial ointment (unguentum hydrargyri).[5] The infested parts of the body should be well rubbed with it for about twenty minutes, when the ointment may be washed off.

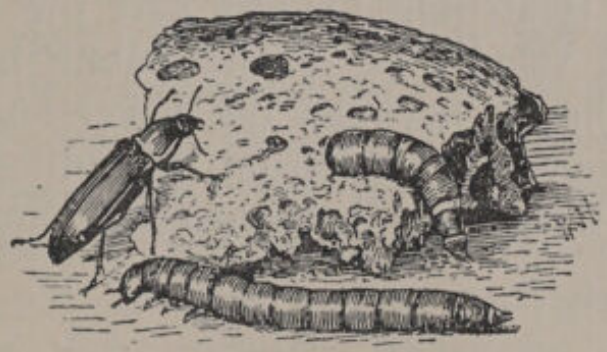


[5] The "Gothaer Arzneibuch" says: "Against lice and their eggs take *Ruta graveolens* and Hydrargyrum, which has been extinguished with the saliva of a sober man; mix this well and anoint the head with it."

CHAPTER X.

The Meal-beetle.

The Meal-beetle and her larvæ are a great pest to bakers, millers, and flour merchants. It is about $\frac{1}{2}$ in. long, black, and active only at night. The female lays her eggs in meal, flour, and similar foodstuffs. The larvæ when hatched are much longer than the beetle, thin and round, and yellowish in colour. Under the name of Meal-worm these larvæ are well known as food for cage birds.



MEAL-BEETLE (*Tenebrio molitor*) AND ITS LARVÆ.

Meal-worms are very voracious, and in consequence do much damage. The power of the British species for doing mischief has of recent years been reinforced by the American Meal-beetle, which was brought to England in American flour, and has since done enormous

injury in granaries and stores in ports, spreading thence over the whole country.

There is only one means of exterminating them—hand picking; and only one of preventing them from becoming obnoxious—the most scrupulous cleanliness. Meal-beetles and Meal-worms in a bakehouse correspond to lice on a person's head; they indicate a disgusting state of uncleanliness. In a modern bakery Meal-beetles and their larvæ have no chance of existing, all the conditions favouring their growth being absent. But the owner of the ancient bakehouse—badly fitted, badly lit, badly ventilated, and badly cleansed—will tell you that, "There were meal-worms and cockroaches in bakehouses as long as I can remember, and there always will be." The same man will probably look down with the utmost contempt upon the verminous vagrant shuffling and scratching his way past the baker's shop; yet from the standpoint of the public health there is nothing to choose between the baker and the tramp: one is verminous in his person, the other in his shop, and both are therefore a danger to the community.

CHAPTER XI.

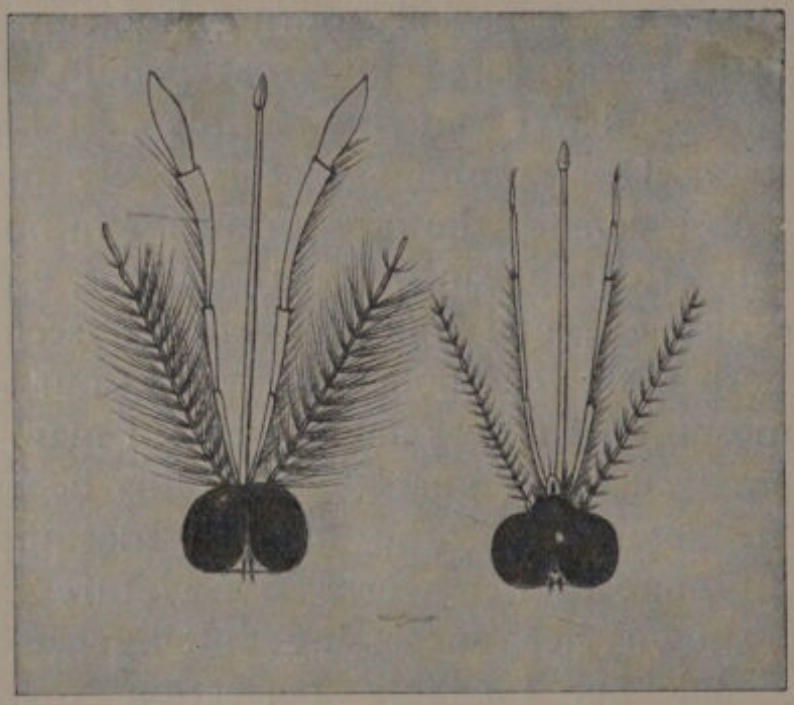
The Mosquito.

The name mosquito is a diminutive of the Spanish *mosca*, and means "a little fly." It is used to describe various troublesome gnats that occur chiefly in tropical countries, but are also found in the far north, in Arctic America and Siberia. Though we read now and then in the newspapers, especially during hot summers, that the mosquito has appeared in Great Britain, there is no proof of any kind yet that this terrible pest has invaded this country. Our common gnat is easily mistaken by inaccurate observers for the mosquito ; for in hot weather these insects often appear in great swarms, especially in low-lying districts, and the temperature seems to exaggerate both their venomous voracity and our sensibility.

The mosquito is a very ancient pest of man. Horace called them "accursed gnats," and Pliny becomes quite poetical in describing "the fiendish mosquito." He says : "In none of her works has Nature more convincingly shown her surpassing intelligence, her vast resources, and her ineffable perfection than in the mosquito. . . . Where has she found room to place in it its eyes, its sense of taste, its sense of smell, and the organ of its sharp shrilling voice, so utterly disproportioned to the minuteness of its body ? With what marvellous cunning has she spread its wings, and lengthened out its legs, and framed that long craving concavity of a belly, and inflamed it with that insatiable

thirst for blood, and especially for the blood of man!" One can see, in reading this passage, that it had been dictated to Pliny the naturalist by Pliny the man who, too, had fallen a victim to the bloodthirsty mosquito.

In places where mosquitoes abound it is almost impossible to secure complete protection from their bites, but "mosquito curtains" of very fine gauze are most useful safeguards at night.



HEAD OF A MALE AND OF A FEMALE MOSQUITO (ANOPHELES).

There is also an ingenious mosquito-trap, invented by Mr. Lefroy, of the Indian Entomological Department: "A small box, 12 in. by 9 in., fitted with a hinged lid, is provided with a small opening over which moves a sliding cover. The box is lined with dark green baize

and has a tin floor. The trap is placed in a shady corner of the room, and the mosquitoes on entering the house in the morning seclude themselves in the box to escape the sunlight. When duly settled the lid is shut and about a teaspoonful of benzine injected into the box." Mr. Lefroy caught with this trap in one month 2,300 mosquitoes.

The natives in various tropical countries smear themselves with oil and grease, and sometimes sleep with their bodies almost covered in sand. White residents in mosquito-infested countries depend upon preparations, such as muscatol, which are a complete protection against mosquito bites.

A common means of the Indian natives for clearing a room of mosquitoes is to burn a little myrrh in it. A little tincture of myrrh sprinkled on the pillow will always protect the sleeper against them.

Mosquitoes will on no account stay in a room where the Sacred Basil (*Ocymum sanctum*) and the Mexican Thistle (*Argemone mexicana*) are grown, and I am also informed by an Indian physician that the burning of Chinese-made pastilles, consisting of juniper sawdust and pounded wormwood, is a never-failing means of getting rid of them.

Since, however, science has proved that the mosquito is not only a nuisance but a terrible danger to mankind, in that various species play an important part in the dissemination of malaria and yellow fever, it is not enough merely to drive the mosquito away, but it

becomes the bounden duty of all to destroy them by every available means. That man can be successful in his campaign even against an elusive enemy like the mosquito is proved by the results which have attended the American campaign in the Isthmus of Panama and Havana.

"The attempt of the French to cut the canal was foiled," said the *Times*, "chiefly by the mosquitoes of intermittent fever and yellow fever, and cost some 50,000 lives. When the Americans took possession of the works, their first endeavours were directed to sanitation. The results were that, in 1906, among 5,000 white American workmen the death-rate was only 7 per 1,000, of which only 3·8 per 1,000 was due to disease. These results showed, therefore, that a white population coming into tropical countries *can* protect itself against yellow fever and malaria by measures that are both simple and inexpensive."

Some years ago an American Commission was sent to Havana to make investigations into the causes and spread of yellow fever. Manson's great discovery of the *rôle* played by the mosquito (Anopheles) in the spread of malaria had opened up new paths, and working along them the Commissioner found that yellow fever is spread by the mosquito of that country, and that this mosquito is the only agent in the spread of yellow fever. That discovery has rid Havana of yellow fever and is enabling the Americans to construct the Panama Canal; and there is not the least doubt that if the war against mosquitoes is conducted intelligently with money, disci-

pline, organization, and thought, centres of wealth and civilization will again be found in countries which have been desolated by parasites of man gaining the mastery, aided by the indifference and ignorance of their victims.

If this statement seems harsh, let us recall the fact that in 1789 Mauritius was practically free from malaria, and that it continued free for many years thereafter. But gradually the number of cases of malaria increased, until in 1867 there raged a terrible epidemic, extending along sixty miles of the coast-line. More than one-fifth of the population succumbed to the disease. The survivors were so prostrated that the living were scarcely able to bury the dead. During the period 1900 to 1906 the death-rate was 37·4 per 1,000; to-day it is 40 per 1,000, compared with 20 per 1,000 in the neighbouring islands of Seychelles and Rodrigues, with no malaria. The chief of the Health Department estimated that the annual cost of the disease to the estates alone was 650,000 rupees in loss of labour, and to the labourers themselves 150,000 rupees in loss of wages.

The plea of ignorance can no longer be advanced as an excuse for doing nothing against the mosquito, for recently a practical scheme has been suggested by Major Ross, one of the most prominent men in preventive medicine, for conducting a war of extermination against the mosquito. The measures consist, on the one hand, in the medical treatment of all those whose blood is found to contain the germ of malaria, and in the continuous house-to-house distribution of quinine; on the other hand, in the prosecution of works that tend to

prevent the mosquito from coming into existence, such as the destruction or filling up of shelters or pools in which mosquitoes can breed, the destruction of eggs and larvæ, chiefly by means of encouraging the various species of fish, such as "Millions,"[1] that are the natural enemies of the larvæ of mosquitoes, and finally by the improvement of sanitation generally. "The cost of the scheme is estimated at 135,000 rupees (or £9,000), and this amount would gradually diminish and ultimately disappear if the measures were successful. If we compare this estimate with that of 800,000 rupees, which the disease is now believed to cost the Colony, it will become manifest that the adoption of the plans proposed would be likely to bring about a great saving, not only in human health and life, but in actual money as well."[2]

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[1] *Girardinus preciloides.* They are called "Millions" on account of the vast numbers in which they occur. They are exceedingly small, the adult female being about 1½ in. only in length, whilst the male is much smaller. They are viviparous and very prolific, and, as they usually frequent very shallow water, are able to keep out of the way of larger predatory fish. They are very hardy, and do well in captivity, thriving and multiplying in ponds, fountains, reservoirs, and aquaria in which plants are kept. "Millions" are natives of Barbados, and some three years ago it was suggested that the immunity from malaria enjoyed by the island was due to their presence in the streams and ponds. The theory was supported by the fact that these fish are most voracious feeders on the eggs, larvæ, and pupæ of mosquitoes, which were unable to breed in the waters frequented by them. Two species of mosquitoes, *Culex fatigans* and *Stegomyia fasciata*, are certainly known in Barbados, but both breed also in small temporary collections of water, such as remain in many receptacles after rain. The Anopheles, on the other hand, reproduce only in shallow water such as is frequented by Millions, and are unknown in the island. It is therefore inferred, with good reason, that their absence, due to the Millions, is the cause of Barbados being free from malaria.

[2] *Times* Report.

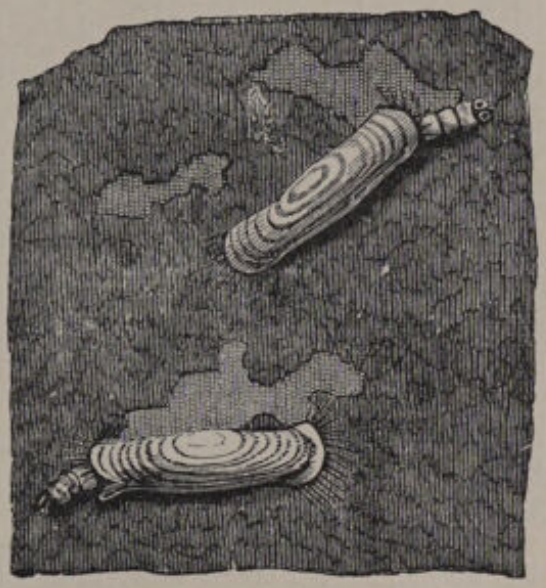
CHAPTER XII.

The Moth.

"Neglected heaps we in by-corners lay,
Where they become to worms and moths a prey."—Dryden.
"The moth does most mischief to the finest garment."—French.

Moths are the butterflies of the twilight and darkness. Like the butterflies, they differ greatly from one another

THE WOOLLEN MOTH (*Tinea pellionella*).



LARVÆ OF THE WOOLLEN MOTH.

in size and colour, habit, and diet. There is a species in Brazil—the Giant Owl Moth—which measures nearly a foot across from tip to tip of the expanded wings. There are also several species which are hardly visible to the naked eye.

The moth which is of interest to us, *the* moth,[1] lives in clothes, furs, and upholstery, and, with her larvæ, which feed on hair and wool, has since times immemorial done incredible damage.[2] It is, however, not at all difficult to prevent this. First of all, the clothes should be kept perfectly dry, in wardrobes or chests without cracks or crevices. Pieces of camphor should be kept about the wardrobe and among the clothes ; and, finally, the clothes, furs, &c., should be taken out and well beaten or shaken at certain regular intervals.

If a moth has succeeded in laying her eggs on a garment and the larvæ have been hatched, it should immediately be carefully taken out and immersed in boiling water, or burnt as hopelessly spoilt. The burning will save many more articles from destruction by moths.

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[1] Properly speaking, there are three species: the woollen moth, fur and skin moth, and hair moth.

[2] There are many allusions in the Old Testament to the devastations caused by this tiny insect. In Isaiah we read (li. 8): "For the moth shall eat them up like a garment, and the worm shall eat them like wool, but my righteousness shall be for ever, and my salvation from generation to generation."

In Job (iv. 19): "How much less in them that dwell in houses of clay, whose foundation is in the dust, which are crushed before the moth?"

Job (xiii. 22): "And he, as a rotten thing, consumeth, as a garment that is moth-eaten."

CHAPTER XIII.

The Mouse.

. . . . "It's a bold
Mouse that makes her nest in the cat's ear."
—English Proverb.

Though Burns would have us love the "wee, sleekit, cowrin', tim'rous beastie," there is no doubt that with all

THE MOUSE (*Mus musculus*).

its pretty ways the mouse is vermin of the worst kind. Sentiment

"Wad be laith to rin and chase it
Wi' murdering prattle";

but economic zoology and pathology, looking at the evidence against the little rodent in the cold light of science, have found it guilty of being a nuisance and a danger to health, and sentenced it to death. The "mony a weary nibble" of Burns's mouse means, in the aggre-

"A LECTURE ON TRAPS."

gate, to the people of these islands, many millions in good hard cash, and the aspect of the part played by the mouse in the diffusion of disease becomes more and more sinister in proportion as our knowledge on that subject advances.

BISHOP HATTO AND THE MICE.

In 1875 and 1876 this "wee beastie," or, to be correct, the species of mouse known as the field vole, caused enormous damage in Scotland to young herbage. Again, in 1892, it became such a pest that in Roxburgh and Dumfries alone 80,000 acres of herbage were all but destroyed. The official estimate of the damage done gave a minimum figure of £300,000—a very respectable loss for a "wee beastie" to cause.

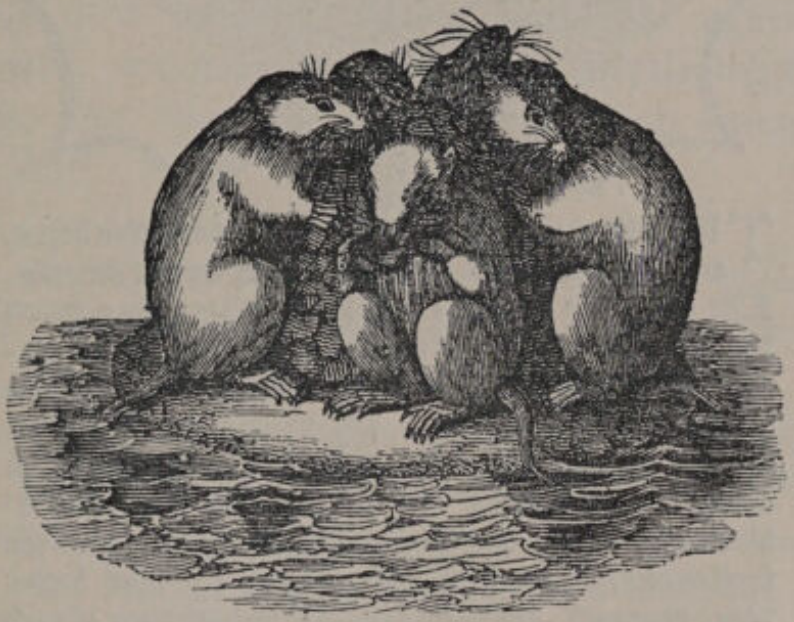
RED FIELD VOLE, OR BANK VOLE (*Arvicola glareolus*).

The Royal Commission appointed to enquire into the causes of this plague proved conclusively that the excessive numbers of rats, mice, and voles were entirely due to the senseless and persistent persecution by game-keepers of birds and quadrupeds of prey, the natural enemies of the noxious rodents.

If we assume that there are at least 100,000,000 mice (house and field mice) in this country, and that each mouse causes damage, by the destruction of

food and material, to the extent of only one-tenth of a penny per day, we find that the "luxury of keeping mice" costs this country at least three and a half million pounds sterling per annum.

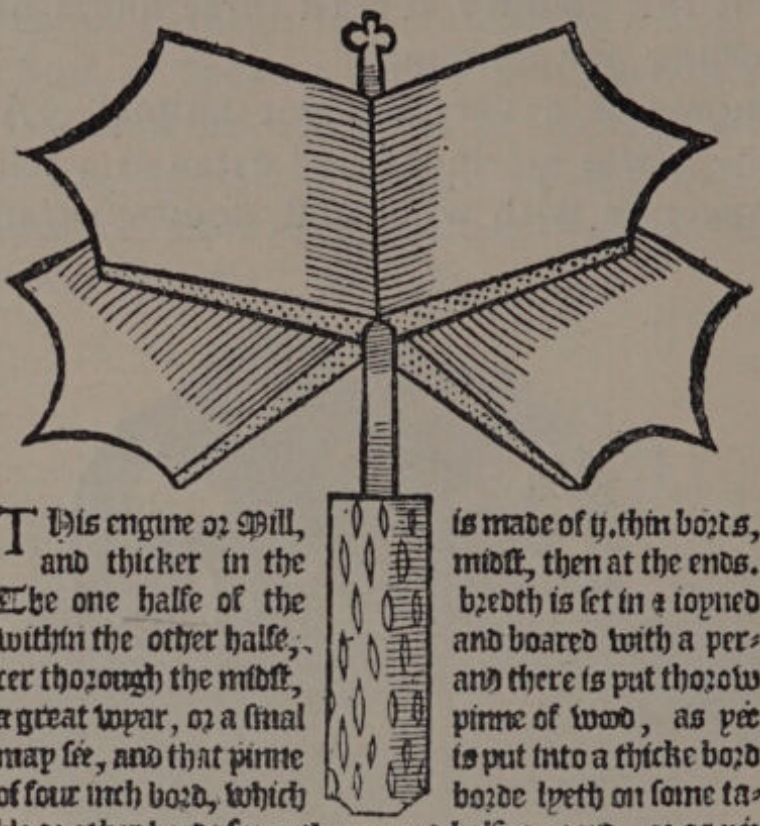
The mouse is a very ancient animal. Among the Babylonians it was sacrificed and eaten as a religious rite, but in connection with what god, does not transpire.



THE PADDLE-MICE OF ICELAND.[1]
(From an old book.)

[1] Books on Natural History published about 1840 stated in all seriousness that the "Economical mice of Iceland present a remarkable instance of animal sagacity. They cross rivers in search of berries, and, having found them, gather them in bags which they make out of mushrooms. They then select a flat piece of dried cow-dung and bring it to the water's edge, place the bags with berries upon it, and, after launching the whole, embark upon it, sitting around the heap of bags, with their heads joined over it, their backs to the water, their tails pendant in the stream, serving as rudders and oars. Thus they make their way, travelling for distances, conveying heavy loads."—Dr. Henderson and others.

A Mill to take Mice.



THis engine or Mill, is made of ij. thin boards, and thicker in the middle, then at the ends. The one halfe of the bredth is set in a iopned within the other halfe, and boared with a per- cer thorough the middle, and there is put thorow a great wpar, or a smal pinne of wood, as yee may see, and that pinne is put into a thicke bord of four inch bord, which borde lyeth on some ta- ble or other borde from the ground halfe a yeard, or as yee shall thinke good: and set some panne or pot with water vnder your mill, and baite your mill on both sides of each leafe with some butter, mixt with otmele and sugar, and set all other things away, and so shall ye drowne threescore or more perhaps in a night, as I haue seene done, if there be store. Ye shall make your mill to turne very easely, that the least weight thereon shall turne it. Also set your Mill an inch from your square borde that the pinne is sin, and baite your borde with some otmeale, to tice them to the mill.

FROM PASCALL, "SUNDRIE ENGINES AND TRAPPES TO TAKE POLCATS, BUZARDS AND RATS," 1600.

The Jews regarded the mouse as an unclean animal. (*Cf.* Isaiah, lxvi. 17 : " . . . . . they that eat swine's flesh, ... and the mouse, shall be consumed together, sayth the Lord.") In German mythology the mouse was sacred to Wuotan, the storm-god, and his wife, Freya. When with the establishment of Christian religion the saints took the place of the old heathen gods and goddesses, St. Gertrud succeeded Freya, but now protected the believers against mice, which means, according to German mythology, against all diseases. St. Gertrud is pictured with mice running over her staff.

Like other vermin, mice anciently enjoyed the reputation of possessing considerable curative properties, and were occasionally prescribed by eminent physicians. The Romans ate dormouse sausages as a cure for sleeplessness. Petronius records a recipe for dressing and serving them with poppy and honey, " to be taken to bring sleep." Another ancient medical writer says that : " The soles of the feet being anointed with fat of dormouse does procure sleep."

Bulleyn, physician to Henry VIII., recommended that a small young mouse roasted should be given to a child suffering from any nervous disorder.

The London Pharmacopœia (1695) said of the mouse : " *It is a short-lived, lecherous creature. The fat is good for the baldness caused by falling off of the hair, so also with honey and bear's grease. The dejecta of mice applied outwardly help the ringworms, scurf, and cures all sorts of warts*

and piles." Pliny and others recommended them for constipation in children.

In the "Rich Storehouse" (1650) is offered as "*An excellent good remedy for one that spitteth blood,*" to "*take the dung of mice and beat it into a fine powder (in quantity as much as will lie on a groat of silver), and put it into a pint of the juyce of plantane, and put thereto a little fine sugar well beaten first into powder; and let the party grieved drink a good draught thereof at a time both morning and evening every day, until such a time as you perceive the infirmity to be clean gone; and that will help.*" Again, as "*A very good medicine for the chin cough, take a mouse, and flea it, and drie it in an oven, and beat it to a powder; and let the party grieved drink of it in ale, and it will help, probatum est.*"

Topsel wrote in 1656 about the shrew-mouse: "*The tail of a shrew, if cut off and burned, and beaten to a powder, and anointed on the sore of any man which came by the bite of a ravenous dog, will in a very short space make the same whole and sound, so that the tail be cut from the Shrew while she is alive.*"

Fried mice are considered in some English counties a specific against small-pox, it being insisted by some persons that they must be fried alive! Dyer tells us in his "Folk-lore" that in East Lincolnshire fried mice are regarded as an infallible cure for the whooping-cough. In Gloucestershire "roast mouse" is recommended for the same purpose.

Paracelsus,[2] who knew an "infallible remedy" against every ill, tells us how to destroy mice: —

[2] "Bombast von Hohenheim, Paracelsus." Translated by R. Turner, 1656.

"Having found a Conjunction of *Saturn* and *Mars*, take a piece of iron, and frame a mouse of it, before the Conjunction passeth over; and in the hour of *Jupiter* engrave upon the Belly of the mouse these words: ALBOMATATOX. Afterwards, when the *Moon* is in the 9° or 10° of *Cancer*, on the right side engrave: *ιυνδεμῶρακιξ*. Afterwards, the *Moon* descending, and is in 9° or 10° of the sign Pisces, on the left side engrave as followeth: יודשתחב, and upon the back thereof, from the beginning of the back bone unto the Tayle, engrave this word, with the character as you see,

IO + NATURA SUA.

"Note that from the signe of *Venus* unto the centre of the other character, a line is to be drawn overthwart. Then prepare a Collary for this mouse, of pure lead, the

Moon increasing on the day of Saturn, and first hour of the night, which is the hour of Saturn, and engrave thereon the characters:—

IL CON. 3. 4. A. B. Ελία.

This being thus performed, fix the Collary in the Conjunction of *Saturn* with *Mars* as above said, and place

it about the centre or middle of the house. All kinds of mice will die among that one in the house; and if afterwards any mouse come therein he will not stay there an hour, and if any quick mouse be bound with a thread to this metallic mouse, he will not live above an hour, but will die, and swell, as if he had eaten Poyson."

An ancient Greek treatise on farming advises the husbandman who would rid his land of mice to act thus: "Take a sheet of paper and write on it as follows: I adjure you, ye mice here present, that ye neither injure me nor suffer another mouse to do so. I give you yonder field [here you specify the field], but if ever I catch you here again, by the mother of the gods, I will rend you in seven pieces. Write this and stick the paper on an unhewn stone in the field before sunrise, taking care to keep the written side up." The field assigned to the mice is a neighbour's.

A similar incantation is at the present day employed in the Ardennes against rats. In order to get rid of rats one must repeat the following: "*Erat verbum, apud Deum nostrum.* Male rats and female rats, I conjure you, by the great God, to go out of my house, out of all my habitations, and to betake yourselves to yonder-place, there to end your days. *Decretis, reversis et disembarassis virgo, potens, clemens, justitiæ.*" Then write the same words on pieces of paper, fold them up, and place one of them under the door by which the rats are to go forth, and the other on the road which they are to take. This exorcism must be performed at sunrise.

Our indifference to suffering, year after year, the enormous loss inflicted upon us by mice is all the more extraordinary as there is no difficulty whatsoever in getting rid of mice, no matter where, or how numerous they are. Mice have an utter horror of the smell of chloride of lime and of tar ; therefore, all that is required for driving them away is to put or pour a small quantity of either into their runs. This should be done in the evening. By the next morning all the mice will be found to have emigrated. Should another contingent arrive when the deterrent effect of tar and lime has passed off, the dosing should be repeated.

This is the easiest and quickest method for ridding one's place of mice, but not the best, for it is not in the public interest that the mouse plague should be merely shifted from one house to another. The interest of the community demands that mice should be killed. Where cats are not objected to, a good "mouser" is worth its weight in gold. Where it is undesirable to have cats about, trapping is the next best method. To kill mice by giving them poison or bacteriological preparations is a proceeding which should never be resorted to where mice live inside a house. Mice so killed usually die under the floor or behind wainscoting, and thus the second state is worse than the first. Moreover, where an ordinary poison[3] has been used there is the danger of domestic animals picking up a dying or dead mouse and being poisoned in their turn.

[3] Bacteriological preparations are not "poison," except alone for mice and rats.

Any trap will prove effective so long as it is handled carefully. If one does not like the trouble of looking after traps, re-setting and re-baiting them as required, one may buy for a few shillings a very effective automatic trap that needs no looking after and will catch mice as long as there are any mice to catch.

When mice become noxious in the garden, the following simple trap described in the *Field* will usually exterminate them in a very short time :—

CAT, RAT, AND MOUSE.
(From "A Booke of Beasts Lively Drawn," 1660.)

"Take an ordinary large square biscuit tin, without the lid, and sink it in the ground near the runs up to its edges. Then half fill it with water, and on each of the inner sides smear a small quantity of lard or soft toasted cheese. The bait should be placed so that the mice can just reach some of it, but not all, by stretching over the edge. In trying to get the rest they topple in and get drowned, the slippery edges of the tin preventing

their escape. This is a cheap and effective way of getting rid of mice in the garden, and the trap requires no attention beyond the periodical removal of the victims' bodies. To prevent other things from getting into it, the lid of the box or a piece of board may be placed over it, but raised sufficiently to allow the mice to creep underneath."

As regards field mice, far and away the best method of exterminating them is by means of bacteriological preparations. Some of them are greedily eaten by mice. They are all quite harmless to domestic animals, and most of them give excellent results. The bacillus used in all these preparations, differing only in the "breed," sets up an epidemic which spreads rapidly from mouse to mouse, owing to their habit of nibbling the dead bodies of their comrades.

With the value of the owl and kestrel as destroyers of mice I shall deal in the last chapter.

CHAPTER XIV.

The Rat.

"Rats and conquerors must expect no mercy."

The greatest of all household pests is the Brown Rat (also called the Hanoverian or Norway rat). "They will

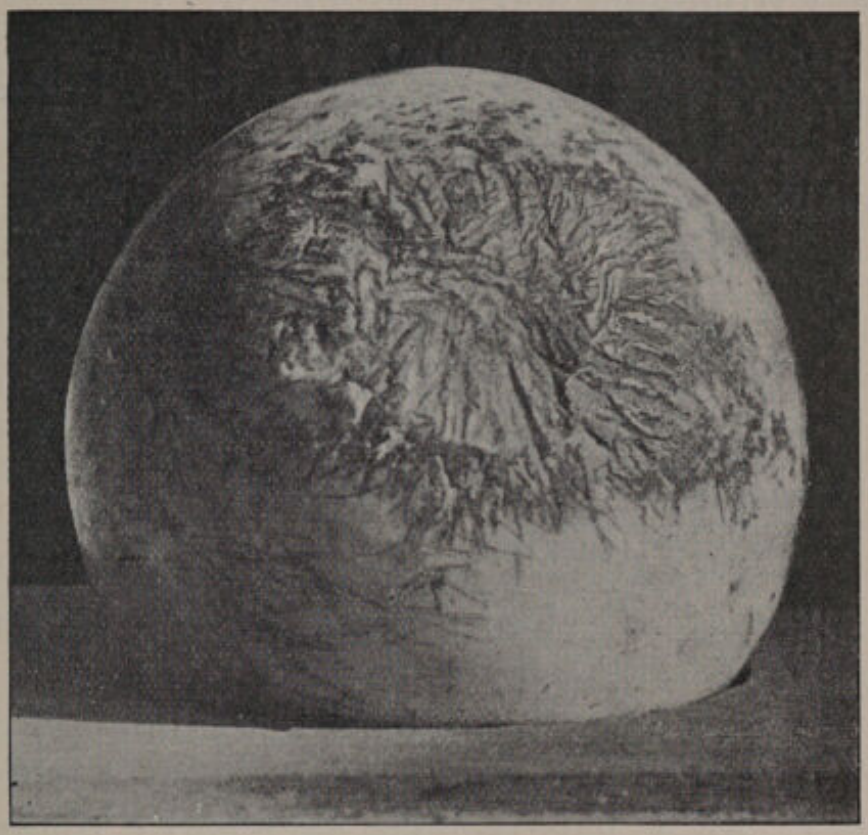
HEAD OF BROWN RAT.

THE BROWN RAT. (After Bell.)

devour anything," says Rodwell,[1] "from a delicate chop

[1] "Book of the Rat," 1858.

of a house-fed lamb, or babies' fingers, to a venison pasty, an old tortoise or putrid carrion, duckling, partridge, pheasant, fowls, geese and turkeys, all kinds of oily and fatty substances, from the purest olive oil to the refuse of whale blubber ; soaps, yellow or mottled ; tallow, fresh or stale ; boots, shoes, and harness ; roots, from a prize



IVORY BALL GNAWED BY RATS.

tulip to a mangel-wurzel—nothing comes amiss to them. They even get into churchyards and eat our departed friends in their graves, and infest the dead-houses on the Continent. Thus it appears we are never secure, either dead or alive, from the liability of becoming food for rats."

It seems proved that the brown rat, like some other pests, came to us from Asia in 1731. It found the country in possession of the so-called old English black rat, and immediately set about exterminating it. Having succeeded in this and gained a firm foothold in the land of the "Mistress of the Sea," it commenced on her ships a triumphal journey around the world. To-day there is no civilized country which does not suffer severely from a rat plague, and so complete has been the victory of rat over man that so far the efforts of the whole civilized world have been unable to save it from

HEAD OF BLACK RAT.

the humiliation of submitting to whatever tribute the rat may choose to levy.

To speak of man having been ignominiously defeated by the rat sounds like gross exaggeration, yet what are the facts? As I have shown elsewhere,[2] there are at least as many rats in Great Britain as there are men, women and children, or to choose another illustration, one rat per cultivated acre.[3] By means of a series of experiments

[2] "The Rat Problem." By W. R. Boelter. Bale, Sons and Danielsson, Ltd., London, 1908.

[3] According to the French *Moniteur*, there are in France upwards of 2,000,000,000 of rats and other rodents.

I proved that each rat causes a loss, by the destruction of good food and material, which amounts at the lowest computation to ¼d. per rat per day. These estimates have been universally accepted, and are the basis of "The Rat Destruction Bill," which was recently introduced into Parliament.

THE BLACK RAT (*Mus rattus*). (After Bell.)

According to these estimates the rat inflicts upon this country a loss of at least £15,000,000 per annum. There is no trade or profession from which the rats do not take toll—when they like and what they like. Ships, docks, wharves, warehouses, stores, shops and factories, palaces and cottages, orchards, farms and gardens, libraries and museums, hospitals and graveyards —all are attacked by the rat and suffer defeat time and again.

There is another and even more important side to the rat problem, the part played by rats in the dissemination of the plague.

THE PLAGUE AT ASHDOD. (After Poussin.)

Though mankind has been groping about for many centuries in an endeavour to find the truth, more or less dimly suspected, about the part played by the rat in the

dissemination of the plague (black death), it has been left to our days to prove beyond doubt, by the discovery of the plague bacillus in the rat, that there can be no epidemic of plague unless an epizootic of rats has preceded it.

STATUE OF THE HINDOO GOD GUNPATI, RIDING ON A RAT.[4]

Of the relationship of the rat to the plague we hear first in Syria, 3,000 years ago. On the defeat of the Israelities by the Philistines the Ark of God was taken to Ashdod and lodged in the temple there. An outbreak of pestilence followed, during which 50,000 people perished. Owing to it, the Ark was

[4] See Note 6, p. 130.

sent to Gath. Again the plague broke out, and on the Ark being removed to Ekron "there was a deadly destruction throughout all the city." Then the priests of the Philistines told the people to send the Ark back, and with it a propitiatory offering to the God of Israel, in the shape of "five golden images of the animals in their secret parts, and five golden images of the mice that marred the land." Mice means here rats, the Hebrew "akhbar" signifying both rat and mouse.[5] Their temples were swarming with rats, as such buildings do in India to-day.[6] Owing to the presence of food, and as we read that the Ark had a covering of badger-skins—an ideal retreat for the fleas escaping from rats and from plague—it was but natural that plague spread in the places to which the Ark had been successively removed.

To-day, as then, the plague is spread by the rat-flea, which sucks up the bacillus of plague with the blood of the plague-stricken rat, and transmits it from rat to rat,[7] and from rat to man.

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[5] *Cf.* the Egyptian *penna*, the Greek μυς, the Latin *mus*, and the German *Maus* in mediæval times. The legendary death of Bishop Hatto in the Mäusethurm was obviously intended to have been due to *Mus rattus*, not *M. musculus*.

[6] It is a grim coincidence that Hindoos object to killing rats, because the rat is the *sowari* (means of locomotion) of their god Gunpati. Some of them even catch rats in order to let them go free in the fields.

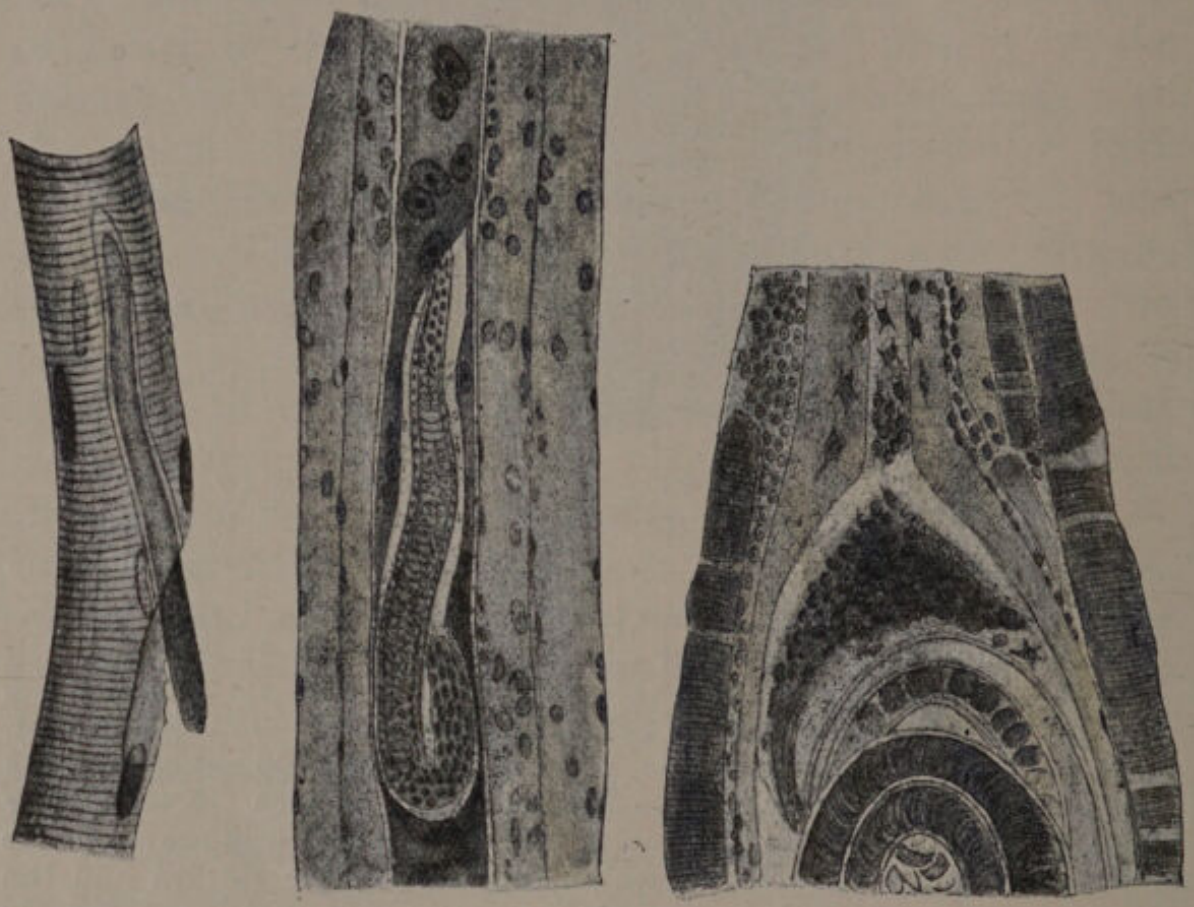
[7] It may be necessary to mention here that since the three principal factors in the spread of bubonic plague are the rat, the rat-flea, and the plague germs, the destruction of rats alone will not suffice, but must be accompanied by measures calculated to destroy both the rat-flea and the plague bacillus. The disinfectant formerly used for that purpose was perchloride of mercury until the Plague Research Commission

Another disease of man spread by rats, which is very prevalent on the Continent, but as yet practically unknown

CALCIFIED TRICHINELLA IN THE MUSCULAR SYSTEM OF A PIG ; THE CAPSULES ARE NOT CALCIFIED.

showed that it was utterly useless in plague disinfection. Then kerosine oil emulsion was recommended until it was conclusively shown that it did not kill the plague bacteria though it killed the fleas. The disinfectant in general use to-day is cyllin or cyllin-petrol (in equal parts). When diluted with water in the proportion of 1 in 900 either of these disinfectants is absolutely fatal to both flea and bacillus. Exactly how many persons died because the authorities persisted in using as a pulicide and bactericide a disinfectant which did not kill the rat-flea and the plague bacillus, and afterwards another preparation which is incapable of killing the plague bacillus, will never be known ; but that such preparations were officially employed for years, in spite of the strongest protests made by the best authorities at home and in India is a calamity which is aggravated by the fact that an official encouragement having once been given to one particular disinfectant, and thus popularised its use, it is a matter of the greatest difficulty to let the private user know that the vaunted properties of perchloride of mercury and kerosine oil emulsion are non-existant and that those plague authorities who pinned their faith to cyllin-petrol and cyllin have been vindicated by the results of every comparative test on record.

in this country, is trichinosis. The trichinella is a parasite which spends one stage of its development in the rat, and it is noteworthy that an epidemic of trichinosis is found only where the brown rat is also found, though



a *b* *c*

(*a*) MUSCULAR FIBRE OF A RAT, INVADED BY TRICHINELLA ; (*b*) SECTION THROUGH THE MUSCLE OF A RAT ; THE INFECTED FIBRE HAS LOST ITS TRANSVERSE STRIATION ; ITS NUCLEI ARE ENLARGED AND MULTIPLIED, 310/1 ; (*c*) PORTION OF A TRICHINELLA CAPSULE.

isolated cases ot trichinosis occur by direct infection through meat coming from a distance—as in the case of trichinosis which occurred in Glasgow. From the rat

it is passed on to the pig—by means of the droppings of trichinous rats having become mixed with the food of pigs; and from the pig to man, who eats the trichinella with trichinous pork.

The *Medical Press* said with reference to this case: "If the rat needed one more nail in his coffin it ought to be supplied by the discovery in the Glasgow City abattoir of the fact that 3 per cent. of the rats killed on the premises are infected with *Trichina spiralis*. American meat, in spite of President Roosevelt's law, is often but poorly inspected before it leaves that country, and it is by no means safe to rely on the care and discretion exercised at the other end. British inspectors must rely on their own efforts and their own judgment, and when they have condemned a carcase it should be destroyed before there is a chance of its doing further harm. If an outbreak of trichinosis occurred in Glasgow or the neighbourhood, the officials, now that they have received their warning, should be held responsible."

The presence of the brown rat is an indispensable condition to the spread of epidemic trichinosis. No sooner, therefore, has a case of trichinosis been reported to the health authorities in Germany than the wholesale destruction of rats is undertaken as a matter of course. Experience has taught the German Government that by breaking the connecting link in the chain they make an epidemic of trichinosis impossible.

There is, finally, well-grounded suspicion that the rat is an active agent in the spread of swine fever. In

spite of a very elaborate and costly apparatus designed by the Board of Agriculture for the suppression of swine fever this disease is as prevalent as ever. Rats go from one pigstye to another, and from one farmstead to another. Yet, whilst the Board of Agriculture regulations include everything that might conceivably spread the disease—there are seventeen sections in the Swine Fever Order, with numerous clauses — they entirely disregard the rat, though the organisms of the disease have been repeatedly found on rats captured in infected areas, and though in two cases where huge rat drives had been held in Eastern Germany for the purpose of stamping out trichinosis, there was observed during several months subsequent to this wholesole desruction of rats a remarkable fall in the cases of swine fever.

Even among vermin there is nothing so utterly bad that one good word might not be said on its behalf. Was it not even said of Satan himself by a kindly old Scotch lady that, "Nae doot he's bad, but ye maun grant his gey industrious"? As to the rat, once upon a time when there were no sanitary laws in Great Britain, and the inhabitants were wont to dispose of all refuse by throwing it out of the window or front door, rats no doubt did some little good by acting as a kind of unpaid municipal scavengers. Further, it was formerly used by physicians in many forms as a cure for various ailments. "*The fat*," wrote Dr. Salmon, "*is excellent against the palsie, the dung is good to help the badness, the ashes being taken every day to clear the eyesight, but the tayl is full of poyson.*"

Quite recently an eminent Chinese authority has strongly advocated the use of rats as food for preserving or restoring the hair. Writing on the subject he says : " What the carrot is to a horse's coat the rat is to the

RATTING—"THE GRAHAM ARMS," GRAHAM STREET.
[From a Photograph.]

RATTING AT "THE GRAHAM ARMS."
(From an old Print.)

human hair." Every horseman knows that a regimen of carrots will make his stud as smooth and lustrous as velvet, and the Chinese, especially the women, know that rats used as food stop the hair from falling out and make

the locks soft, silky and beautiful.[8] It is well known that rat soup is in China a delicacy, being considered equal to ox-tail soup, and that in many parts of that country there are hawkers selling "split and dried rats."

It has often been suggested by ingenious people that if we could only discover a way of making the rat an article of commerce the rat problem would solve itself. As a matter of fact, the skins of rats are already used in this country in large quantities, chiefly for making thumbs in ladies' "kid" gloves, but I am told by a prominent member of the trade that all these skins are imported from France and Belgium, as it has been found impossible to secure a regular supply here. Excepting the rat-catcher, there is no organized system of killing rats in this country; the unemployed does not think it worth his while to kill rats at a penny per skin, and the rat-catcher finds it, of course, more profitable to sell his catches to the "sporting fraternity," who pay him as much as six shillings per dozen of live rats.

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[8] Natives of Central Australia who desire to cultivate their beards, prick the skin all over with a pointed bone, and then stroke it carefully with a magic stick or stone which represents a rat with very long whiskers.

South African warriors twist tufts of rats' hair among their own curly black locks, because they think they will have just as many chances of avoiding the enemy's spear as the nimble rat has of avoiding things thrown at it. Hence in these regions rats' hair is in great demand when war is expected.—Macdonald, "Manners, Customs, and Religions and Superstitions of South African Tribes," *Journ. of Anthrop. Inst.*, xx. (1891), p. 132.

THE RAT-CATCHERS OF THE SEWERS.

[From a Daguerreotype by BEARD.]

THE RAT-CATCHERS OF THE SEWERS. (Mayhew.)

To be rid of rats is one of the most difficult tasks which civilization is called upon to perform. We all know that the physical and mental faculties of the rat are of a very high standard. Further, to kill 100,000 or even 1,000,000 rats will not make the slightest impression upon their incredible numbers, recruited by an immense fecundity. If we mean to demonstrate that man is after all superior to the rat in intelligence, which so far we have failed to do, we must first ascertain the cause of our defeat and then organize a war against the rat *à l'outrance*.

The causes of our defeat by the rat—in other words, the growth of the rat pest—are mainly the senseless killing off, by gamekeepers and farmers, of the rat's natural enemies, the weasel, the owl, and the kestrel (because they will sometimes, but very rarely, take a young pheasant) and the total absence of co-operation between the various methods chosen by man to destroy the rat. Excepting the difference in size of the vermin, there is no difference between a verminous tramp and a rat-infested town. Both are suffering from a parasitic disease. But what should we think of the attendant at the infirmary or prison who entrusted with the task of cleansing the tramp would attempt to do it in the piecemeal and unintelligent fashion in which we "pretend" to be killing rats, one to-day, another next week, a third in a month, and so on? It stands to reason that until we conduct the task in a rational manner it is utterly futile to hope for anything beyond the merest temporary relief.

As in other wars, so there is in this war no ideal

weapon for destroying rats. Any method is in my opinion good so long as it kills rats and is used persistently and in co-operation with similar efforts made elsewhere. Considering the extent of the rat pest, nothing but a national campaign, waged with all the weapons available, can bring about the destruction of the brown rat, but this co-operation can be effected only by the State.

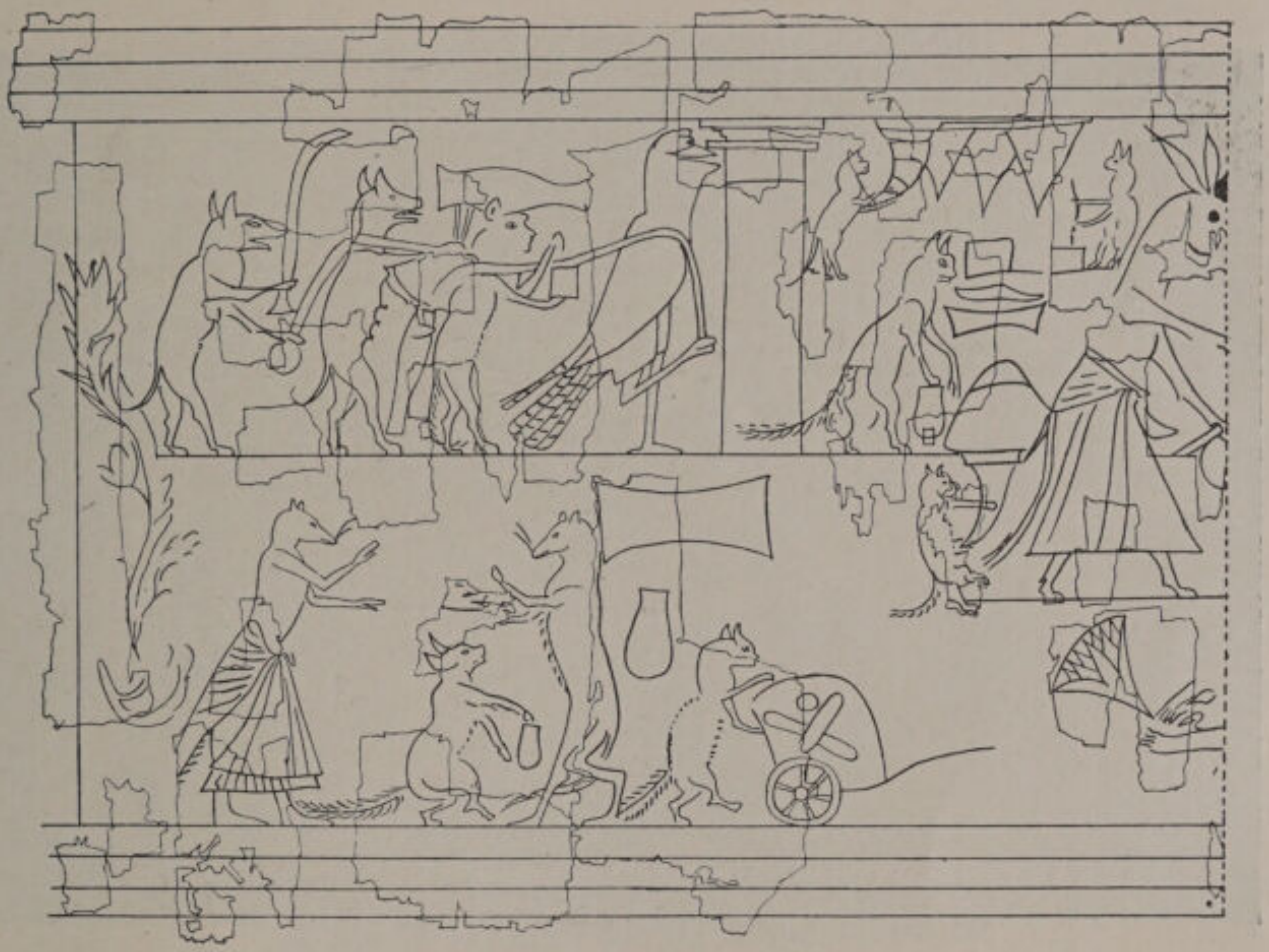
In Denmark the war against the rat is now carried on under a National Rat Law, with the greatest success. There are Rat Laws in operation in Hong Kong and Barbados, and I had recently the satisfaction to be informed by the Hon. E. Drayton, C.M.G., the Colonial Secretary of Grenada, that as a result of my book on "The Rat Problem" the Legislature had just passed a Rat Ordinance. Here in England, when the Rat Bill was introduced by Sir Charles McLaren, it was, according to the newspaper reports, received "with derisive cheers."

Yet the State already undertakes the destruction of rats for hygienic reasons, acting through the Port Medical Officers of Health. The destruction of rats by the State outside ports, whether for hygienic or economic reasons, is therefore only the natural development of the present duties of the State. This development could be provided by a short Act of Parliament. If such Act made it compulsory for County Councils and Municipal Authorities to destroy rats, it would probably effect the practical extermination of the rat in this country in ten years, and an annual expenditure of £50,000 would, in

EMIL ZUSCHLAG,

ADMINISTRATOR-IN-CHIEF OF THE DANISH RAT LAW;
PRESIDENT, ASSOCIATION INTERNATIONALE POUR LA DESTRUCTION RATIONNELLE DES RATS; ORIGINATOR OF THE WORLD'S WAR AGAINST RATS.

my opinion, result in saving the greater part of the enormous loss inflicted by rats, which exceeds £15,000,000 a year. But until the people of this country have become sufficiently interested in this problem to insist on

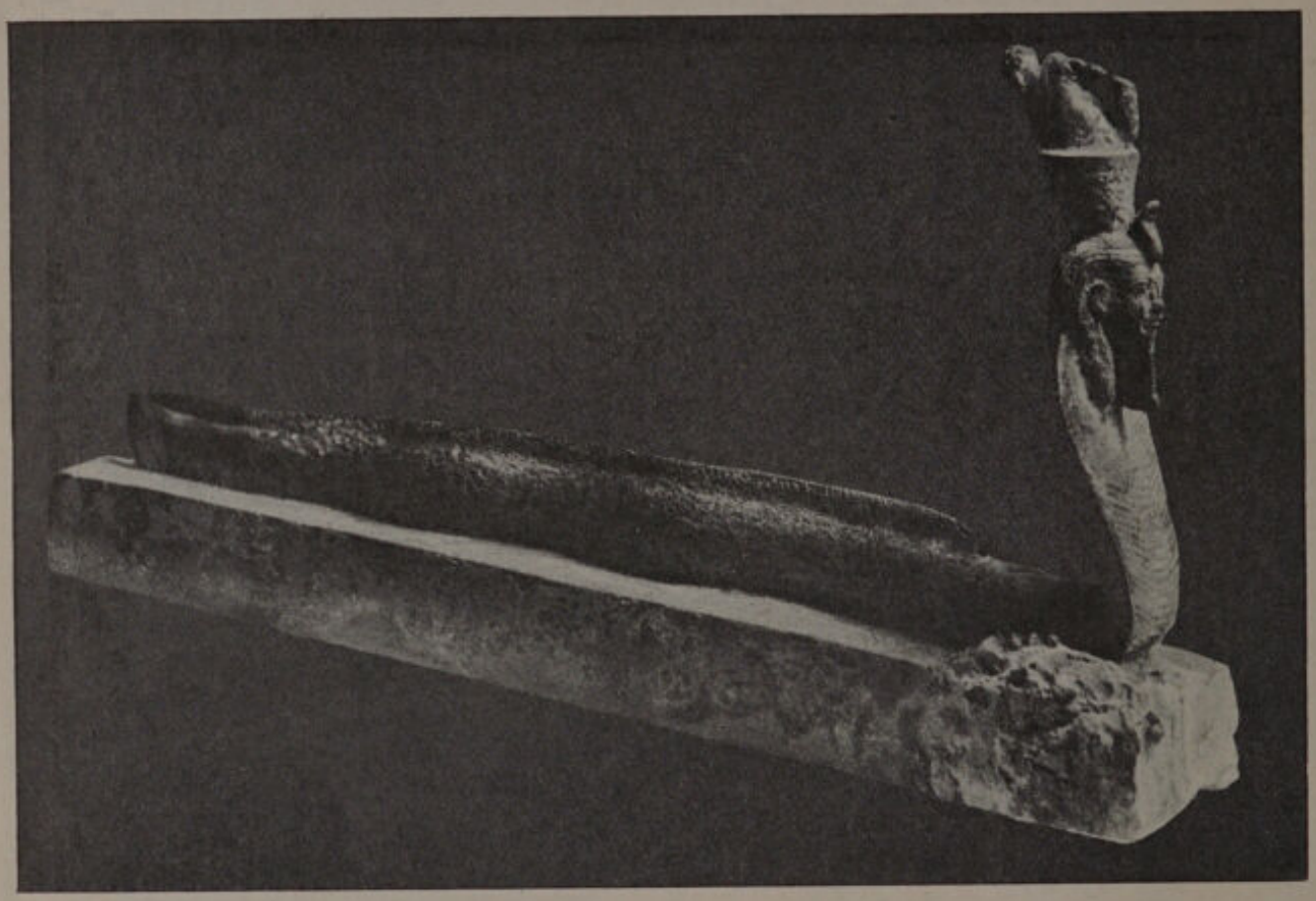


THE BATTLE BETWEEN THE CATS AND THE RATS. A SATIRICAL PAPYRUS.

the Legislature passing such rat law, we may all do a great deal towards its ultimate success by persistently killing off all the rats that attack our goods and chattels.

In houses, the old-fashioned means are the best ; first and foremost, cats and dogs. Good " ratters " are worth

their weight in gold. I have several times, in heavily infested villages, come across a farm where no rat or mouse was ever seen, though the neighbouring farms were swarming with them. The explanation given was that "'our Tom' or 'our Prince' won't let a rat come



BRONZE CASE AND IMAGE OF A SNAKE.

near the place!" The old Egyptians realized the value of a good cat 3,000 years ago. They did not merely recognize them as valued members of the household, as "our Tom" is reckoned, but regarded them as sacred,

inflicting the severest penalty on anyone who should kill a cat. Bast, one of their goddesses, was represented with the head of a cat. After death cats were embalmed and placed in often most valuable mummy cases. The

HEAD OF THE CAT-GODDESS BAST.

same dignity, for the same reason, the ancient Egyptians bestowed upon the hawk, the ichneumon and the snake.

Unfortunately, the great majority of modern cats are quite useless, owing to the influences of a pampered and

luxurious life, as represented by the morning milk and the cats'-meat man. In 1906 there were received at the London Institution for Lost Cats 13,314; in 1907, 15,319.

MOSAIC PICTURE : FOWLING SCENE. THE CAT AS A RETRIEVER.

The number of rats in London far exceeds 6,000,000. So much for the London cats. It would be better if instead of spending money on keeping alive useless cats

that are too lazy to "keep themselves," though there are rats and mice galore, the public would give it for the establishment of lethal chambers for stray cats. Such cats degenerate into a verminous state and thus become a danger to health. A cat suffering from mange will infect a whole neighbourhood of its nocturnal companions, and these will carry the disease to their respective homes, infecting dogs and even their owners. Ringworm is another disease which is carried from cat to man, and it seems from recent investigations that cats are not quite innocent of being agents in the spread of diphtheria. It behoves us, then, to relegate cats to their proper places, which for the family cat is not dining, drawing and bed rooms, and for the tramp cat is the lethal chamber.

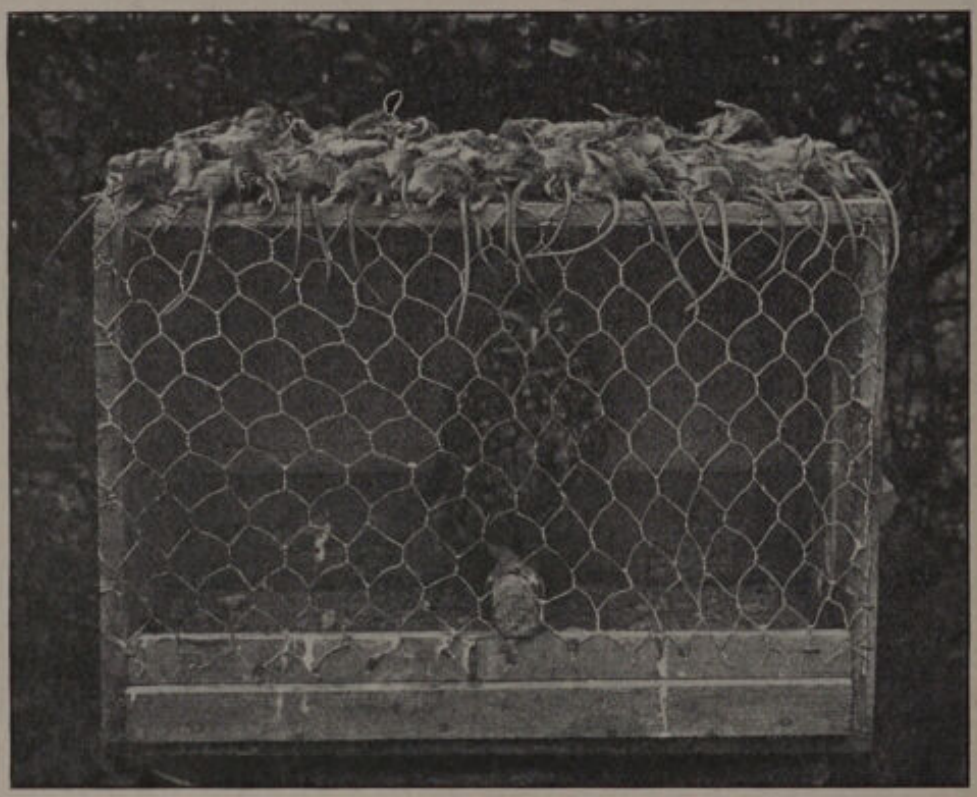
Among the natural enemies of the rat the barn owl (*Strix flammea*) is probably the most valuable ally of man. Hated by the ignorant gamekeeper, it is, nevertheless, the game-preserver's and farmer's best friend. Though it may occasionally kill a singing bird or young pheasant, its chief nourishment is furnished by mice and young rats, so that it has been justly called the flying cat.

As many as twenty freshly killed rats have been found in a single owl's nest, and to judge by a proof supplied by the bird itself, the total number of rats, mice and moles destroyed by the barn owl must be enormous.

All owls have the habit of casting up the indigestible parts of the food swallowed by them in the form of pellets, which may often be found in abundance under the owl's roost and reveal without any manner of doubt

what the prey or the bird has been. The results in nearly every case show the enormous service they render to men in destroying rats and mice.[9]

"As owls subsist entirely on living prey, which at night must be closely approached before they can be



AN OWL AND ITS LARDER.

detected, an absolutely silent flight is essential, and this is effected by the soft and fluffy nature of their plumage. It is doubtless from their ghostlike, stealthy flight, coupled with their nocturnal habits, their large glaring eyes, and

[9] Dr. Aldous examined 706 pellets of the barn owl and found the skeletons of 16 bats, 3 rats, 237 mice, 693 voles, 1,520 shrews, and 22 small birds.

their weird hootings and screechings, that these birds have in all ages and in all countries been regarded as creatures of ill omen. Because of an unreasonable

ATHENIAN COIN WITH AN IMAGE OF THE OWL.

animosity, owls are mercilessly shot down both by the gamekeeper and farmer, but there is some reason to believe that the latter at least is beginning to see the error of his ways."[10]

FACE OF THE BARN OWL (*Strix flammea*).

The weasel (*Putorius vulgaris*) is another relentless enemy of the rat. A magnificent hunter and fighter, it chases the rat in its hole and kills annually immense

[10] Lydekker, "Royal Natural History."

numbers. It is often confused with the stoat, which is brown above, dirty white beneath, the tail always black at the tip, longer and more bushy than that of the weasel. The stoat is twice as long as its elegant little congener, which is red above, pure white beneath, the tail red and uniform. Their habits differ in many details, and the crimes which the weasel is said to

COMMON WEASEL *(Putorius vulgaris).*

perpetrate in the farmyard and the hen-roost, as well as amongst game of every description, on hares and rabbits no less than on the feathered tribe, are principally due to the stoat. The weasel lives in hedges, woods, among stones and along the edge of swamps. It preys on many small creatures, such as moles, shrews, insects and birds, but chiefly on rats and mice.

The common or true kestrel (*Falco tinnunculus*) derives its other name of windhover from its habit of hanging suspended in mid-air, with its wings in rapid motion, its fan-like tail spread out, and its head directed to windward. When in this position it spies a rat or mouse it drops

THE COMMON KESTREL (*Falco tinnunculus*).

upon it suddenly and noiselessly with unerring aim. Although its chief food consists of rats, mice and moles, the kestrel occasionally kills small birds, and will also eat frogs, beetles, worms and grubs. That it will now and

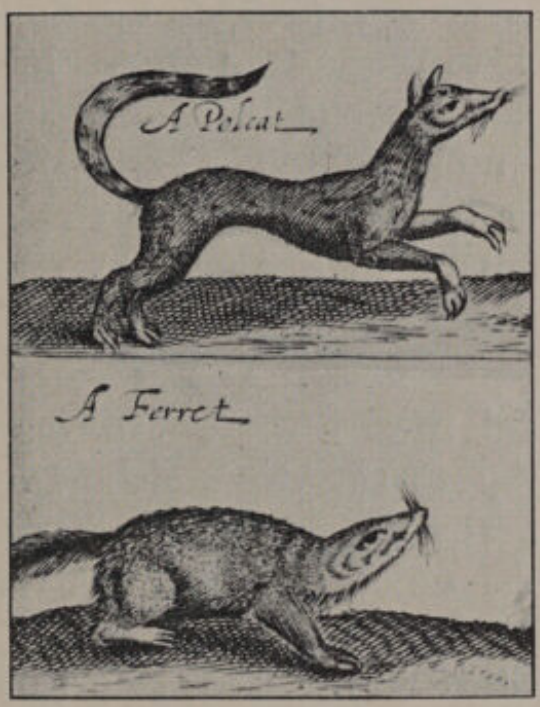
then poach a young partridge[11] or chicken is doubtless true, but such small robberies are more than counterbalanced by the benefits it confers on the agriculturist by the destruction of hosts of pernicious rodents. It ought, therefore, to be carefully preserved, instead of being ruthlessly shot down. The kestrel and the owl are, in fact, the day and night police against the rodent

FERRET AND POLECAT.

[11] It seems that the kestrel is, in the first place, attracted by the pheasants' food, and finding that young pheasants are "good to eat," it will now and then vary its diet of rat and mouse with pheasant *à la tartare*.

tribe, and it seems rather an insensate proceeding to pay men for their services in killing them.

The ferret, another merciless enemy of the rat, is a variety of the polecat, somewhat modified by the effects of long-continued captivity. There are two different colours in ferrets, one a rich brown and tan, the other white with pink eyes. The latter is preferred by most for



FROM "A BOOKE OF BEASTS LIVELY DRAWN," 1660.

rat-catching.[12] The female ferret should always be used, as it is not half the size of the male, and can therefore follow the rat faster and better in narrow holes. The male ferrets should be kept entirely for rabbiting.

The mongoose (common Indian mongoose, *Herpestes mungo*) is often recommended by dealers to people suffer-

[12] Barkley, "Studies in Rat-catching," London, 1891.

ing from a rat plague, but owing to the fact that the animal becomes soon tired of a permanent rat *menu* and learns to appreciate the taste of chickens and ducklings, this remedy is often worse than the disease which it was intended to cure. The disastrous results of the experiment made by some planters in Jamaica are often quoted as illustrating this fact. Introduced into the island to clear the sugar-cane fields of rats, this animal rendered at first excellent services, but soon developed into a worse plague than ever the rats had been by the wholesale destruction of poultry and harmless animals. At the same time the mongoose, by extirpating the ground lizard, so increased the swarm of ticks and grass-lice that the Government had finally to take measures for the extermination of the mongooses.

Of mechanical means there are legions, from the modest penny trap to the most elaborate and ingenious cage-traps worth 10s. to 30s. Generally speaking, the best trap is useless unless it is handled and baited with the utmost care, and in the right hands a small sixpenny trap will catch dozens of rats, and earn its money a hundredfold. It must be clear, however, that by the non-expert traps can be usefully employed only where the number of rats is small, and where a decided result is not sought. For the rats are cunning animals, quick to discover the danger that threatens from such contrivances. By means of their smell they recognize those traps that have been touched with the hands, and avoid them most carefully. In addition, the trapping of

JACK BLACK, HER MAJESTY'S RATCATCHER.

[From a Photograph.]

JACK BLACK, ONE TIME RAT-CATCHER TO THE LATE QUEEN VICTORIA.

rats—by the laymen—is far too tedious a process to have any perceptible influence upon the number of rats, having regard to their prodigious fecundity.

Rat "gins" are still more awkward and slower to use than traps; for as they can only catch one rat at a time it is necessary to remove the victim before the gin is ready for use once more. If the rat happens to be caught by one leg only it will bite it off and thus make good its escape, though it will be killed immediately on rejoining its companions, as being of no further use to the rat tribe.

On "how to use traps successfully" the old books give us some valuable hints.[13] "In order to attract the rats," says Robert Smith, "take twenty drops of the oil of rhodium, six or seven grains of musk, half an oz. of the oil of aniseed, put them in a small phial, and before you set the traps shake them well together; then take a small piece of paper twisted up, dip it in the bottle and rub each end of the trap, and leave the paper in the trap. The reason of mixing these three ingredients together is that I have always tried it with

[13] They contain also some very quaint and queer advice. One writer says: "Take a rat and beat or cut him very sore, then let him go, and he will cry and make such noise that it will frighten the rest from your house. Some flea the skin off their heads, and that does the same. Agrippa says that hog's lard mixed with the brains of the weasle and laid in large pellets or quantities about the rooms, they will not come into that room; put oak ashes in their holes, and they running among them, makes them scabby, and so kills them. Let the printers put infusion of wormwood into their ink, and they will never eat the letters. Smoke of ivy burned drives all rats and mice away. Take a weasle and put bells about his neck, and let him run about your house, and he will frighten away all the rats and mice."

success ; for in some places the rats love the smell of rhodium, in others they like the smell of musk, and again in other places they love the smell of aniseed."

For bait the following recipe is recommended : "Take a lb. of good flour, 3 oz. of treacle, and six drops of the oil of caraway, put them all into a bowl, and be sure to mix them well, then put a lb. of the crumbs of bread to it, for they like the bread mixed with their food better than the food alone."

The trap which Brehm describes in "Thierleben" "is no credit to the human heart," as he says, "but is

"A MARVELLOUS BAIT." RATS RUNNING TO BE TRAPPED.
(From "The Complete Ratcatcher," 1768.)

most effective. Close to the haunts of the rat dig a pit 5 feet deep, and line the bottom and sides with tiles. The bottom should be larger than the top, and the walls be slanting, so that it is impossible for the rats to climb out. Then pour out honey diluted with water, mixed with mutton fat and other fragrant stuff, so as to give a coating to the bottom, but no more ; put in the centre a small earthen vessel with a very narrow neck, filled with a mixture of honey, maize, wheat, hempseed,

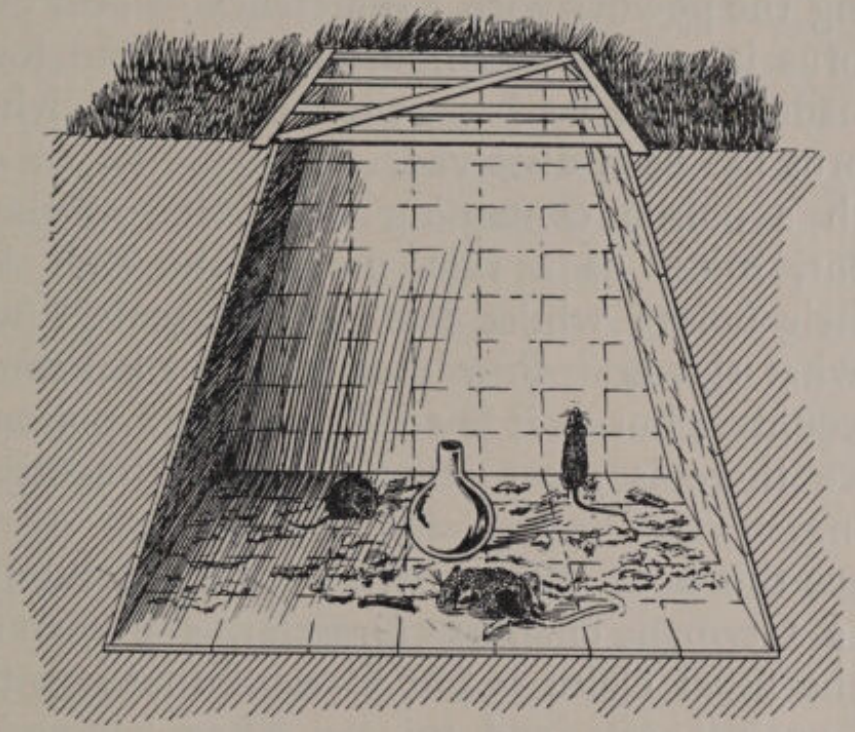
oats, fried bacon, and similar delicacies ; spread a few handfuls of chaff on the floor, put a lattice door on the top so that no chicken or other young domestic animals may tumble into this pit, and then rest in peace that all your rats will soon be got rid of. The fragrancy of the honey and the cosy-looking chaff will tempt the rats to jump down in joyful expectations. But, alas ! though the fragrance is indeed lovely, no one can live on the 'smell' alone, and certainly not rats. They then commence an orgy of cannibalism. The first rat has tired itself out in trying to escape. Down jumps rat No. 2. Sometimes there are deliberations, but they are cut short by the terrible hunger of No. 1. A fight for life and death commences, and the victor devours the vanquished. A few hours after there will be again two captives and another grim duel. The process will go on until all the rats have been caught in the pit. It has the further advantage that though it is a 'murder hole' it remains always fairly clean."

The principal objections to the destruction of vermin by means of vegetable and mineral poisons are that the use of these substances is dangerous to human beings and domestic animals like dogs and poultry, and that the vermin, after partaking of the poisonous substances, retire to inaccessible haunts to die, their bodies then decomposing and becoming a danger to the health of the community.

Various expedients have been adopted to overcome the latter unpleasantness, and it has been thought that

if barium carbonate be mixed with a sufficiency of the poison decomposition would be so retarded that it would not become an active nuisance. For this reason nearly all the rat poisons at present sold contain a varying proportion of this chemical.

The poisons most used for killing rats and mice are



"RAT-PIT."

strychnine, arsenic, phosphorus, squills (sea-onion) and cantharides. The first two of these are mixed in various proportions with sugar and powdered biscuit, oatmeal, flour or rice flour, flavoured with the essential oils of rhodium, aniseed or caraway, and coloured with either Prussian blue, soot, or chrome green, the last preferably,

as this colour is the most easily detected if the rat poison be used for criminal purposes. If used in powder form, it is advisable to bait the ground with the inert base for a few nights previous to putting down the poison, in order that the vermin may become accustomed to the flavour of the substance used.

If a paste preparation is wanted it can be prepared by mixing the powder with a sufficiency of beef dripping. Phosphorus is generally administered in paste form, this being made with a fat base, such as lard, in which the phosphorus has been dissolved.

With a poison containing strychnine as the active ingredient, mice, as a rule, die on the spot, but rats die in their holes ; whilst death from arsenical poisoning is somewhat slower. Powdered squill is not much used in this country, but as it is an active heart poison to rats and mice there is great scope for experiments in this direction.

[Since this book was written I have had submitted to me by a German chemist, Grasztat, a preparation for which the usual claim is put forward that it is the ideal remedy against rats and mice. After having made a number of experiments with this preparation I am inclined to believe that it is going to play an important *rôle* in the world's campaign against the rat. Tested against bacteriological preparations this new discovery shows that (1) it is eaten equally readily ; (2) its clearing action is far quicker than that of the bacilli, usually less than twelve hours; (3) the results are ascertainable by the number of dead rats and mice found (usually where

they took this preparation); (4) it is undoubtedly harmless to domesticated animals and man unless forcibly given to them in quantities exceeding 100 grammes of the preparation; (5) it is supplied in the form of broken biscuits and actually ready for use; and (6) it is far cheaper than virus, costing less than a third. Tested against poisons its advantages are, that (1) it is taken readily, whilst poisons are frequently rejected by rats and mice; (2) like poisons, it is sure in its action, but, unlike poisons, is only fatal to rats and mice; (3) it is as cheap as poisons. This preparation seems, indeed, to possess the advantages of both poisons and bacteriological remedies without their known disadvantages; and as the enactment of a Rat Law in this country within the near future depends now largely upon the knowledge of a rat and mice exterminator which will only exterminate rats and mice and not also human beings and domesticated animals, kill them quickly and not cause unnecessary and prolonged suffering, and may be bought by the pennyworth and used without difficulty by anyone, it would be well if this preparation were widely tested in order to ascertain whether its results are as uniformly successful under varying conditions in this country as they are on the Continent and have been in my own necessarily limited experiments.]

Cantharides, or Spanish fly, is still less used. It produces inflammation and lesions of the kidneys, together with peritonitis, and is very active, but its use in unprincipled hands for illegal and undesirable purposes

renders it necessary that the most stringent regulations shall govern its sale, and therefore, rightly, it can only be procured with difficulty.

The employment of bacteriological preparations in inhabited buildings is, in my opinion, inadvisable. The statements made by the purveyors of viruses that "the rats will die in the open," and that "there is no smell or inconvenience from dead rats," is frequently contradicted by experience. I know from personal investigation where a huge mansion was cleared of numberless rats and mice by virus in a manner which can only be described as miraculous; and of a country house treated with the same virus with the most disastrous results. I have seen rats dead from a certain virus to have become practically mummified, emitting only the faintest odour; and others, dead from the same virus, smelling as horribly as only a putrifying rat can smell. All that we really know of virus is that we do not know with any degree of certainty how the bacillus is going to act in any particular case; moreover, neither the manufacturer nor the user has any means of knowing, short of making the actual experiment, whether the preparation sold contains any bacillus at all.

But in spite of these objections, bacteriological preparations, or at any rate a few of them, form a very powerful weapon in a war against rats, because they may be successfully used in cases of rat infestation where no other known method would be of practical value. I have dealt with this subject at length in my monograph on the Rat Problem, to which I must refer

those readers who wish to obtain fuller information concerning the various viruses, but I would mention here that since Liverpool virus is now prepared and sold in a form "ready for use," it must be regarded, together with Ratin, as one of the best means for the destruction of rats, especially over large areas. The gelatine culture sold under the different names of Danysz, Laroche, or Pasteur vaccine virus is of little practical value.

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APPENDIX I.

THE LAW IN RELATION TO VERMIN.

I.

IT is a curious fact that the Legislature has been as tender in its treatment of verminous persons and premises as it has been severe in the treatment of vermin-infested animals or plants. It has created an elaborate machinery for killing vermin (ticks) on sheep, destroying vermin (mildew) on gooseberry bushes, preventing the importation of the Colorado beetle (vermin that lives on potatoes), and making other similar provisions regarding pests; but it has made no effort to kill, for instance, pediculi on *Homo vagrans, alias* tramp, or to prevent him from importing them into any other place he may wish.

* * * * *

Under the Verminous Persons (Cleansing) Act, 1897, both Urban and Rural District Councils *may*, but are not compelled to, expend any reasonable sum on buildings, appliances, and attendants for the purpose of cleansing persons infested with vermin and their clothes. Such persons can, if they care, by applying to the Council, obtain the use, free of charge, of the apparatus provided for that purpose, and the use of such apparatus does not subject them to any disqualification or disability.

Whilst the law, therefore, does not permit a sheep to have ticks or a gooseberry bush to have mildew, it distinctly recognizes the right of a person to be verminous and remain verminous if he be so inclined—and thus to be a danger to other non-verminous human beings. In law the shedding of vermin and, thereby, attacking the

health of other persons is no offence, but if a tramp asks a person for a penny "for his doss," and thus makes an attack merely upon such person's pocket, he is liable to instant arrest.

II.

To the lay mind all vermin is emphatically a nuisance, and pathology tells us in addition that vermin is a distinct source of danger to health and life. In Common Law a "nuisance," apart from statutory meanings given to the expression for particular purposes, means anything which works hurt, inconvenience, or annoyance. Private nuisances, or those which affect the property of particular individuals, are the subject of actions at the suit of those individuals.

Under the Public Health Acts of 1875 there are a large number of nuisances liable to be dealt with by summary proceedings. Among these are :—

(1) Premises (land or buildings) in such a state as to be a nuisance or injurious to health.

(2) Pools, ditches . . drains or ashpits so foul, or in such a state, as to be a nuisance or injurious to health.

(4) Accumulations or deposits which are a nuisance or injurious to health, other than those which are necessary for effectually carrying on businesses or manufactures, and are not kept longer than necessary, provided that the best available means are taken for preventing injury to the public health.

III.

It would appear from this that as rats are notoriously a nuisance, *i.e.*, work hurt, inconvenience or annoyance, and as, further, in the light of modern knowledge they are notoriously injurious to health, they come within the scope of this section of the Act; for

their presence could be proved to render land or buildings, and drains or ashpits, to be in such a state as to be a nuisance or injurious to health, and would also cause what might be construed to constitute "accumulations or deposits" in the form of dejecta mentioned under (4).[1]

IV.

Supposing this interpretation of the clause to be correct, the procedure to be adopted for obtaining a conviction would be as follows :—

Information of any such nuisance may be given to the District Council by any person aggrieved, by any two householders, or by any constable or police officer.

When the Council receives information of the existence of any such nuisance they are required, if satisfied of the existence of such nuisance, to give notice to the person by whose "act, default, or sufferance" it arises or continues, or if he cannot be found, to the owner or occupier of the premises, requiring him to abate the nuisance within a specified time.

When this notice is not complied with, the Council may take proceeding before a Court of Summary Jurisdiction for a penalty not exceeding £5, and for an order directing the defendant to abate the nuisance. If the magistrate's order is not complied with further severer penalties may be inflicted.

V.

It is important to note that such summary proceedings in respect of the nuisances mentioned may also be taken by any

[1] In the kitchen of a restaurant not far from Piccadilly Circus, and in the grocery department of a huge London "store," rat dejecta that had habitually been swept into a dark corner had accumulated so much that they filled several buckets when they were at last removed in my presence.

person aggrieved, or by any inhabitant of, or owner of, premises in the district. Consequently, whilst in law no person has a right to be aggrieved at a verminous person, he has a distinct right, it would appear, to feel aggrieved at the presence of rats, and of other vermin on any stationary object—as opposed to a moving body—anywhere, and may apply to a magistrate for a summons, and on the summons having been granted and proof of the nuisance given he may obtain a conviction.

Even if the nuisance arises from the acts or defaults of more than one person, the Council (or other complainant) may institute proceedings against all or any such persons. If the nuisance originated outside the district in which its effects are felt, the Council of that district may nevertheless take proceedings as above mentioned.

VI.

On house-vermin other than rats the law is quite clear, for if it appears to the Council, on the certificate of their medical officer of health (or of two medical practitioners), that the whole or part of a house is in such a dirty or unwholesome condition that the health of any person is endangered, or that whitewashing, cleansing, or purifying would tend to prevent or check infectious disease, they may require the owner to do such work, and on his default recover penalties and do the work at his cost. Under Part II. of the Housing of the Working Classes Act, 1890, a dwelling-house so injurious to health as to be unfit for habitation, whether it is actually occupied or not, may be closed until it is rendered fit for habitation. Proceedings must be taken if four or more householders living near such place demand them. If the Council refuse to act, the complainants may petition the Local Government Board for an enquiry.

VII.

From the foregoing it may be concluded that there are powers under the existing law for dealing with verminous places, and it may therefore be possible in future to obtain convictions of persons responsible for a nuisance of rats. In ports, the law already regards rats both as a nuisance and injurious to health, wreaking their destruction through the elaborate apparatus of the Port Medical Officers' Department. Why the rats should be within the operations of the Public Health Act inside the boundaries of a port and free of the fear of the law as soon as they have crossed the border, is not quite intelligible. This point, however, has not been hitherto challenged, but a test case would most likely result in a conviction, and range the rat with other nuisances. To deal with the last remaining nuisance, as far as vermin is concerned, *Homo vagrans pediculosus*, will, however, require the repeal of his charter, the Verminous Persons (Cleansing) Act, 1897.

APPENDIX II.

THE RATS ORDINANCE, 1909.[1]

AN Ordinance to authorize the framing of regulations for guarding against infection by rats and other vermin.

June 2, 1909.

Whereas there is reason to believe that in certain circumstances rats and other vermin are instrumental in spreading the plague, and whereas it is expedient to minimize their numbers and destroy them both on shore and on vessels in the waters of this Colony,

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[1] See p. 139.

and to prevent their access to the shore from vessels, or to vessels from the shore:

Be it therefore enacted by the Governor, with the advice and consent of the Legislative Council of Grenada, as follows:—

(1) In this Ordinance, the term "vessels" includes any ship, boat or vessel of any description used in navigation.

(2) The Governor in Council may make, and thereafter may, from time to time, vary, amend or rescind, such Regulations as he may deem expedient.

(*a*) For the destruction of rats and other vermin, and for minimizing their number both on shore and on vessels in the waters of this Colony.

(*b*) For the provision of means and precautions, to be taken on shore or on board vessels in the waters of the Colony, to prevent rats and other vermin from passing from such vessels to the shore or from the shore to such vessels, and,

(*c*) Generally for guarding against the spreading of infection by rats and other vermin in the Colony.

(3) Any person who shall—

(*a*) Violate the provisions of any such Regulations,

(*b*) Refuse or neglect to act in obedience to any such Regulation, or,

(*c*) Resist, oppose or obstruct the lawful execution thereof,

shall for every offence be liable, on summary conviction, to a fine not exceeding £20.

(4) This Ordinance may be cited as "The Rats Ordinance, 1909."

Passed the Legislative Council this twenty-fifth day of May in the year of our Lord one thousand nine hundred and nine.

T. T. DYER,
Clerk of Councils.

ASSOCIATION INTERNATIONALE POUR LA DESTRUCTION RATIONNELLE DES RATS.

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[1] à qui veuillez adresser toute correspondance.

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