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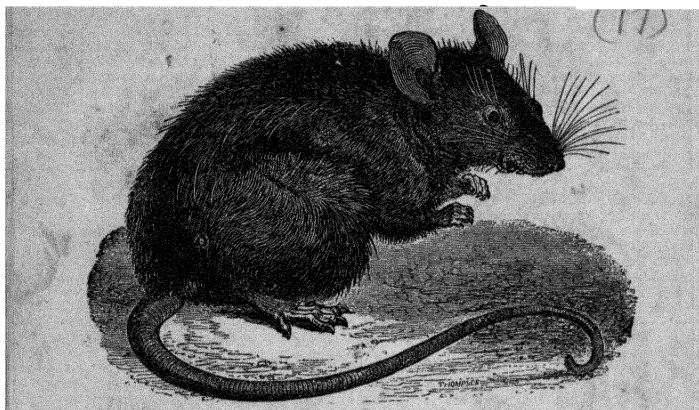
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AND

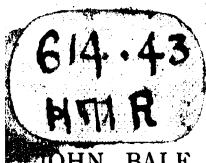
HOW TO KILL THEM.



RATS CARRY DISEASE
and are man's implacable foes.

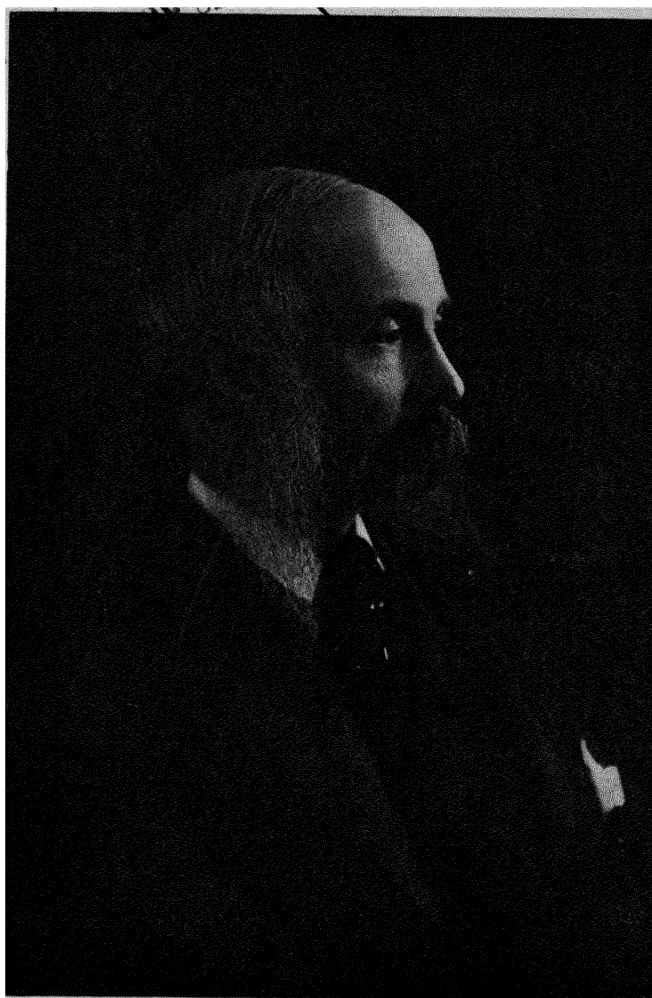
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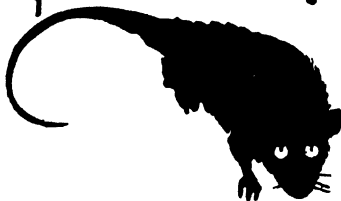
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83-91, GREAT TITCHFIELD STREET, LONDON, W. 1.
FOR THE COLLEGE OF PESTOLOGY (INCORPORATED),
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Sir JAMES CRICHTON-BROWNE, LL.D., M.D., F.R.S.,
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Liverpool Virus spreads death from Rat to Rat and Mouse to Mouse.

It causes them to die in the open and not under the floor boards as is the case with poisons.

It is absolutely* harmless to human beings, domestic animals and birds.

It cannot contaminate food.

LIVERPOOL VIRUS

From all chemists, ready baited in tins.
For Mice 1/6 and 2/6. Rats 2/6 and 6/-.

*Free advice given to owners of
large or badly infested premises.*

EVANS SONS LESCHER & WEBB, LTD.
56, Hanover Street, Liverpool.

Kills Rats AND MICE.

"RATSTICKER" the non-poisonous rat and mouse catching compound supplies a long felt want. It is a pest destroyer that is perfectly harmless to use and handle.

SAFE.

CERTAIN.

CONTINUOUS.

DR. HOWARTH, the City of London Medical Officer, has experimented with "RATSTICKER" and has been successful in catching as many as 80 Rats at a time. He affirms that the Rats die quickly, death being caused by shock.

"RATSTICKER" is now being used by -

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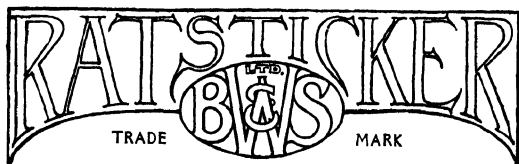
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INTRODUCTION

Introduction by the Right Hon. Lord Aberconway, P.C.

Although the ravages and destruction of food and property by rats have been the subject of discussion for many years, no really serious attempt has been made until now to cope with the plague on national lines. Some years ago I introduced into the House of Commons, at the request of a Society formed for that purpose, a Bill to give Local Authorities power to kill vermin of this kind, but though it excited great interest, and was warmly supported by agricultural societies, the Bill did not proceed to a Second Reading.

In the year 1919, through the efforts of A. Moore Hogarth, an influential society was formed, "The Vermin Repression Society" (the College of Pestology), and at their request I introduced into the House of Lords, and carried on the Second Reading, a Bill on similar lines to the one above mentioned. The Government pledged themselves in the House, during the debate, to introduce and carry through legislation of a far-reaching character, giving Local Authorities power to spend money in rat destruction, and to prosecute private individuals who allowed their houses and land to become centres of rat propagation. This Bill has now passed through both Houses and has become law.

This is a subject which everybody ought to be interested in, and the influential character of those at the head of the College shows how strongly the scientific world is impressed by the evils we have so long tolerated in our midst.

ABERCONWAY.

From the Minister of Agriculture and Fisheries.

To the Vermin Repression Society [now the College of Pestology (Incorporated)]. 29th December, 1919.

The passing of the Rats and Mice (Destruction) Act is a matter for congratulation to all who have the interest of the community at heart.

There is no need to dilate on the very widespread and special benefits which may be confidently expected to result from a wise but firm enforcement of the Act. The appalling waste of foodstuffs, farm produce of all kinds, and other material damage wrought by these vermin would alone justify the passing of the Act, but in addition to these considerations, and by no means secondary in importance to them, is the menace to the public health.

In this, as in so many other directions, the stress and con-



Mr. and Mrs. RAT
and family

present their compliments and beg to announce
that they have now returned to their Town House,
after an invigorating holiday in the fields.

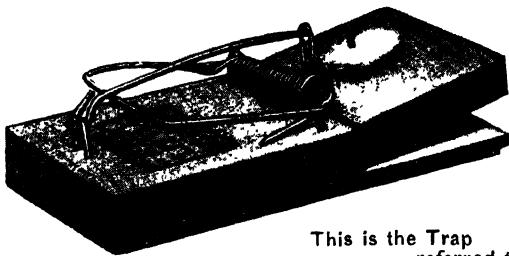
They earnestly request that all

**"LITTLE NIPPER" MOUSE
AND RAT TRAPS
SHOULD BE DESTROYED**

as they have suffered severe family bereavements
in the past through these particular traps.

Other traps, etc., can be generously baited
and left about as usual,

AT HOME,
"ANY HOUSE,"
EVERYWHERE,
ALWAYS.



This is the Trap
referred to.

PROCTER BROS. (Wireworks), LTD., LEEDS.

Introduction

sequences of the War have directed public attention to a subject which, so far, has been a matter of concern only to those reformers who have been for years endeavouring to secure the necessary powers to deal effectually with the evil. I welcome this opportunity of expressing the indebtedness of the Minister of Agriculture to your Chairman and to those who have assisted him in the movement from its inception in 1908. Although my predecessor, Lord Ernle, before Lord Aberconway had presented his Bill in the House of Lords, had arranged to introduce a similar Bill to secure permanent and more effective powers, I gladly express our obligation to Lord Aberconway for bringing his Bill forward. His action has assisted us very largely to create a favourable atmosphere, and has enabled the Government to pass its own Bill more rapidly than might otherwise have been the case.

The experience gained in the past twelve months of the administration of the Rats Order has afforded ample proof of the value of united and loyal co-operation. More encouraging results have been secured in those districts in which local Authorities have appointed officers to organise and supervise the work on self-supporting lines. If the remainder will now follow this good example, there is every reason to hope that the objects aimed at will be attained without friction or difficulty and that the new powers of the Ministry to take action in cases of default will not need to be invoked.

LIE OF FAREHAM.

From the Right Hon. Lord Lambourne.

*To the Vermin Repression Society, now the College of
Pestology (Incorporated). 24th March, 1920.*

It is to be earnestly hoped that the efforts of the Vermin Repression Society and Lord Aberconway will induce farmers to see how important it is that the crusade against rats should be carried out on National lines. We frequently hear of damage done to crops by game, and no doubt these complaints are well founded; but the damage done by game is infinitesimal as compared with that done by rats. My own belief is that fifteen millions a year is an under-estimate of the damage done to crops generally by these vermin. The efforts of one single individual, or even two or three, is insufficient. Rats travel for miles, and it can only be by combined efforts that the farmers can hope to save for themselves the very large amount that is annually lost to them. The Government is pledged to assist; but let the farmers help themselves and, by increasing warfare against these rodents, show that they are, at all events, alive to the damage that is being done in the country generally.

LAMBOURNE.

DAK Ratlime

HUNDRED RATS

Fred. Griffiths, Esq., Lockhill Hall, Ashcott, writes.—The results are wonderful . . . nearly a hundred rats with two tins. Neighbouring farmers are sending for supplies.

THIRTY WITH TRIAL TIN

D. Gray, Esq., Inverness, writes.—In a large hotel here the first trial tin caught over 30 rats. A poison previously used necessitated lifting large amount of flooring.

FIFTY-EIGHT RATS

Mr. H. A. Clowes, Place Lodge, St. Mawes, writes.—With the trial tin I caught 81 rats . . . six on one tray on one occasion. One weighed 15½ ozs. Have now caught 58 rats in all.

GRIMSBY DOCK RATS

Messrs E. Bacon & Co., Ltd, write.—The results have been truly amazing . . . it seems possible that rats on the Grimsby Fish Docks might be almost exterminated. It is the finest rat-catching material we have ever experienced and we have tried a good many.

PREMISES

CLEARED

Messrs. Bookless Bros. (Aberdeen) Ltd., Aberdeen, write.—The first night 15 rats and mice were got, and the same DAK was used again for the next two nights. Since then we have not seen a sign of a mouse or a rat, the whole seem to have been cleared out of the premises, and it is certainly highly satisfactory to be in a position to have the dead rats removed rather than die in holes as with other preparations.

NO POISON
NO GERMS
NO DANGER

Leaflet post free.

EMPLOY the most modern and successful method. Get a 2/6 (4/6 or 14/6) tin of DAK Ratlime at a chemist or ironmonger or (postage 6d. extra) from the Sole Makers, KAY BROTHERS Ltd., Manufacturing Chemists, STOCKPORT. Medical and Public Health Officers are expressly invited to write for special bulk prices, leaflets for distribution and cinema slide



Don't let him defy you
kill him with RODINE

the fascinating and fatal Rat Remover. Rodine is the satisfactory solution to the Rat problem. No Rat can resist its powerful magnetism or revive from the effects of the first nibble it is forced to take. Every bite means a dead Rat.

40 RATS KILLED WITH ONE THIRD OF A TIN.

Mr. Powell, Much Cowarne, writes —“I consider there is no Rat Poison to equal Rodine. After using about one third of a tin the result was a clean sweep of 40 Rats. I keep fowls and pigs and have not lost one.”

100 RATS KILLED WITH HALF A TIN.

Mr Rutland, Miller's Farm, Wrotham, writes:—“This place was over-run with Rats even in daylight. I purchased a 1/3 tin of Rodine and used half of it. Result: first night 61 Rats and 39 the next two nights.”

YOUR CHEMIST SELLS RODINE,

Tins: 7½d., 1/3 and 2/6, post 3d.; 5/-, post 6d.

Sole Maker and Proprietor.

HARLEY, Manufacturing Chemist, PERTH, SCOTLAND.

The Rat Hunt.

From THE LANCET, 17th January, 1920.

The brief career of the Vermin Repression Society (now the College of Pestology) has been a glorious one, for, unlike its two predecessors, it has secured the passage through Parliament of a Rats and Mice Act, which if properly administered will go far to rid the country of a dangerous and destructive pest. Lord Aberconway, Chairman of the Society, who presided at the dinner, held at the Connaught Rooms, London, on Friday, January 9th, to celebrate the passing of the Act, queried whether the work of the Society having culminated in legislation, it might now be disbanded. But the Government representative at the dinner, Sir Arthur Griffith-Boscawen, said that he regarded the Society as only at the beginning of its work. The new Act empowered any local sanitary authority to carry out the destruction of rats on the premises of a negligent private owner, charging him with the expense incurred. The Act also empowered the Ministry of Agriculture to do the same in regard to negligent local authorities. The Vermin Repression Society should, he thought, undertake the task of keeping the new Ministry up to the mark.

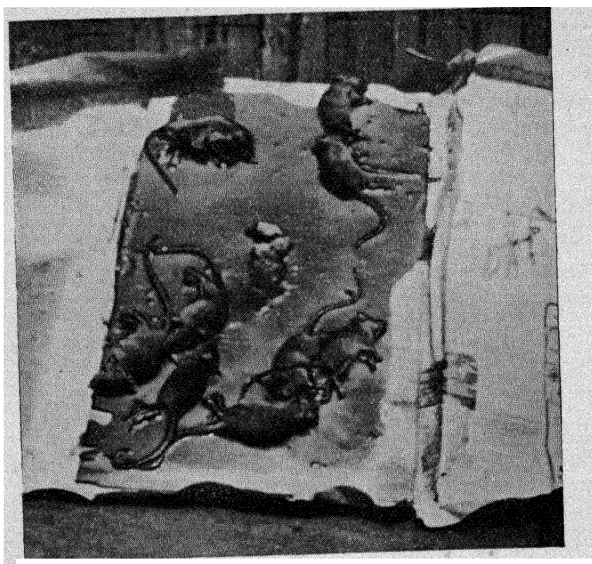
Rat Extermination.

BRITISH MEDICAL JOURNAL, 12th February, 1921.

An example of what can be done by the well-directed energy of a comparatively few enthusiasts, concentrating on one piece of work and doing that well, is shown by the results achieved by the Incorporated Vermin Repression Society (College of Pestology), the annual dinner of which was held in London on February 8th. This Society was the means of pushing the Rat Bill through Parliament, and after that useful object had been achieved it would have been wound up but for the fact that the Ministry of Agriculture urged the Society to remain in existence to encourage its special propaganda. At the annual dinner, Sir Bruce Bruce-Porter, who was in the chair, gave figures of the enormous destruction effected annually by rats, and suggested that the Boy Scouts' organisation might take up ratting as a part of its work, pitting the brain of the scout against the nimble brain of the rat. Professor W. J. R. Simpson spoke on the rat as a carrier of disease, and Professor F. Hobday and others spoke from the agricultural and other points of view. Mr. A. Moore Hogarth, the indefatigable honorary secretary, to whom much of the success of the Society is due, mentioned that the Society was going to offer its gold medal for the best rat virus that should prove harmless to human beings.

“RATKILLA”

**A clean non-poisonous and effective destroyer
of rats and mice.**



This photograph taken at the Royal Arsenal, Woolwich,
shows 9 rats killed on one “Ratkill” trap.

“Ratkill” is a litho varnish preparation,
clean and harmless to human beings and
domestic animals, and is used in the manner
described on page 34 of this leaflet. A 2s. 6d.
tin will make 6 traps as illustrated, and
a 7s. 6d. tin 20 to 24 traps.

Post Free.

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JOHN KIDD & Co. LTD.

11, Wine Office Court, Fleet Street, London, E.C.4.

THE RAT.

(Man's Implacable Foe, and a Nation's Economic Burden)

By A. MOORE HOGARTH, F.E.S. (*Founder and Chairman of the College of Pestology*).

No scheme of national salvage is complete that ignores the conversion of sound property into salvage by preventable agency; *e.g.*, carelessness and vermin. Just as small pieces of soap which when allowed to accumulate in a sink trap, rapidly decompose and become malodorous, so doing things in wrong places and animals whose utility is doubtful, become in varying degrees dangerous to the public.

Sparrows and Wood Pigeons exact a toll of food besides injuring and converting wheat, young clover, and other crops, into a modified salvage. They should, therefore, be kept down, and I suggest that the edible qualities of these birds might be exploited, for once they become an article of everyday diet, their numbers would be appreciably diminished.

On the other hand, well-defined sanctuaries might be promoted for Barn Owls, Kestrels, Robins and other useful and all insectivorous birds. Moreover, care must be taken to protect the Dunnock, or Hedge Sparrow, as it is sometimes called; it feeds largely on insects in their various stages of development and minute snails, as well as on small seeds, especially those of the grasses. This dainty, gently moving little bird, whose only resemblance to a house sparrow is the colouring of its wings, cannot be confused with the latter's bold bearing and quick movements, except by the most unobservant. It is, however, when we come to the Rat that we encounter man's most relentless enemy, an animal costing at least £70,000 per annum for food besides doing incalculable damage. The rat is not now required as a scavenger, if it ever was, and having no redeeming feature it should be exterminated.

That the Rat is a disease carrier of the first magnitude is now an established fact. Among diseases for which it is responsible may be enumerated the following:—

- (a) Plague. In India alone this disease killed 10,000,000 people during the course of 20 years, while in England during October, 1910, cases of "pneumonic plague" were notified by Dr. Sleight in the Samforth Rural District of E. Suffolk.
- (b) Trichinosis. In Germany a large staff is constantly employed in examining pig meat for *Trichinæ*.

- (c) Rat Bite Fever. Sir Thomas Horder, Bart., K.C.V.O., M.D., read a paper on this disease before the Association of Physicians of Great Britain and Ireland at Dublin, June 4th, 1909, in which three specific cases of serious illness were provedly attributable to Rat Bite.



THE PLAGUE AT ASHDOD. AFTER POUSSIN.

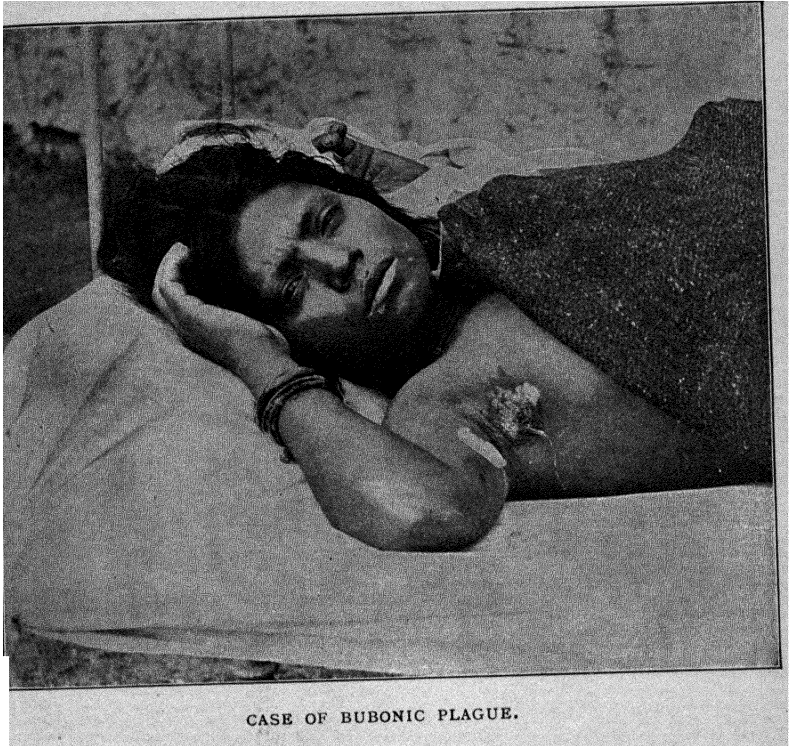
- (d) Spirochætal Jaundice. Col. Andrew Balfour, C.B., C.M.G., M.D., at a Deputation to the Ministry of Agriculture on 24th January, 1921, gave it as his opinion that the Rat is afflicted with malignant jaundice, which, although harmless to the rat, was very serious in man.

The Rat is also responsible for the transmission of diseases to other animals.

The Rat is certainly as inimical to his animal companions as he is to man, and it need hardly be said that in districts where outbreaks of such diseases as mange, distemper, and

foot-and-mouth disease occur, rats should be regarded with grave suspicion, sought out and killed.

We know, too, that there are numbers of cancerous rats, and while I do not suggest definitely that rats are a cause of cancer in man, I do suggest that comparative regional tables showing the percentages of cancer deaths do show the districts in which they occur to be rat-infested in a large number of cases.

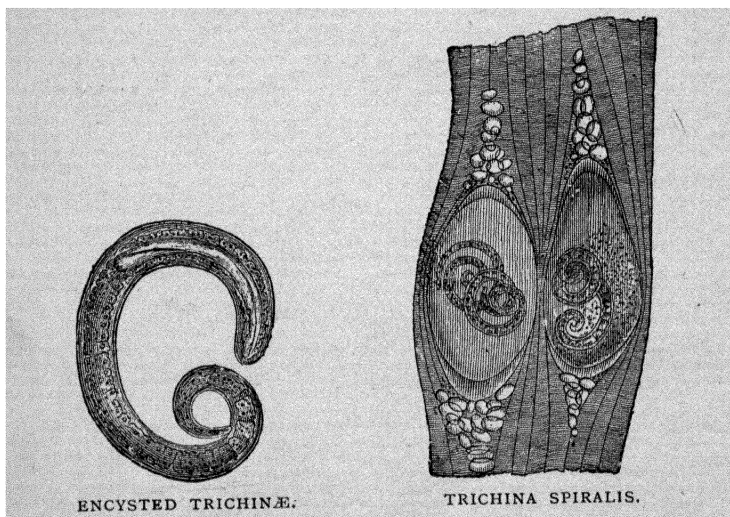


It must not be imagined for a moment that the rat "scare" is an imaginary evil of exaggerated proportion. San Francisco had realised before 1908 the dangers attending unrepressed rats; and on 1st January, 1901, there was published the following account of San Francisco's War against Rats, taken from the *American Review of Reviews*, where Mr. Augustin C. Keane describes in detail the determined war waged by San Francisco last year directly upon rats and indirectly upon bubonic plague.

As a first step the city was divided into thirteen districts, each with its officer and an army of subordinates—a thoroughly military plan of campaign. On a large map of the city the spread of contagion and the operations of and against the rats were marked with coloured pins. Then came the difficulty that there were not enough different colours among pins, and one expedient after another was tried, till it occurred to someone to dip the heads in different kinds of coloured sealing-wax. Yet another difficulty occurred which no one had foreseen. Tags were used to mark the captured rats, showing where, when, and by whom they had been caught. But only after much ado and two months trying was a satisfactory, untearable tag found.

Methods of Attack: Trapping Rats.

First, the rats were systematically trapped in each district, at the outset 13,000 being caught per week. They were then immersed in bichloride of mercury, which killed both them and their parasites, and then sent to a laboratory to be scientifically examined. If found to be plague-infected, the tag showed



from which district a rat had come, and proper notifications and instructions were given; and if there had been any contact with plague-infected rats, and eight-days' watch was kept. All trapped rats were also skinned and microscopically examined. Five varieties of rats were found in San Francisco—the big grey Norwegian rat, the ordinary brown rat, the red rat, the house mouse, and a rare hybrid.

The fleas were always combed out of a rat's fur and preserved in phials, one phial for each rat's fleas, for it is, of course, the fleas which carry the infection in the case of bubonic plague. Five kinds of fleas were found; sand-fleas, rat-fleas, mouse-fleas, dog-fleas, and the plague-flea of India. The entomologist employed had the pleasing task of identifying about 10,000 fleas.

Poisoning Rats.

Rats were also systematically poisoned by bread cut into cubes and laid about where rats, but no human beings, would get it. Record was kept of where the bread was laid, and how much of it, etc. But so quickly do rats breed that trapping and poisoning alone would never have stamped them out, or sufficiently kept their numbers down.

Starving Rats.

Accordingly, the enemy had to be attacked by cutting off food supplies as much as possible. No refuse was allowed to accumulate where rats could get at it. The utmost care was taken as to the disposal of refuse, and everything was done in order to induce those people who did not already use sanitary dust-bins to use them at once. Entrances to all markets had to be screened, sanitary chicken-coops provided, and stables fitted with metal-lined food and refuse-bins. The municipal authorities naturally helped in this war against rats, especially when force had to be exercised in order to compel people to take the sanitary precautions necessary for exterminating the rats.

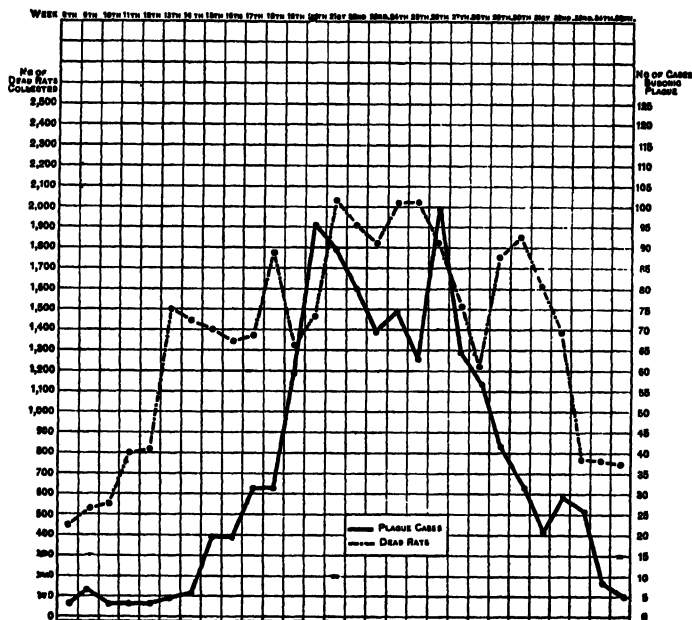
Making Buildings Rat-proof.

As far as possible San Francisco was made rat-proof. In order to do this basements and ground-floors had to be made of some rat-proof material, concrete being found to be best, and wooden sidewalks replaced by concrete ones; and, secondly, buildings had to be screened near the ground. Stables especially had to be rigorously rat-proofed. Sewers damaged by the earthquake had to be similarly treated, and warehouses (great harbouring places for rats) to be built of reinforced concrete. Finally, the wharves, which used to be of wood, and across which doubtless many rats had found their way, are to be built of stone and concrete. Also an isolation hospital was built for treating plague cases. With these numerous and rigidly enforced sanitary precautions, San Francisco contrived to have a plague death-rate of only 48.42 per cent., as compared with India's of 90.60 per cent. .

Among all vermin the rat stands unique as a consumer of foodstuffs and as a destructive agent. The loss occasioned by the rat in his search for food, drink and home is also considerable.

To enable one to realise the vast depredations of the Rat, the following illustration of the approximate cost of rats to the Nation (based on an estimate of one penny per day per rat) may be useful. The cost of feeding rats per annum would pay for any one of the following items. —

- (1) 16,500,000 quarters of Wheat.
- (2) 1,864,235,290 bottles of Bass.
- (3) 220,000,000 gallons of Beer.
- (4) 2,640,000,000 loaves of Bread.
- (5) 66,000 Freehold Houses.
- (6) 44,000,000 tons of Coal.
- (7) 6,600,000 tons of best Hay.
- (8) 2,000,000 horses, or it would keep a large Hospital for 500 years.



All informed authorities are agreed that the rat stands unequalled among animals for ubiquity and destructiveness.

* It is only when we come to the repression of the rat that we become even faintly acquainted with his numbers, his organisation, power and cunning. Only when we attempt repressive measures do we realise the fact that the rat, besides consuming and contaminating our food, destroying articles of daily use, killing our young live utility stock, polluting our

rivers, and honeycombing our countryside farms, warehouses and docks, employs quite an army of people; (a) Making viruses; (b) making poisons; (c) making traps; (d) putting into operation a, b, c; (e) making bacteriological tests as a plague preventive measure; and (f) repairing rat ravages. So that the plague is genuinely terrible, it would be no fanciful estimate that placed the cost of the rat scourge to the Nation at over £100,000,000 per annum. The rat problem is not only National, it is International, and for that reason I advocate that:—

- (1) An International Commission be created to extract the best of all existing rat laws and codify them in such a manner as to ensure their being concurrently effective in all countries, and in all ships and vehicles of water transport.
- (2) Our own rat laws be amended: (a) to make rat trafficking a crime; (b) to make rat reinfestation a crime; (c) to make financial provision for the carrying out effectively of the rat law; (d) to make it an obligation upon the Ministry charged with the administration of the Act to enforce its being carried out by the authority concerned. And, that the Owner jointly with the Occupier be made responsible for the carrying out of the Provisions of the Rats Act. This latter suggestion, together with a recommendation that Parliament should make financial provision to enable the Ministry of Agriculture to carry out its onerous duties imposed by the Act was unanimously carried in the form of a Resolution at the Conference of Medical Officers, Rat Officers, Sanitary Inspectors, and other Public officials at the Section of the College of Pestology Conference, September, 1927, which, presided over by Sir Thos. Horder, Bart., specially debated the working of the Rats Act.
- (3) All *bona fide* rat-catchers be registered and given instruction in elementary pathology, sanitary engineering and hygiene, and certificates be issued to competent and honest persons engaged in this business, withdrawable publicly in the Press in the event of petty larceny, offences against the Rats Act or for other specified reasons.
- (4) Twice a year all British authorities be compelled to co-operate and synchronise their efforts in rat destruction, and during the period public lectures on rat destruction, rat-proofing, and the necessity for eliminating possible rat-breeding grounds, be organised by the authorities.
- (5) The authorities responsible for the zoological laboratories of all universities, colleges, and institutes be

invited to set apart a portion of their time for the teaching of economic biology in so far as it concerns the rat, the diseases it carries, its movements, the nature and extent of its depredations, its natural enemies, and the known poisons which are safe to use, this with the view of discovering improved methods of ensuring its destruction.

- (6) In all elementary schools pupils be taught the life-history of the rat, regarding the rat as man's natural enemy, the toxicity of the various raticides in common use, the value of the barn owl (*Strix flammea*), the ferret, the weasel, the common kestrel, and the pine marten, the use of baits, varnishes, traps, the progress made by gassing as a method of rat destruction in ships and in places where it is possible to confine the gas, and the best methods of destroying rats (by water-flooding) in their runs, an effective method of killing rats in the country.
- (7) All local authorities should frame their bye-laws so as to encourage rat-proofing, and all employers of labour should exhibit in canteens, etc., a card, 12 in. by 10 in., warning their employees against leaving about the debris of food, and a reminder: "NO SCRAPS, NO RATS."

It cannot be urged too strongly that of all remedial measures against the rat, the most important are rat-proofing and the withholding of food and water, especially water, for rats can exist much longer without food than without water.

Among remedial measures one cannot improve very much on the U.S.A. Bureau of Agriculture Report, which deals with the problem very thoroughly and from which I have made appreciatingly copious notes.

Removal of Shelter.

"To remove places where, without fear of molestation, rats make their homes and raise their families is one of the most important problems in rat control. The surest way to permanent rat riddance is the removal of favourable rat harbours, for a rat will not remain where safe and comfortable shelter is not available.

"The most common rat harbours are dead spaces within double walls and beneath floors. Considerable effort is usually required to abolish these shelters, but it is often essential to permanent rat control. Double walls may be shut off from rats by stopping the openings left between the studs and floor joists just above the sill. In new structures these spaces should be filled to a height of 4 inches above the floor with cheap or broken bricks, a mixture of cinders and cement, or some other similar non-combustible material. In old buildings walls may be stopped by fitting sheet metal between the joists and nailing

it to the sill. Sealing hollow walls by these means is commonly called fire-stopping. It is now required by the building regulations of many cities and is of great value not only in retarding the spread of fire but also in improving insulation against heat and cold.

"Wooden floors in buildings without basements, particularly on farms, provide a free shelter for rats. Where possible these floors should be replaced by concrete, with retaining walls extending 2 feet underground to prevent the rats from burrowing under the floor from the outside.

"Other common rat shelters are those provided by stored produce and supplies, lumber piles, and accumulations of trash and refuse. Waste should be disposed of promptly and stored materials elevated on platforms at least 18 inches off the ground or floor." Summed up I suggest that, in order to keep down the number of rats, disused buildings and lumber heaps should be cleared frequently, or made rat-proof.

Access to buildings is open to rats by—

- (a) Defective drains, particularly broken joints at lavatories, sinks, etc. If in doubt ask the sanitary inspector to call and test the drains. The course of service pipes led into buildings through holes which are too large is another opening. These should be cemented and tightly packed up.
- (b) Burrowing under floors, doorways, etc. Fill up burrows with broken glass and cement; failing this, with gas tar or chloride of lime. It must be realised that the filling in of burrows is quite futile unless their constructors—rats—are destroyed, otherwise new burrows will be quickly made. Cement, asphalt, or concrete the basement floors, repair doors and protect door foot with sheet iron and basement windows or openings with galvanised wire netting $\frac{1}{2}$ inch mesh.

Poisons.

Among the poisons mostly employed are arsenic, strychnine, phosphorus, barium carbonate. Rat-catchers prepare these poisons in varying ways, according to their knowledge of rat-craft. Flour, sugar, oil of aniseed, carraway and musk, figure largely in the various prescriptions.

1. A 30 per cent. or 40 per cent. mixture of barium carbonate properly blended with oatmeal or a fatty base forms one of the safest and most effective poisons, particularly for town or city use. It is not enough, however, merely to mix barium with any sort of tallow, dripping, lard, or fat, for experience shows that such haphazard compounds defeat their own

ends, being unattractive and scaring off the rats. Barium carbonate is a good method of rat poisoning and relatively cheap; only 2-2½ grains are required to kill a rat. Given the right base, carefully selected after trial, this is the ideal bait, since it is ready for use without troublesome preparation, always attractive, and most important, it may be used indefinitely by cross-baiting on a variety of foodstuffs. Barium carbonate preparations in bulk may be obtained from The Rodent and Insect Pest Destruction Co. Ltd., The Haller Laboratories, and other well-known London houses.

2. A well-known Continental way of destroying rodents is to bake a pancake—egg pancake not essential but beef dripping advisable—to which 20 per cent. of finely chopped *Scilla maritimus* (red variety) is added, either to the batter before frying, which is simpler, or placed between two layers of pancake after frying. When cold the pancake should be cut in pieces of about ½ inch square and laid in the rat runs or holes.

Rats are particularly susceptible to the effects of *Scilla mar.* (Squill). The lethal dose is ½-1 grain. Squill may be obtained from The British Drug Houses, Ltd., and Messrs. Pinnock and Co.

The following anti-rat measures recommended by the U.S.A. Bureau of Agriculture are most practical and efficacious.

Barium Carbonate.

Barium carbonate (precipitated) is a heavy, white, mineral salt, mildly poisonous, tasteless, odourless, slow in action, and inexpensive, all of which characteristics contribute to its value as a rat poison. This compound has been proved also highly effective and dependable for killing rats when used in the proper way, and is therefore recommended above other poisons for this purpose wherever it can be used with safety. The only serious objection to barium carbonate is that baits containing it cannot be distributed freely without endangering other animals. Although comparatively mild and far less dangerous than most of the poisons commonly used in commercial rat baits, it is nevertheless fatal to chickens, dogs, cats, and larger animals if eaten in sufficient quantity.

Barium carbonate can be used with safety, however, even in poultry runs if sufficient care is taken to expose it in such inaccessible places as behind or under boxes or behind boards leaned lengthwise against a wall to form a natural runway. In such cases the bait should be either in the form of meal or so wet that the rat cannot drag it from cover.

The following directions for using barium carbonate have

been carefully worked out and found to produce the best results:—

KINDS OF BAIT.

A variety of baits used separately gives the rat a choice of foods and increases the chances of the bait being taken. One kind of each of the following classes of food mixed separately with barium carbonate is recommended:—

Cereals, such as bread, corn meal, and rolled oats.

Meats, such as Hamburg steak, sausage, sardines, or eggs.

Fruits and vegetables, such as apples, melons, and tomatoes.

Baits should be fresh and of good quality. Fresh kitchen scraps or garbage can be worked into the ration to advantage, but in such case it is desirable to run meat scraps and other hard food through a chopper to facilitate mixing with the poison.

HOW TO PREPARE BAITS.

The powdered barium carbonate should be thoroughly worked into the soft cereal or ground-meat baits with the hands or with a spoon, in the proportion of 1 part to 4 parts of the selected food. Add water when necessary to make the baits moist. In dry weather baits moistened to the consistency of soft mush are particularly acceptable to rats.

Barium carbonate should be sifted over sliced fruit and vegetable baits and rubbed well into them with the fingers or a knife. The slices should be thin and should be moistened, if necessary, to attain as nearly as possible the 1 to 4 ratio.

HOW TO DISTRIBUTE BAITS.

A teaspoonful of the prepared mixture is a sufficient quantity for the average rat bait. Put the baits in places frequented by rats, preferably where they have been observed to feed.

A convenient and successful method of exposing baits is to wrap teaspoonful quantities in small squares of newspaper or place them in small paper sacks and to close them by twisting the tops. When a variety of baits is used, wrap each kind separately and expose one of each kind in groups, or in sequence, to give the rats a choice. In public places, where there is a possibility of their being disturbed, baits should be wrapped and the packages labelled POISON.

It is important that a sufficient number of baits be distributed at one time to provide an ample supply for every rat on the premises; otherwise the resulting mortality will arouse the suspicion of the rats that are unharmed and will render subsequent baiting less successful. It is much better to prepare an excess of bait than not enough.

Baits should be distributed in the evening; so they will be

fresh when the rats are feeding. Uneaten baits should be picked up the following morning and destroyed, as stale baits usually are unattractive to rats and as the acids resulting from souring baits render barium carbonate bitter and objectionable.

If the poisoning has been carefully carried out, a high mortality may be expected. It often happens that the destruction of a large proportion of rats on premises results in frightening away the remaining few, so that moderately successful poisoning sometimes results in a complete clean-up. Should the poisoning operations not be wholly successful, it is well to wait two weeks or more before repeating with other baits.

PREBAITING.

In stubborn cases, or when one is willing to go to additional trouble to increase the chances of success, prebaiting is recommended. This consists of exposing fresh, unpoisoned baits, prepared precisely as the poisoned baits will be later on except for omitting the poison. If these are taken freely the first night, poisoned baits should be substituted after an interval of one or two nights. Otherwise clean baits should be exposed at two or three day intervals (picked up in each case the following morning), until any suspicion the rats may have has been overcome and they take the baits without hesitation. When this occurs, they will doubtless take the poisoned bait the next night, and then the result should be a complete clean-up of the infestation.

Caution.—Barium carbonate is a relatively mild poison, but the danger from accidents must be emphasised. *Keep it out of the reach of children and irresponsible persons and from domestic animals and fowls.*

Antidote.—Give an emetic consisting of either mustard or salt dissolved in warm water, or induce vomiting by inserting the finger in the back of the throat. Follow vomiting with a liberal dose of Epsom or Glauber salts.

Red Squill.

Squill is a perennial bulb that grows wild along the coast of the Mediterranean Sea. The bulbs are pear-shaped, usually from 3 to 6 inches in diameter, and weigh up to 5 lb. There are two commercial varieties, the white, used in medicine as a heart tonic, emetic, diuretic, and nauseant expectorant, and the red, which in addition has toxic properties of use as a rat poison. Squill contains calcium-oxalate crystals, which, on coming in contact with the skin, cause a sensation similar to that of a nettle sting.

Red squill as a rat poison has the distinct advantage of being relatively harmless to human beings and domestic animals. This is due in part to its acrid taste, which is highly

objectionable to most animals, and also to the fact that it usually acts as an emetic when taken in dangerous quantities. Rats, however, usually take it readily and do not vomit, so that red squill approaches the unique position of being a poison specific to rats. Active red squill preparations are therefore of particular value where the use of more toxic products would be inadvisable.

The chief objection to squill is that it has no uniform toxic standard, so that commercial red squill rat poisons are apt to vary considerably in potency. It is therefore important that individuals, as well as dealers, purchase their supplies from manufacturers who will guarantee the toxicity of their products.

Red squill is marketed in both liquid and powdered form, and either one is effective. The powder, as a rule, however, is more toxic to rats, less expensive, and keeps better; it can also be mixed readily with a wide variety of baits.

DIRECTIONS FOR PREPARING RED SQUILL BAITS.

Because of the variability of commercial red squill, it is necessary in preparing rat baits to vary the proportion of red squill to the foods used. Directions for use accompanying red squill products purchased should serve as a guide in this respect. The proportions given in the following directions, however, will be found to apply in most cases:—

Cereals.—Mix thoroughly together, dry, 1 part, by weight, of powdered red squill and 10 parts of any cereal meal, as oatmeal, corn meal, graham flour, or bran. Peanut meal also makes an attractive bait. One level tablespoonful of dry squill to one measuring cup of meal is the right proportion.

Butters.—Mix together or “cream” 1 oz. of powdered red squill and 2 oz. of good butter. Cut half of a pound loaf of bread into very thin slices and spread liberally and evenly with the squill-butter mixture and make “sandwiches.” Cut each sandwich into six smaller ones for rat baits.

Ground Meats.—Scatter or dust with a pepper shaker 1 part, by weight, of powdered red squill over 10 parts of Hamburg steak, sausage, or other ground meat, or minced sardines. Mix thoroughly to ensure even distribution of squill.

Fruits and Vegetables.—Using a pepper shaker, dust powdered red squill over thin slices of fresh fruit or vegetables and stir or shake as the powder is applied to ensure even distribution. A small musk-melon, for example, should be cut into about 16 slices and each slice cut into 3 sections. This will require an ounce of powdered squill and will make 48 baits. Three medium-sized tomatoes or three bananas each cut into about 16 sections may be similarly used for each ounce of squill powder.

Liquid red squill should be used only with a dry bait capable of absorbing about double its weight of liquid. Cut one-half pound of stale bread into half-inch cubes, place in a clean dish, and pour 1 pint of liquid red squill over them and mix gently with a spoon. Use several cubes for each rat bait.

DISTRIBUTION OF SQUILL BAITS.

In exposing squill baits the directions for distributing barium carbonate baits, as given on previous pages, may be followed to advantage in a general way. Barium carbonate, being tasteless, may often be repeatedly used with success, whereas squill has a taste that, although not objectionable to rats, would probably be associated by them with the ill-effects suffered from former nearly fatal doses. It is therefore desirable for best results that prebaiting be practised and that a sufficient quantity of bait be exposed on a premises at one time to dispose of all rats present.

Although barium carbonate baits must be moistened with water to overcome the objectionable feature of a dry powder in the mouth, squill is effective when mixed with a dry cereal meal, and should keep in good condition for a long time. A bait that keeps well may be left exposed for an indefinite period in poison caches, where it will be of value in protecting premises from rats and mice that may from time to time find their way into buildings temporarily vacated. Although the department has not found squill injurious to domestic animals, it is recommended that baits be placed where other animals will not have access to them.

Other Poisons.

Relatively mild rat poisons, as barium carbonate or squill, are usually effective and are recommended in most cases. Sometimes, however, some of the more active poisons are necessary for complete success. In using a highly poisonous preparation additional care is necessary to prevent accident. Of the many poisons that will, when properly prepared, destroy rats, phosphorus, arsenic, strychnine, and thallium are of outstanding usefulness and form the basis of the majority of commercial rat poisons.

Phosphorus is used extensively in commercial rat poisons. It has distinctive taste, odour, and luminous properties by which it may be readily identified, but to which rats apparently do not object. Though undoubtedly effective against rats, phosphorus is dangerously poisonous, and in the absence of a good antidote is considered unsafe for general use. Fire hazard connected with the use of commercial pastes containing this element probably exists only when the percentage of the phosphorus is too high and the paste is not thoroughly mixed.

Powdered white arsenic, or arsenious oxide, is widely used in commercial preparations for the destruction of rats. It is practically tasteless and odourless, and is usually taken readily when mixed with attractive baits in the proportion of about 1 part poison to 20 parts food, although a slight grittiness detracts somewhat from its palatability. A finely pulverised, non-gritty form of white arsenic has recently been demonstrated by the department to be of greatly increased toxicity. Arsenic is somewhat variable in its effect upon rats, and if they survive a first dose they will refuse subsequent baitings. It is highly toxic both when taken internally and through local external application, and great care must be exercised in its use.

Strychnine is extremely poisonous. It has a bitter taste that must be disguised if it is to be used successfully as a rat poison. Its rapid action also increases the chances that rats may die in walls and other inaccessible places in buildings. Strychnine is therefore not recommended for use in poisoning rats in buildings, but has been found useful under certain conditions in the open.

Thallium sulphate is a salt of thallium, a heavy metal similar to lead in its physical properties, which is now being extensively sold both in Europe and America as a rat poison. It is a cumulative and powerful poison, slow acting, and certain in its results. It is also tasteless and odourless, so that were it not for the grave danger attending its use it would make an ideal rat poison. Without taste or smell to identify it, however, such as have strychnine and phosphorus, thallium sulphate should be used only with the utmost caution, as it is most dangerous to human beings as well as to domestic animals.

Fumigation.

The fumigation of rat burrows and other rat harbours is a simple and highly effective method of destroying rats, and is recommended for use wherever a sufficient concentration of gas can be obtained readily. Unfortunately, however, rats are found in many places that cannot be reached with gas, so that this method must usually be combined with poisoning or other methods of destruction.

In certain buildings, where insect pests, as well as rats or mice, are a serious problem, as in flour mills, grain elevators, packing houses, and even in stores and dwellings of certain types, the fumigation of the entire building with a poisonous gas becomes the most practicable method of pest riddance. This type of fumigation, however, on account of the danger involved, should be entrusted only to experienced men recommended by local health authorities. Rat burrows or harbours, on the other hand, can be gassed by any intelligent person without danger of accident, if directions are carefully followed.

Calcium Cyanide.

Of the many chemicals commonly employed for destroying rats in their harbours, crude calcium cyanide dust is of outstanding usefulness. Calcium cyanide is a compound that rapidly gives off hydrocyanic, or prussic, acid gas when acted upon by the moisture in the air. This gas is extremely poisonous and in sufficient concentration is destructive to most animal life. It has recently come into prominence in connection with control operations directed against various rodent and insect pests, and the dust form of the compound has proved a highly effective agent in favourable situations for local extermination of rats.

Calcium cyanide dust may be used to advantage in destroying rats in open burrows in fields, along ditch banks and levees, in city dumps and sanitary fills, around the exterior of buildings, under sidewalks, pavements, and tight floors, in lumber piles, rubbish, and other accumulations, in walls and hedgerows, in corncribs, and sometimes in hay or straw stacks. It is particularly suited for use on farms and poultry plants and around city dumps.

The dust is used most effectively by forcing it into rat burrows or other harbours by means of a portable dusting pump or duster with a flexible hose attached. A few strokes of the pump will fill most rat burrows with the smoke-like dust, which will emerge from all connecting openings and thus indicate the extent of the system. All openings through which the dust escapes should be closed with earth, sod, or other material.

In double walls of farm buildings, lumber piles, or corncribs, where the escape of the gas cannot well be prevented, it is necessary to use much more dust than in an air-tight burrow. Dusting should be done on a still day, so that draughts or air currents will not quickly carry the gas away.

In dusting corncribs some of the powder should be forced into the corn about midway between the top and bottom of the crib and then should be pumped in all around near the bottom at 3 ft. or 4 ft. intervals. A short length of iron pipe driven into the corn that is to be dusted will aid in getting the chemical well into the centre of larger cribs. It is also suggested that one or more perforated iron pipes be laid on the bottom of the crib before filling to facilitate the later entry of poisoned gas. Such pipes should extend the entire length of the crib to allow application of dust at either end, one end, of course, being plugged while the dust is pumped in at the other. Holes about a quarter of an inch in diameter should be bored along each side of the pipe at 6-in. intervals, staggered to permit an even escape of gas along its length. Pumping gas into the projecting pipes as occasion demands will enable the farmer to keep his corn free from rats.

The use of gas in haymows is less practicable, because the quantity of dust required is usually out of proportion to the results obtained.

There is little danger attending the use of calcium cyanide dust in corn or other edible products, because the gas becomes entirely dissipated in a few hours and the residue is non-poisonous. To be entirely safe, however, the corn should not be fed for several days after dusting.

There are several types of dusting pumps on the market suitable for use in forcing calcium cyanide dust into rat harbours, but a foot-pump duster, similar to a bicycle pump but of greater diameter, most nearly meets requirements in poultry plants and on farms, city dumps, and other large premises. This type of duster will enable the operator to force the dust into the extremes of rat systems which it is impossible to reach with a less powerful pump. For use around the exteriors of residences, however, and in other places where only burrows in the ground are involved, a smaller inexpensive hand-pump duster will give satisfactory results. Dust pumps should be lubricated with powdered graphite each time they are used and always be emptied before being put away.

Caution.—Both the calcium cyanide dust and crystals and the hydrocyanic acid gas given off by them are extremely poisonous and should be handled with the utmost care. This poison should not be used in enclosed buildings or transferred from the container to the duster indoors. Avoid breathing the gas given off, and always wash the hands after handling the poison. The dust rapidly deteriorates upon exposure to air, so that the cans should be quickly and tightly closed after removing part of the contents. *Store in a safe place away from the house and out of reach of children, irresponsible persons, and livestock.*

Antidotes—For poisoning from calcium cyanide fumes breathe fresh air and inhale ammonia fumes as a stimulant. Artificial respiration should be administered if necessary. If calcium cyanide has been swallowed, the treatment to be of any avail must be undertaken with great promptness. The stomach should be immediately emptied with a stomach pump, as emetics often fail. Keep on hand 1 oz. of a 23 per cent. solution of ferrous sulphate, 1 oz. of a 5 per cent. solution of potassium hydroxide, and 30 gr. of magnesium oxide. These should be mixed in one-half pint of water before use.

The action from cyanide poisoning is so extremely rapid, however, that there is rarely time for any antidote to be of value.

Other Fumigants.

Exhaust gases from an automobile, tractor, or other gasoline engine may be successfully used in destroying rats in their

burrows, beneath floors, and in other reasonably tight enclosed places. The exhaust is directed into the rat burrow by means of a hose, and the entrance around the hose and all connecting entrances through which the gas escapes are sealed with damp earth. The carburetter is adjusted to obtain a rich mixture and the engine allowed to run at moderate speed for ten minutes or longer.

Carbon disulphide is effective in destroying rats in their burrows in the ground and may be used in fields or in holes in dirt floors in chicken houses, cellars, and similar places. The gas is more effective in heavy damp soils and during wet weather. A wad of cotton or other absorbent material should be saturated with 1 oz. (about two tablespoonfuls) of carbon disulphide and pushed as far as possible into each burrow entrance. Entrances should then be closed with moist earth to prevent the escape of the gas. Long forceps are convenient for handling the absorbent materials.

Caution.—Carbon disulphide is highly inflammable and explosive and should be kept away from all fire. As it evaporates rapidly, it should be kept in an air-tight container.

Sulphur dioxide, acetylene, and chlorine are used for exterminating rats and all are successful when properly applied. Sulphur dioxide particularly is widely used in Europe and has the advantage of being the least dangerous of the fumigants mentioned. The difficulties connected with its use, together with its relatively slow action, however, have prevented its becoming popular in the United States.

Trapping.

Trapping rats is just as effective as poisoning them, but it requires more skill and labour. It is recommended where the use of poison seems inadvisable. Careful attention to detail is necessary in trapping rats, as success will depend largely upon the skill and resourcefulness with which the traps are handled.

Although the more complicated traps and devices for catching rats are sometimes useful, the simple and inexpensive snap trap, sometimes called "guillotine," "spring" or "break back," has proved the most effective and consistent rat catcher. There is little choice among standard makes of this style of trap; selection should be governed by apparent strength and durability. The essential part is a very sensitive trigger provided with a hook or some other means of holding the bait fast. Large triggers have the advantage over small ones in providing a greater surface for the rat to step on and in being better adapted for use along walls and narrow runways, places where rats can be trapped successfully without baiting.

To get the best results the following directions for baiting and setting snap traps should be carefully followed:—

Kinds of Bait.

The selection of baits for trapping is as important as in poisoning. Fresh baits, changed daily, should be used. A variety of baits, such as meat, vegetables, and cereals, on successive traps will usually give better results than only one kind of bait.

One of the best single baits is doughnut. Bread is also good, but both of these must be fresh, for a rat will usually ignore them when only a little stale. Among other foods that may be used as alternative baits are raw or cooked meats, bacon, fish, apple, melon, tomato, carrot, and nut meats. These may sometimes be made more attractive by sprinkling rolled oats, corn meal, or powdered milk lightly over the trap. Cheese, although an excellent bait for house mice, is not attractive usually to rats. Almost any food suitable for human consumption will appeal to the gluttonous appetite of the rat, so that there should be no lack of variety.

Where to Set Snap Traps.

Rats rely on concealment for protection and avoid open spaces as much as possible. The best place to set traps, therefore, is close to walls, behind objects, in dark corners, or in any place where a rat would run for concealment. Traps should be set in such a manner that the rat in following its natural course will pass directly over the trigger. For example, in setting along a wall the trap should extend from the wall at right angles, the trigger end close against it. Boards may be leaned lengthwise against walls to form natural runways for rats and good places to set traps.

How to Set Snap Traps.

Baits should be large and fastened securely to the trigger by means of the trigger hook or tied with thread or fine wire, so that the rat will be sure to spring the trap when attempting to remove them. Traps should be set lightly to allow them to spring easily.

After most of the rats have been caught, the others sometimes leave the premises. Oftener, however, the remaining rats are not frightened away but avoid baits and prove difficult to catch. Strategy must be used in outwitting such individuals, and the most successful method is to camouflage the traps. Traps set on the ground may be sunk slightly below the surface. A small piece of paper or cloth should then be placed over the trigger end of the trap to prevent dirt from getting underneath and clogging the action, and the whole should be lightly covered with fine earth or sawdust. The same method may be employed on hard floors by burying the trap in a shallow pan of meal, sawdust, or grain. A trap set in this way may be placed in a runway without baiting, or

several pieces of bait may be scattered over it. In stubborn cases food may be exposed on pans of meal until the rats take it readily, after which the traps should be set in the meal. Stones, boxes, or boards will often serve to guide rats along an easy path over a trap.

Cage Traps.

Cage traps are in general less efficient than snap traps, although they are capable of catching a large number of rats at one time. Most of them are self-setting. A particularly effective trap of the cage type is a box-shaped wire-and-metal device, one end of which is raised and open when set. The end drops into place when released by the weight of the rat on the floor of the trap. The well-known French wire-cage traps will sometimes get desired results, but are not recommended for general use, although they have been improved somewhat with a simple wire catch that holds the trap-door open until the first rat has entered. Other rats are more likely to venture into the trap after the first one has been caught.

There are a large number of other cage traps and similar devices, many of which have some merit but no outstanding feature that would warrant describing them here. Cage traps of any kind are made more attractive by covering them with old burlap bags, straw, or other handy material. They should be set in places where rats are accustomed to feed and should be baited with a variety of baits as suggested for snap traps.

General Trapping Instructions.

An abundance of accessible food for rats makes trapping much more difficult. Before starting a trapping campaign put all food out of reach and stop the sources of supply. Plenty of traps should be used. Trying to catch a hundred rats with half a dozen traps will make those not caught suspicious and dishearten the trapper long before the job is half done. A dozen or more traps for a heavily infested dwelling and from 50 to 100 or more for farms and larger buildings are not too many. It is important that a sufficient number be obtained to make the campaign short and decisive. The cost of traps is little compared with the damage caused by rats.

Traps should be kept in good working condition and carefully examined before setting to ensure their instant operation. They should be kept reasonably clean, and may be boiled and scraped if they become foul. When trapping is done on a large scale, especially in damp places where metal parts of traps may rust, an occasional dipping in melted paraffin will lengthen their usefulness, cause them to spring more easily, and have a deodorising effect.

Trapping rats in larger buildings and on farms should be assigned to a man with a natural aptitude for such work. When interest is taken, only slight training is necessary for some men to become proficient in the work, and these should be encouraged to persistent effort.

I do not quite agree with the U.S.A. Report on *Viruses*. There is, in my opinion, a great deal to be said for Rat Viruses; indeed, there are cases where it is practically impossible to use, advantageously, any other kind of bait, for example, on farms where live stock of various descriptions are liable to pick up poison baits.

Even when poison baits are cunningly hidden the safeguard is not adequate, for the rats themselves drag them forth into daylight and their presence constitutes a serious menace.

It might be useful to remark that Messrs. Evans, Sons, Lescher and Webb, with "Liverpool Virus," and the Haller Laboratories with "Danyasz Virus," were Exhibitors at the first College of Pestology Exhibition, Central Hall, Westminster, in 1927.

The U.S.A. Report on *Deterrents* says:—

"Rats appear to have a marked aversion for certain odours and seem consistently to avoid them. This allows their use as rat deterrents, and this method has been found useful under certain conditions. In seed warehouses and similar structures where sacked grain is stored, it has been found that a liberal application of flake naphthalene scattered on the floor about the stacked grain and over the bags is objectionable to rats and will keep them away, and it does not damage the seed. Because of its odour the use of naphthalene is not recommended in places where food and foodstuffs are stored, unless the nature of the material is such that it can be thoroughly deodorised by airing before use.

"There are many other compounds said to be objectionable to rats, chiefly creosote, carbolic acid, and other coal and wood-tar derivatives, kerosene, and oils of peppermint and winter-green.

"Compounds that rats avoid may often be used where an odorous preparation would be objectionable. Among these are powdered sulphur, lime, lye, and copperas. Sulphur particularly has been used successfully in protecting stored grains, such as corn, from the ravages of rats.

"Deterrents may often be used to advantage to prevent reoccupation of old burrows and other rat habitations after a successful campaign of destruction.

Deodorants.

"There is always the possibility that a rat will die in an inaccessible place, where its body will decay and cause obnoxious odours, particularly if near steam pipes or other

warm place. In such cases the nuisance can be abated to some extent by the use of a deodorant that will absorb, neutralise, or destroy the offensive odours of putrefaction.

"Of a number of deodorising compounds tested in the laboratory, lysol* was found most effective in counteracting putrefactive odours. If possible, a small hole should be bored through the wall in the vicinity of the supposed point of origin and several tablespoonfuls of lysol* inserted, after which the hole may be plugged. Pine-wood oil or perfume may also be added if desired. Zinc chloride may be used in the same manner."

Natural Enemies of Rats.

A good rat dog is almost indispensable on farms where old buildings offer ideal quarters for rats and constantly attract large numbers of them. Small terrier dogs, particularly when taught to hunt by themselves, will often keep a farm free from rats. Cats that are of real value as ratters are rare, and they are usually destructive to bird life. When confined, however, in warehouses, produce depots, and similar places in cities, good cats are sometimes of value in destroying rats and mice. Ferrets are of little use ordinarily except in the hands of experienced men aided by good rat dogs.

Although naturally burrowing rodents, rats do not ordinarily become excessively abundant in fields and woodlands because of their numerous natural enemies among the smaller mammals and birds of prey. If the relation of hawks and owls to rat infestation on the farm were better understood, the killing of such valuable birds would be confined to those actually caught preying upon poultry, and others would be left to their work of reducing the number of rats and other injurious rodents. This policy would tend to lessen the numbers of the three species of hawks and owls that live to any considerable extent on poultry and birds, while the more than forty beneficial species of predacious birds of these groups would be spared.

The U.S.A. Bureau of Agriculture deals with rat destruction very thoroughly. It is imperative, however, that the greatest care should be taken when resort is made to the use of poisons. The Protection of Animals Act, 1911, which restricts the use of poison matter, provides that it shall be a defence that the poisoned matter was placed by the accused for the purpose of destroying rats, provided also that he took reasonable precautions to prevent access thereto of dogs, cats,

* I prefer "Monsol," 1 in 20, to lysol as a deodorant "Izal" is also an efficient and most powerful bactericide when thus used, and having regard to the part the rat plays in the transmission of disease, this bactericidal optimum is an important factor.

fowls or other domestic animals. This means, of course, that poisons must be used with great circumspection and always under supervision of a responsible person.

In addition to the various poisons, an effective method of getting rid of rats on farms is by means of a water-cart. A nozzle with a $1\frac{1}{4}$ -inch bore attached by tubing to the water-cart should be inserted in one of the rat holes. The other rat holes should be carefully watched by men with dogs, and when all is ready for action, the water should be turned on. This will have the effect of driving the rats out of the other ends of the runs, where they may be killed with sticks and by dogs. The nozzle should be inserted in the highest hole and the lower holes not stopped up until the rush of water from them is appreciable. Each hole should be stopped up in succession so that the water may rise in the burrows and thus drive the rats to escape by the other holes. When the water has risen to the top hole, the burrow should be kept filled for at least three minutes, because rats will remain strong and active under water for more than two minutes, and it is necessary to ensure that those remaining in the burrows are drowned.

It cannot be too well known that, in placing baits for rats, it is an advantage to run a trail with oil of aniseed, for some nights previously, to non-poisonous food; in this way the rat gains confidence, and, when the real baits are set they are, of course, more effective.

A useful method of trapping rats around farm buildings is to run a trail of chaff near places frequented by the vermin, and two or three nights after the first trail has been laid to smear the trail generously with birdlime. This method is only effective in dry weather.

When ferreting is employed as a method of destroying rats, the rat holes should be closed immediately the rats have been driven out.

When ferreting a building, or a bank, one ferret only should be employed at a time. A second ferret, however, should be put on a line in case the first one lies up, so that its position may be readily detected, as a line can be traced, whereas a hole quickly becomes obliterated if an attempt is made to follow it without such a guide.

Another method of killing rats, which provides a certain amount of sport, is by shooting them while they are feeding in the morning and evening. This method is very useful near poultry runs, and one of my correspondents has had very great success by placing a little meal about 2 feet in diameter on the ground, and in the centre on the meal placing a little corn. The effect of this is that the rats are easily seen in the twilight when eating the corn, and they provide some useful and decent sport.

I am indebted to Dr. W. J. Howarth, Medical Officer of Health of the City of London, to whom every rat hater owes

a big debt of gratitude for his splendid pioneer work in the City, for particulars of a method of killing rats, hereunder:—

Litho Varnish Traps for Rat-Catching.

The varnish used is strong lithographic varnish spread about $\frac{1}{8}$ th to $\frac{1}{4}$ th of an inch in thickness on strawboards (thickish cardboard) measuring about 15 in. by 12 in., leaving a margin of an inch or so from varnish. The varnish should be warmed by placing the container holding it in boiling water. After warming, it will run, in which condition it should be spread over the strawboard, using a painter's stripper or other suitable tool. Place a bait in the centre of the card where it will adhere to the varnish.

The best bait to use is one which is different from the food the rats find on the premises; for example, in fish shops, use meat, cheese or bread; in grain stores, warehouses or restaurants, bloaters, red herring or cheese is effective. It is advisable to vary the bait.

A varnish trap is effective for about four days, when the old varnish should be scraped off and fresh varnish applied.

The traps should be placed along the "runs" or near the rat holes.

The litho varnish may be obtained, among other places, from—

Messrs. JOHN KIDD & Co., 11, Wine Office Court, Fleet Street.

Messrs. B. WINSTONE & SONS, LTD, 100-101, Shoe Lane, E.C.

(N.B.—*Rat-Catching Varnish should be asked for.*)

This varnish is suitable for all ordinary places, but a stronger varnish should be asked for if it is to be used in very hot kitchens, boiler houses, etc., where steam is kept up all night. One pound of this varnish is sufficient to make six traps, 15 in. by 12 in. The varnish traps are useless in wet places.

A very reliable preparation of Ratlime called "Dak," made by Messrs. King Bros, of Stockport, is worthy of honourable mention too.

In infested places traps should be laid nightly so long as rats continue to be caught.

Dr. Howarth desired it to be understood that his experience has been gained entirely *within* premises, and I would amplify his conclusions by pointing out that in my opinion Rat Varnish or Ratlime are the only rat traps that can be used in hospitals, or places where it is dangerous to lay poison and where natural agents cannot be employed. Dr. Howarth says practically no opportunity affords itself in the City for outside investigations. He directed attention to the possibilities of failure outside, the two chief being:—

(i) If the feet of the rat become covered with moisture, it is possible that the varnish will prove not sufficiently holding.

(ii) If the varnish trap is laid in a current of air, the draught may cause a hardening of the surface of the varnish which may prevent the feet of the rat sinking in sufficiently deeply to hold.

Precautionary measures should therefore be taken in this regard. *Inside* buildings the varnish is particularly successful if the rules are observed. (Brown paper instead of cardboard gives excellent results.) There is an excellent Ratline called "Dak" from which I have obtained very satisfactory results.

It cannot be over-emphasised that rats have their own peculiar habits and distinctive tribes differ in their choice of diet. While some favour a meat diet, others a fish-paste diet, others again prefer simple and compound diets composed of other ingredients. There are no hard and fast rules in this regard; they eat what comes to hand, and in setting traps and mixing poisons this fact should be borne in mind.

We have discussed traps of all types, but the best is a 5-inch rabbit trap, because the rounded spring of the rabbit trap has a longer life than the spring rising at the angle on a rat trap, and the teeth of the rabbit trap being more blunt and less closely-fitting, do not cut off the feet of the rat, as do the sharp closely-fitting teeth of a rat trap. A 4-inch rabbit trap is generally used, but in my opinion the 5-inch trap is in every way superior. Among the useful types of break-back traps, the best is, perhaps, the English iron break-back trap worked by a treadle.

The "Little Nipper" trap, manufactured by Messrs. Procter Bros, Wire Works, Leeds, Yorks, is among the best known and most effective of traps, while among wire traps the most effective are the "Terrier" Death Run, the "Brailsford" and the "Terrier" Blocking Trap.

Another good trap is the Automatic Rat Catcher manufactured by the Pied Piper Patentee, Pinkhill Railway Station, Edinburgh.

Rats and Ships.

Clause 6, section (1), of the Rats and Mice (Destruction) Act, 1919, reads as follows:—

(1) This Act shall apply to a vessel as if the vessel were land, and the master of the vessel shall be deemed to be the "occupier" thereof.

Which interpreted means that the ship's master has the same obligation as is imposed upon all occupiers of land under Clause 1 of the Act, viz.:—

Any person who shall fail to take such steps as may from time to time be necessary and reasonably practicable for the destruction of rats and mice on or in any land of which he is the occupier, or for preventing such land from becoming

infested with rats or mice shall be liable on summary conviction to a fine not exceeding five pounds, or where he has been served with a notice under this Act, requiring him to take such steps, not exceeding twenty pounds.

The authority for the enforcement of the Act in any port sanitary district is the port sanitary authority. [*Vide* Clause 2 (1) (d)].

It was through the medium of ships about the time of James II that the black rat was introduced into the country, and the species increased rapidly, causing the great Plague of London in 1665. Ships brought the brown rat to these shores in the 18th century, and this stronger rodent has so greatly multiplied as to overshadow its smaller cousin, the black variety.

It is only in this generation that the danger of the rat as a carrier of disease is gradually being realised, parasites harboured by rats being the actually infected organisms and spreaders of disease.

In 1900, plague broke out in the Hamburg Port, and stringent regulations were issued as to fumigation, etc., of ships harbouring rats. Quite recently, Spain has issued orders that all ships shall be cleared of rats and mice before using her ports, and many other foreign Governments demand steps to be taken to destroy these vermin.

Rats have always taken their toll of edibles on ships, in addition to destroying cargo and fittings of the vessel. I have seen a potato locker yield seven and eight nests of rats when tropical conditions have made necessary a turnover of stacked potatoes. Bad as this is, it is of comparatively small importance in relationship to the question of disease, specifically plague. Shipowners lose large sums every time a vessel leaves a home port, which may be visited by a single case of plague whilst the ship is on its outward journey. Sometimes the vessel, as a precautionary measure, is sent into quarantine many hundreds of miles from its destination or is subject to treatment for rats, often causing through detention a loss of thousands of pounds.

It seems desirable that all maritime nations should hold a convention on the question. This convention should issue model regulations setting forth an agreed procedure for the destruction of rats and mice on board ships. All vessels that faithfully carry out the regulations should receive a certificate to this effect, which certificate should be recognised by all the subscribers to the Convention, and thus, through the world-wide validity of such a certificate save time and expense otherwise incurred through quarantine, &c., also incidentally preventing rats being continuously conveyed from one country to another to carry disease and destruction.

The subject has many aspects, but the following are a few suggestions for the suppression of rats on ships:—

All storerooms on ships containing edibles for rats to be rat proofed—on new ships during construction, on others whilst undergoing survey. Iron bulkheads only, where feasible, to be allowed in such stores. No wooden panelling should be used in food stores, but where it is used $\frac{1}{4}$ -in. fine wire netting should be employed to cover such wood, to prevent rats gnawing and using the space behind the panelling for nesting places. Wood panelling often harbours beetles and cockroaches as well as rats and mice. Rat-proof flour and meal bins should be of metal with close-fitting lids. If wood is used, a protective coating of wire netting should be insisted upon.

If rats could not gain access to food in storerooms, they would most likely remain in the holds, where they could be more easily destroyed by fumigation, etc

Conversely, rats brought in packages, cases, sacks, etc., amongst packing material, would be confined to the storeroom and destroyed there.

The question of shipowners paying a bounty for rats caught by members of the crew whilst the ship is on a voyage might be considered. This system, if properly worked under supervision, should do much to keep the rat population of a ship under control. Traps, Litho Varnish, or Bird Lime, and mechanical devices could be employed. The shipowners should supply traps, etc., and members of the crew using same be held responsible for such appliances. This procedure would not entail extra cost on shipowners as they have a LEGAL obligation to clear their ships. In many cases the continuous efforts of the crew during the voyage would not necessitate the detention of a ship in harbour for the purpose of deratisation.

The sum paid for each rat caught should not be too small, 6d. or even 1s. per head could be paid. Owing to its prolific nature, every rat represents a potential source of destruction and disease, so that a reasonable head money for all caught on board is a wise expenditure.

After all, antirat insurance is just as important as antire insurance. What would happen, for instance, if a Port like Liverpool was closed through plague? One thing is certain, that whatever else happened the loss to the Port would not be far short of £2,000,000 per day.

The keeping of rats off ships affords scope for ingenuity. Certainly gangways from ship to shore should not be left down all night, even though smeared with tangle feet mixtures or varnishes, because dust, dirt, and accidentally broached cargo soon render these protective devices useless, while the inverted cones on hawser ropes are not adequate where the difference between high and low tide is marked.

Gassing or Fumigation has already been dealt with, but it is perhaps the only really efficacious method for use on board ship.

For banks and hedgerows, two machines working *towards* each other is the ideal method. Various sizes of these machines are manufactured by the Clayton Fire Extinguishing and Disinfecting Co., Ltd., 22, Craven Street, Northumberland Avenue, London, W.C.2. A rough and ready method is the ordinary smoke ferret, and if sulphur is burned instead of brown paper and the gas forced under maximum pressure into holes the results are often quite good. Carbon bisulphide is a colourless, heavy and extremely volatile liquid. It may be employed by soaking wadding, cotton waste, or some such material, and placing the latter into the hole and then immediately covering the hole in. In this way the vapour is allowed to permeate the runs. As the vapour of carbon bisulphide is highly poisonous it must be used with caution, and no light or smoking should be allowed during its application. Sulphur candles and "Chokers" are of some service in small burrows, and should not be overlooked; while good results have been obtained by means of fuses reinforced by a milk tin and an old stocking.

Good results have been obtained in Venice with Hydrocyanic acid gas, where an elevator containing 25,000 tons of grain was fumigated with this gas; but I consider the use of this gas too dangerous for the layman, and Calcium Cyanide dust is more effective. Experiments, too, have been made with phosgene and chloropicrin, but the results obtained were not encouraging.

Cats are an invaluable asset in Rat and Mouse destruction and they should be employed in barns, maltsters' stores, warehouses, farm buildings and wherever possible. The breed of rat-killing cats might well be improved by the introduction of special prizes for a rat-catching strain of cats at exhibitions.

The skin of the rat might be utilised for the making of various small articles; in fact, they have been so used by the Japanese, but it is doubtful if in England the proposition could be made a commercial success owing to cost of production; in any case it must be made criminal to breed rats for any purpose whatever except under licence. I am a strong advocate of the cinema as a teaching medium, and the public should be taught the life-history of all destructive animals and insects and their natural enemies, and the means for the proper repression of insects, animals, and birds hostile to man should not be neglected.

• A Vigorous Campaign and a Warning.

It will be seen from what I have written that there is no saving trait in the rat, that on the contrary he is, by reason of his ubiquity, his remorseless war on mankind (prompted no doubt by his immense numbers and by his struggle to live), and his potentiality as a disease carrier, a very real and ever-

present scourge; a scourge in fact which threatens man so seriously that unless it is met with ordered, co-ordinated, synchronised and *enduring* effort, there is, in my opinion, a danger that future generations may easily see the wellbeing of mankind seriously menaced by uncountable rat hordes.

Frenzied effort, sporadic effort, and even National enthusiasms are unavailing against overwhelming waves of rats and mice; we must have an intensive International campaign.

In the meantime it is the personal and intimate duty of everyone to get acquainted with and to observe the regulations imposed by the Rats Act, 1919, and to destroy these living emblems of depredation, filth and disease. Poisons are useful in houses, runs, under barns, etc., break-back traps, rat pits, and all kinds of mechanical devices are generally useful and suitable to most places, while cats, dogs, and ferrets may be usefully employed in ridding farm buildings, stables, out-houses, hedgcrows, etc., of the vermin. Stacks should be netted while being threshed; poison gases used in drains of certain types; all places where cereals are stored should be made as rat-proof as possible. Rat and Sparrow Clubs should be formed wherever possible. The aim of these clubs should be, however, to kill rats for sport and not for payment, as it is a bad principle to pay persons for killing their own rats. I suggest that these clubs should be worked co-operatively with Boy Scout formations, and care should be taken that the members of them should have some elementary training in natural history, to ensure that birds, other than sparrows, are not wantonly destroyed. It cannot be impressed too often upon all concerned that "NO SCRAPS, NO RATS" is a useful if not strictly accurate motto.

It is a matter for conjecture how many people are employed repairing the ravages of the rat, but if one visualises the damage which one rat can do in a house by destroying door frames, skirting boards, etc., one is forced to the conclusion that the rat compels us to employ quite a considerable amount of labour which could be devoted to other more useful objects. I am convinced that one method of reducing the number of rats and mice is the employment of Refuse Destructors. Modern Refuse Destructors should be more generally adopted; where Destructors are utilised and up-to-date methods of sorting and screening are adopted, a big advance in repression has been accomplished. The reappointment of a Royal Rat Catcher would also be a move in the right direction. There is little doubt that many enjoyable afternoons and evenings could be profitably spent in the exhilaration of a Village or Rural Rat-Hunt, and Boy Scouts might sharpen their wits against the problem set by Brer Rat, and last but not least, the rat-catcher must be recognised as a man whose profession requires brains, skill, patience and experience, his calling should be dignified by examination and registration, and finally, but by no means

leastly, I would say a good word for the Rodier method. The destruction of Rats and Mice by the Rodier method of killing every female caught and by liberating all the males is undoubtedly biologically sound.

In fact, I would go further and say that if public opinion could force the Government to make rat killing punishable except by Government trappers and at the same time force the Government to provide a reasonable number of men as trained trappers, then the Rodier method would, I think, succeed. It is the difficulty of successfully organising the scheme that makes it practically impossible, for, although we know that scientifically the scheme is right, we must abide the time when we can get an experiment carried out on some island sufficiently large to make a thorough public test before we can hope to start on a place like London for example.

APPENDIX.

[9 & 10 GEO. 5.] *Rats and Mice (Destruction) Act,*
1919. [CH. 72.]



CHAPTER 72.

A.D. 1919. — An Act to make further provision for the destruction
of Rats and Mice. [23rd December, 1919.]

BE it enacted by the King's most excellent Majesty,
by and with the advice and consent of the Lords
Spiritual and Temporal, and Commons, in this
present Parliament assembled, and by the authority
of the same, as follows:—

Penalty for
failure to
destroy rats
and mice.

1.—Any person who shall fail to take such steps
as may from time to time be necessary and reason-
ably practicable for the destruction of rats and mice
on or in any land of which he is the occupier, or for
preventing such land from becoming infested with
rats or mice, shall be liable on summary conviction
to a fine not exceeding five pounds, or, where he
has been served with a notice under this Act
requiring him to take such steps, not exceeding
twenty pounds.

Enforcement
of Act.

2.—(1) The following local authorities shall
execute and enforce this Act; that is to say,—

- (a) In the city of London, the common council;
- (b) In the metropolitan borough, the borough
council;
- (c) In any administrative county (other than
the county of London) or county
borough (except any part thereof which
is a port sanitary district), the council of
the county or borough;
- (d) In any port sanitary district, the port
sanitary authority;

Provided that the London County Council shall,
to the exclusion of any other authority, be the local
authority for the purpose of executing and enforcing
this Act with respect to the sewers vested in, and
the sludge vessels belonging to, that council; pro-
vided also that a county council may, with the
consent of the council of any borough or county

district in the county, delegate its powers and duties under this Act to that borough or district council, and, where powers and duties have been so delegated, the borough or district council shall be the local authority for the purposes of this Act.

(2) The expenses incurred by the local authority under this Act shall be defrayed in the case of a county out of the general county fund, and in the case of a port sanitary authority as part of their expenses as a port sanitary authority, and in any other case as expenses incurred by the local authority in the execution of the Public Health (London) Act, 1891, or the Public Health Act, 1875, as the case may be

54 & 55 Vict.
c. 76
38 & 39 Vict.
c. 55.

3.—(1) Where a local authority having power to enforce this Act fails, in respect of land of which it is the occupier, to comply with the provisions of section one of this Act or fails, in respect of land for which it is the local authority under section two of this Act, to execute or enforce any of the provisions of this Act, the Board of Agriculture and Fisheries may by order empower the person therein named to enter upon such land and to execute and enforce those provisions or to procure the execution and enforcement thereof.

Powers of
Board of
Agriculture
and
Fisheries
in case of
default by
local
authority.

(2) The expenses incurred by or on behalf of the Board by reason of any such default of a local authority shall be paid to the Board on demand by the treasurer or other proper officer of that local authority, and in default of payment the Board may recover the amount of such expenses (except in so far as such expenses are otherwise recoverable under this Act) from the local authority; and any sum paid by a local authority under this section shall be defrayed as expenses under this Act

(3) For the purposes of this section, any statement contained in an order of the Board that a local authority has failed to comply with, execute, or enforce any of the provisions of this Act shall be conclusive evidence of such default, and a certificate by the Board of expenses incurred under this section shall be conclusive evidence of such expenses.

4.—A local authority having power to enforce this Act may from time to time, by public notice within its area, give instructions as to the most effective methods that can be adopted, both individually and collectively, with a view to the destruction of rats and mice.

Notice by
local
authority of
effective
methods.

Powers of local authorities and authorised persons, and penalty for interference.

5.—(1) Where a local authority having power to enforce this Act is of opinion that the occupier of any land in its district has failed to take such steps as are required by section one of this Act, such local authority may either serve a notice on the occupier requiring him to take such steps as are prescribed in the notice within a time specified therein, or, after not less than twenty-four hours previous notice to the occupier, enter upon the land and take such steps as are necessary and reasonably practicable for the purpose of destroying the rats and mice on the land or of preventing the land from becoming infested with rats and mice, and may recover any reasonable expenses so incurred from the occupier of the land summarily as a civil debt.

(2) A local authority in the exercise of its powers under this section shall, as far as possible, take or secure collective evidence for the destruction of rats or mice.

(3) The powers of a local authority under this Act may be exercised by any committee of the local authority to which the exercise of those powers may be delegated.

(4) Any person authorised in writing by a local authority under this Act, or by a person empowered to act in default of a local authority, may enter any land in the district of such local authority for the purpose of ascertaining whether the steps required by section one of this Act are being taken or of executing and enforcing this Act in any other respect. Any such person must produce the document by which he is authorised if so required.

(5) Any person who shall obstruct or impede an officer or other person authorised as aforesaid in the execution of his duties or powers under this Act, or who, being the occupier of any land, shall fail to comply with any reasonable requirement of any such officer or other authorised person for facilitating the execution of his duties or powers, shall be liable on summary conviction to a fine not exceeding twenty pounds.

Application to vessels.

6.—(1) This Act shall apply to a vessel as if the vessel were land, and the master of the vessel shall be deemed to be the occupier thereof.

(2) A local authority having power to enforce this Act may, by notice served on the master of a vessel in its district, require him to take such necessary and reasonably practicable steps as are prescribed by the notice for preventing the escape of

rats and mice from the ship, and if a master fails to comply with the requirements of any such notice served on him, he shall be liable on summary conviction to a fine not exceeding twenty pounds.

7.—(1) A prosecution for an offence under this Act shall not be instituted except by or with the authority of the Board of Agriculture and Fisheries or the local authority. Provided that this section shall not apply to Scotland. Prosecutions.

(2) In any proceeding under this Act a notice purporting to be signed by the clerk of a local authority shall, unless the contrary is proved, be deemed to have been signed by the clerk with the authority of the local authority.

8.—In this Act—

The expression “occupier” means, in the case of land not occupied by a tenant or other person, the owner of the land; Interpretation.

The expression “land” includes any buildings and any other erection on land, and any cellar, sewer, drain or culvert in or under land.

9.—(1) This Act shall apply to Scotland with the following modifications:— Application to Scotland.

(a) The Board of Agriculture for Scotland shall be substituted for the Board of Agriculture and Fisheries;

(b) The section of this Act relating to the enforcement of the Act shall not apply, and in lieu thereof the following provisions shall have effect:—

(i) The local authority for executing and enforcing this Act shall be the local authority under the Diseases of Animals Acts, 1894 to 1914.

(ii) The expenses incurred by any local authority under this Act shall be defrayed in like manner as expenses incurred by a local authority under the Diseases of Animals Acts, 1894 to 1914.

(2) This Act shall apply to Ireland with the following modifications:— Application to Ireland.

(a) Any reference to the Board of Agriculture and Fisheries shall be construed as a reference to the Local Government Board for Ireland;

(b) Subject to the exercise of the powers of delegation given to a county council by this Act, the local authorities for the pur-

poses of this Act shall be, as respects so much of any administrative county or county borough as is not included in a port sanitary district, the council of the county or borough, and as respects any port sanitary district the port sanitary authority.

- (c) The expenses incurred by a local authority under this Act shall be defrayed, in the case of a county council, out of the poor rate as a county at large charge; in the case of a port sanitary authority as part of their expenses as such authority; and in the case of any other local authority as expenses incurred in the execution of the Public Health (Ireland) Acts, 1878 to 1919.

Saving of
existing
powers.

10.—The powers conferred by this Act shall be in addition to and not in derogation of any powers conferred on any Government department or local authority, and all such powers may be exercised concurrently in respect of any land.

Service of
notices.

11.—Any notice under this Act may be served either personally or by registered post.

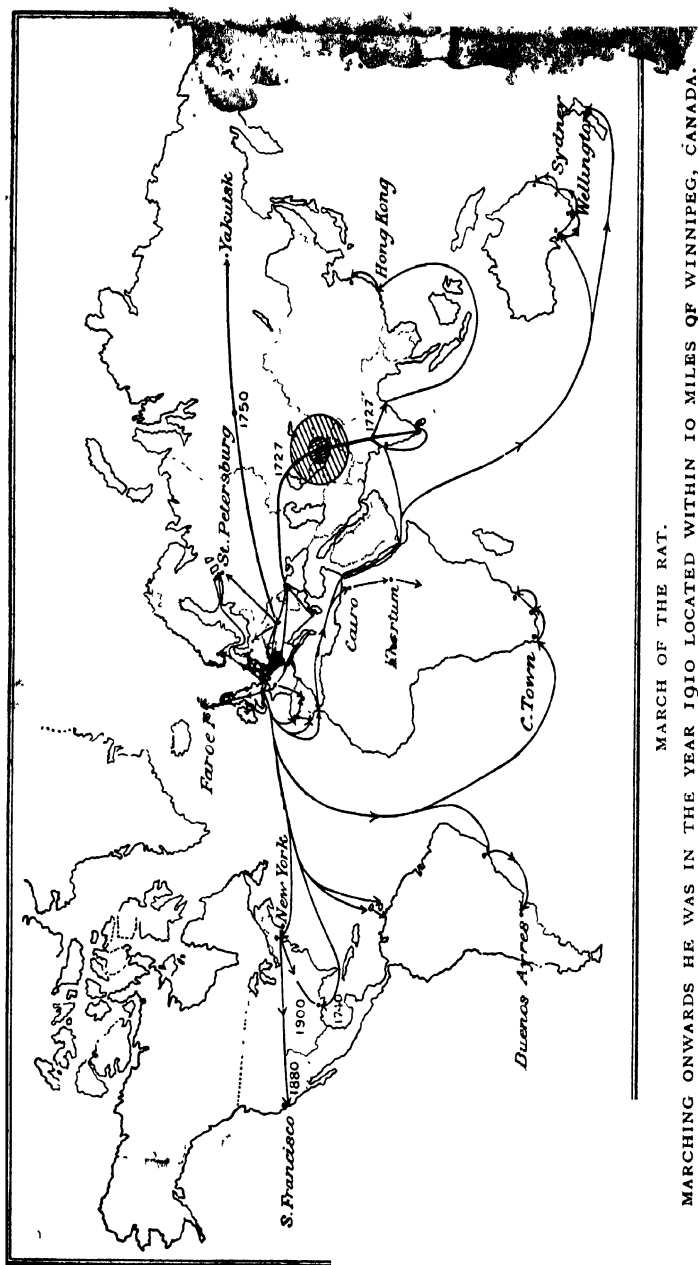
Short title.

12.—This Act may be cited as the Rats and Mice (Destruction) Act, 1919, and shall come into operation on the first day of January nineteen hundred and twenty.

It is hoped the public will not hesitate to seek the help of the College of Pestology, and I *earnestly ask my reader to help by becoming a Member or Associate*. Subscribers of not less than £100 will have their names placed on the Founders' List. Donations are urgently required for Research work. Experience has taught that Rats and Mice are an International menace; they are vermin with no redeeming feature and must be repressed.

P.S.—I am indebted in the preparation of this pamphlet, which I respectfully dedicate to The Rt. Hon. Lord Aberconway, P.C., and Sir James Crichton-Browne, M.D., F.R.S., to the valuable advice and co-operation of Sir William Simpson, M.D., C.M.G., and the United States Bureau of Agriculture, to whom I take this opportunity of rendering my grateful thanks.

A. MOORE HOGARTII.



MARCH OF THE RAT.

MARCHING ONWARDS HE WAS IN THE YEAR 1910 LOCATED WITHIN 10 MILES OF WINNIPEG, CANADA.

