THE PREVENTION AND DESTRUCTION OF RATS.

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"Rats!
They fought the dogs and killed the cats,
And bit the babies in their cradles,
And ate the cheese out of the rats,
And licked the soup from the cook's own ladles,
Split open the kegs of salted sprats,
Made nests inside men's Sunday hats,
And even spoilt the women's chats,
By drowning their speaking
With shrieking and squeaking
In fifty different sharps and flats."

(Browning's "Pied Piper.")

It is well known that rats play an important rôle in the dissemination of the germs of disease, such as plague (spread to man by fleas which infest these rodents). They are also responsible for transmitting and perpetuating trichinosis (Trichina spiralis), certain tape worms, and other parasites. With regard to plague; in a memorandum by the Local Government Board, it is stated that "Plague for administrative purposes may be regarded as a disease of rats which incidentally and occasionally attacks man." Recent researches have also proved that the rat is the carrier of two protozoal parasites causing the diseases known as spirochætosis icterohæmorrhagica, and sokodu, or rat-bite fever, and both these infections have been established by Japanese observers. The rat has also been found to be the natural reservoir of the spirochæte of infectious jaundice, not only in Japan, Belgium and France, but also in America, Algeria and Tunis. The flea and louse apparently play an important part in the spread of the infection amongst rats.

Outbreaks of food poisoning have from time to time been attributed to the contamination of food by the excreta of these rodents and the germs carried on their bodies, consequently the presence of these vermin in barracks, camps and hospitals must be regarded as a grave menace to the health of the troops.

Rats, in addition to being carriers of disease, devour and destroy enormous quantities of food yearly, and are the enemies of the hen-roost, pigeon house and rabbit warren, etc. The gradual waste and consequent financial loss caused by the depredations of these vermin, is not easily detected, but is continuous, and soon amounts to a considerable sum of money. It has been estimated that one rat causes, by the destruction of food and materials, on an average, damage to the extent of a farthing a day (roughly 7s. 6d. per year), amounting to a total loss through the agency of
The Prevention and Destruction of Rats

The black rat has been described by the ancient Greeks as being associated with their outbreaks of plague, and it is recorded that rats were prevalent in enormous numbers in the middle ages, causing outbreaks of plague and also destroying property and food.

The black rat is common in India, where the climate is suitable for...
its well-being, and it breeds prolifically. It is the chief species which infests our ships, where cases of plague sometimes occur; and consequently it is conveyed by commerce to all parts of the world. The black rat is sometimes called the "old English rat," and the species is still to be seen in warehouses on the docks in London and also at Yarmouth.

Dr. Hanna, Assistant Medical Officer of Health, Liverpool, in a recent article, said: "The black rat is, in the main, the plague-carrying rat, and an estimate of the different species identified amongst those caught in the city and port of Liverpool reveals the fact that, of a total catch during 1917 and 1918 of 34,189 rats, the brown rats exceeded the black rats in city warehouses, sewers and other places in the city in the proportion of approximately nine to one. On the dock quays the numbers are almost equal, while on the ships the black rats exceed the brown rats in the proportion of 139 to 1. It must be mentioned, however, that the proportion of black to brown rats in the dock area varies according to the district. In some areas, where foreign-going steamers have permanent berths, the black rat very largely predominates; in the port area, on ships and docks as a whole, the black rats exceed the brown in the proportion of ten to one."

The following is a brief description of the black rat (Rattus rattus): it averages in weight from 7 to 8 ounces, is about 7 inches in length, and has a sharp long muzzle and comparatively large ears.

The body, which is elegantly and slenderly built, is covered with greyish black soft fur (smokey grey on the belly), the fur being often intermixed with bristles, which give it a harsh appearance. The ears, feet and tail are black in colour. Its tail, which is long and scaly, measures from eight to nine inches in length, and is a little longer than the combined length of the head and body.

The black rat is not fond of burrowing, and very seldom enters water; it is, however, a good climber, and on board ship it is therefore able to make its escape (when the ship is in port) by climbing down the cables on to the docks. It frequents the roofs and walls of houses and huts, but is not often found in drains, sewers or cellars.

"The brown rat" (Rattus norvegicus) is said by some to have come originally from China, and by others from Central Asia or India. Boelter says: "In 1731 the brown rat was brought to England in ships coming from India, and, finding a foothold in the land of the 'Mistress of the Sea,' it proceeded on her ships on a triumphal journey round the world." Being a large and much stronger animal, and suited to a cooler climate, it soon waged war on the weaker species, the black rat, which it fought and killed, greatly reducing its numbers. It is the brown rat with which we are chiefly interested at the present time.

It weighs nominally about 9 to 17 ounces, and measures from 8 to 9 inches in length (head and body). The body is inclined to be heavy and rather clumsily built; it is covered with softish fur (softer than that of the black
Black Rat (*Rattus rattus*). (At natural size.)
Brown Rat (*Rattus norvegicus*). († natural size.)
The Prevention and Destruction of Rats

The brown rat, which is of a greyish to reddish brown colour, yellowish grey underneath. The head of the brown rat is powerfully built, with blunt jaws, the ears being rather small and covered with short, thick hairs.

The tail is stout, and somewhat shorter than the combined length of the head and body. Its ears, feet and tail are flesh-coloured.

The females of both the above species breed very prolifically, and commence at an early age; consequently, if well supplied with food, the numbers of rats increase at an enormous rate.

The brown rat, which is more prolific than the black rat, produces several litters a year, averaging from 6 to 9 young, but sometimes as many as 22. It is said that one pair of rats will within nine months give rise to a progeny of 880 rats. To show how prolifically these rodents breed: in 1901, on an estate in Chichester which was badly infested with rats, 31,981 were killed by traps, poisons and ferrets, and during the threshing season 5,000 more were destroyed. Even then the property was not free from these vermin.

The period of gestation is about twenty-one days. De L'Isle, experimenting with R. rattus, found it to be sexually mature when less than three months old; and Buckland records that a female R. norvegicus in captivity bore a litter of eleven young when only eight weeks old, so that she must have been impregnated at the age of five weeks. The young are born blind, and are weak and helpless, their eyes opening about the fourteenth day.

The brown rat (R. norvegicus) is a very strong, voracious, agile, cunning and fierce animal, especially when driven into a tight corner, and is a fairly good climber. It frequents barns, stables, basements of buildings, drains, sewers, slaughter-houses, grain stores and wheat-stacks, etc. This rodent is a great lover of water, and can swim some distance. It burrows into the banks of canals, rivers, ponds and water-courses, where it abounds in large numbers, and in the burrow it makes its nest.

The brown rat is capable of adapting itself to almost any surroundings, and frequently infests coal mines. It will gnaw through almost any obstacles, such as lead pipes, leather, ivory, etc., and in this way keeps its ever-growing incisors at a proper length.

Boelte relates an anecdote by Buckland on the ferocity of the brown rat. "A London rat-catcher shut up together in a cage the result of his day's work, consisting of several dozen rats of both species, and put them away carefully for the night, their intended fate being to afford sport for his employer's dog next morning. What was his astonishment, when he came to fetch them, to find none but brown rats remaining! These cannibals had devoured all their sable brethren."

The migratory habits of rats are well known. In the spring they depart into the open fields, where they burrow and pass the summer. In the early winter they re-establish themselves in buildings, lay up in their holes during the day, and go forth in search of food as soon as it gets dusk.
This migratory habit makes extermination of the pest a difficult matter.
At times when food is short, or when in search of change of food, they
migrate in vast numbers during the night; this also frequently happens
when disease has attacked some of their numbers. When persistently
hunted, these rodents forsake their abode, and migrate to a more favourable
situation. It is said that in towns on the seacoast (such as Yarmouth) rats
become attracted by the fish offal, and are present in considerable
numbers. In October, however, owing to the shortage of food, they
migrate inland. These moving hordes of rats have been frequently seen
and recorded. Pallas relates that “in the autumn of 1772 they arrived from
the East at Astrakhan, South-eastern Russia, in such great numbers and
so suddenly that nothing could be done to oppose them. They crossed
the Volga in immense troops. The cause of this general migration was
attributed to an earthquake, but, since similar movements of the same
species often occur without earthquakes, it is possible that only the food
supply of the animals was involved in the migration.”—Roseneau. In
towns, rats do not migrate so readily, but remain near their habitations,
unless disturbed by being hunted.

When driven by hunger these vermin become exceedingly ferocious and
will fight, kill, and afterwards devour the dead bodies of their comrades,
those injured and unable to defend themselves sharing the same fate.
When hard pressed, rats do not hesitate to attack man. They will eat
almost any kind of food, such as grain and seeds, flour, vegetables, bulbs,
garbage, offal, dead bodies of animals. They kill game, fowls, ducks and
young rabbits, and suck the eggs of birds and fowls, and frequent bakeries,
slaughter-houses, knackers’ yards and such like places. This great variety
of food no doubt enables rats to live in any environment. Shipley says,
“The rats which infest the London Zoological Gardens are said to swim
nightly the canal in Regent’s Park.” Presumably they visit the Gardens
to take a share in the food supplied to the animals, and are killed in large
numbers by the employees. When worried by a dog, rats will display con­
siderable cunning, and to avoid the dog they will dive into a stream (if one
is close at hand) and remain under the water for some time coming to the
surface some distance away.

Before discussing the practical methods for the destruction of rats, it
may not be out of place to quote a recent leading article from the Times
newspaper, on the introduction of the Bill on the destruction of rats
and mice.

“The introduction by Sir A. Griffith Boscawen of the Bill for the
Destruction of Rats and Mice, prepared by the Ministry of Agriculture
and Fisheries, was greeted in the House of Commons with ironical cheers.
Whatever may be the precise political significance of this levity—and
incoherent majority tends to breed political rats—we trust that in its
further stages the Bill will receive the prompt and serious treatment it
deserves. It deals with an urgent need. Rats and mice make huge
inroads on our food supply. Sir James Crichton Browne estimated that, in England alone, rats destroyed food to the value of £15,000,000 in 1908. Since then the value of food has increased manyfold, and there is good reason to fear that vermin have multiplied. They damage property in many ways. They block, divert, or destroy drains and water-pipes. They have been known to cause fires by damaging the insulation of electric wires. They gnaw leather, wood and textiles of all kinds, sometimes to make their runs, sometimes to line their nests. They are a direct menace to health. The most notable instance is their relation to plague. The rats of plague-stricken countries are permanent reservoirs of the disease, and rat-fleas carry the microbes from rat to rat, or from rats to human beings. They are a link in the propagation of many other diseases, and they are intermediate hosts of parasites that affect man and his domestic animals. They are cunning, hardy, and prolific, and it is impossible to reduce their numbers effectively by isolated effort. They migrate from house to house, from farm to farm, from country to country. If an energetic assault be made on them in one place, they flow into the vacuum from surrounding areas. The provisions of the Bill are simple, and the machinery provided should be effective. In the first place, the alien immigrant is to be kept from landing. The Bill is to apply to a vessel as if the vessel were the land, and the master of the vessel is to be deemed to be the occupier. The port sanitary authority has the duty of seeing that ship rats are destroyed. This step, in combination with the usual step of securing that persons affected by plague are quarantined, should effectively safeguard the country from a by no means impossible calamity. Every occupier of ‘land’—and ‘land’ is defined as including any buildings or erections on it, or any sewers, drains, or culverts in it, has the statutory duty, under penalties, of taking reasonable and practicable steps from time to time for the destruction of rats and mice. The Common Council of the City of London, the Borough Councils of London, and the county and borough councils and port sanitary authorities are provided with the powers necessary to see that occupiers comply with the regulations. The Ministry of Agriculture and Fisheries in England, the Board of Agriculture in Scotland, and the Local Government Board in Ireland are enabled to enforce the provisions of the Act if, in their opinion, the local authorities fail in their duty. No suggestions as to the methods of destruction are made. This is wise, as the methods must vary with the special conditions and be the subject of expert inquiry.”

Boelter says, “The first practical attempt at destroying rats in the public interest, in order to minimize the damage done by them to private and public property, seems to have been made in England. About the year 1740, ordinances were made by numerous parishes directing the churchwardens to pay one penny—in some cases twopence—for every dead rat brought to them. But soon the hopelessness of the task becomes apparent and the ordinances fall into disuse."
Towards the middle of the eighteenth century an English colony, realizing that anything short of concerted action must fail against the enormous fecundity of the brown rat, endeavoured to deal with the rat problem by means of a law. The original Act of 1745 does not appear to have been preserved either at the Colonial Office or at the British Museum, but there is a record of an Act passed in 1748 which contains the law of 1745. Quite recently (July, 1908) a third Rat Act was passed."

Recent orders on the subject are the Rats Order, 1918; the Local Authorities (food control) Order (5), 1918; the order amending the Rats Order, 1918, dated March 26, 1919; and the Local Authorities (food control) Order (1) 1919. The enforcement of these orders is the duty of the appointed official. The War Office appointed officers for the purpose of the Rats Order, as the question of rat extermination is not only of the utmost importance to the civil population but also to the military authorities, and it is hoped, by the combined efforts of the civil and military, to ensure a successful campaign against this pest.

In a presidential address, delivered last year before the Royal Society of New South Wales, Dr. J. Burton Cleland pointed out that a town that lets its rats multiply is exposed to a menace that may lead to enormous financial losses and possibly a heavy death roll. Rats lead a communal life in direct contact with each other, and thus the passage of any pathogenic organism is facilitated, while in the passage the pathogenicity of the less lethal forms is probably increased.

In a campaign against rats, it is essential that the greatest energy and zeal should be displayed by all concerned in carrying out the necessary methods of destruction; working in a half-hearted manner is practically useless. In the service, the troops should be instructed in the art of laying poisons, setting traps, ferreting, etc.; as it is only by the co-operation of all ranks that the anti-rat measures can be efficiently carried out, and the best results attained. Where possible a professional rat-catcher could be employed, failing this a reliable "volunteer" could easily be instructed in the art of rat-catching. It has been suggested that the cinematograph might be used as a teaching medium. Films depicting the life history, habits, and the depredations caused by rats, could then be shown to the troops, and so stimulate their interest, as there is nothing "like seeing a thing, to believe it."

**Preventive Measures.**

The protection of all food supplies, the careful removal of waste food so as to avoid spillage, the destruction of refuse, the rat-proofing of buildings, such as hospitals, huts, etc., in barracks and camps, the protection of drains and sewers, and the fumigation of ships, are some of the preventive measures which must be adopted.

*Protection of Food.*—Buildings, especially those where forage is stored, and dining rooms, cook-houses, meat stores, canteens, institutes, bakeries,
The Prevention and Destruction of Rats

etc., should be rendered rat-proof. Where large quantities of food are permanently stored, a rat-proof fence should be erected and all rats inside this exterminated. The fence can be made of half inch mesh wire netting, the lower edge being buried eighteen inches under the ground, and along the top a piece of tin is fastened sloping downwards towards the exterior. All food stored in cook-houses, messes, canteens, regimental institutes, etc., should be protected by means of wire netting, or kept in wire gauze safes. In large stores the provision of wooden grids raised about one foot off the floor have been found effective. Stacks of wheat, etc., should be raised about three feet off the ground on platforms supported by piles; the latter should be furnished with metal rat guards of large diameter, in order to ensure that the rats do not climb up the piles and infest the stack. In stables, concrete or metal forage bins should be provided. The angles of all wooden receptacles and the lower parts of doors should, where possible, be covered with tin sheeting.

Removal and Destruction of Refuse.—All refuse should be temporarily placed in rat-proof receptacles, such as metal bins with close fitting lids, and the bins should never be allowed to overflow. Refuse so stored should be promptly removed and destroyed. The formation of heaps of rubbish is a dangerous practice as these afford good shelter and food for rats. Such accumulations may in time become the principal breeding places of rats. Burrows from which the vermin have been driven should be filled with concrete; a mixture of cement, sand, and broken glass or crockery; or of broken glass or tar, in order to prevent the rats re-establishing themselves in the holes.

Protection of Buildings and Drains.—New buildings should be rendered rat-proof by the liberal use of Portland cement concrete, in foundations and cellar floors, and all doors, windows, ventilators and drains adequately protected. Existing buildings such as old barracks, huts, hospitals, grain stores, forage stores, warehouses and stables, etc., should be repaired if necessary, and afforded similar protection against rats. Openings into drains and sewers should be efficiently sealed, and any repairs to the pipes receive prompt attention. The inlets and outlets of ventilating pipes should be protected by means of wire cones. In the case of infectious disease hospitals, particular care should be taken that all buildings are rendered rat-proof, and that there is no possibility of rats gaining access to any receptacles in the hospitals, or to the drains.

In "Dangers to Health," by Doctor Teale, instances are given illustrating the grave dangers which may result from rats getting into drains. "To have rats appear in a kitchen or cellar the presumption is that they come out of a drain. A hole in a drain which permits the escape of a rat will allow the sewer gas to be drawn into a house, pleno flumine. When a waste pipe or a sink joins a drain under a kitchen floor instead of discharging into a gulley outside, this is what usually happens. The sink pipe religiously trapped passes neatly through the kitchen floor. Beneath the floor and out.
of sight it passes into an open wide-mouthed drain-pipe, four or six inches in diameter, with neither cement nor luting to bar the escape of rats or sewer gas. This piece of scamping, being out of sight, is exceedingly common, and is often overlooked by inspectors who satisfy themselves with a peep at the syphon trap, and take no account of the gaping pipe concealed beneath the flag, ready to let the rat and the gas out of the drain. Even if cement were used it would be no sufficient protection against the rats making their way into the house. In two other ways rats do mischief—one, by eating through the lead pipes to reach water or fat; the other, by making runs under drain-pipes and letting down and opening the joints. Open drain joints concealed under a cellar floor can often be detected in the following way: shut all windows and outer doors; open all doors between the cellar and the fires in the house; then hold a lighted taper opposite any crevices or fissures." It has been estimated that seventy-five per cent. of the cases of rat invasion in houses in towns are due to defective drains.

Dr. Hanna says: "Rats frequently gain an entrance into warehouses, where cotton, grain, etc., are stored, from the sewer by the drain in the basement. Salvage companies require a drain in the basement of warehouses so that water can escape in case of fire salvage operations. The water seal is frequently dry and the drain untrapped. Under such conditions rats gain an entrance into warehouses for food and shelter: they may return to the drain and sewer for water, but frequently there is water in the top floor of the warehouse and the rats may remain in the building for a time, and may carry infection from the warehouse to the drains, and vice versa. An exceptionally high tide may drive all the rats up the drains into the warehouse. It is, therefore, important to examine the basement drains in a warehouse before rat exterminating operations are carried out."

METHODS OF DESTRUCTION.

Measures taken for the destruction of rats should be carried out simultaneously over a wide area and reliance should not be placed on any one method. Extermination is practically impossible as rats readily migrate, and the most that can be hoped from measures against rats is some reduction in their numbers. It should be recognized that the existence of these vermin is strictly dependent upon the food they are able to procure, and that they will not remain or increase in places where such cannot easily be obtained.

Natural Enemies.—Large numbers of rats may be killed by men, dogs, or cats. The fullest protection should be accorded to the rat's natural enemies, such as owls, buzzards, kestrels, sparrow-hawks, rooks, crows, gulls, herons, weasels, stoats and foxes. Many of the natural enemies of these vermin are killed indiscriminately as they are disliked. The owl, for instance, which lives almost entirely on living prey, owing to the weird hooting noises he creates at night is often regarded as a bird of ill-omen,
and shot on sight, whereas he is of the greatest service in the destruction of rats. As many as twenty freshly killed rats have been found in a single owl's nest. In fact all the above creatures are most valuable allies, and destroy numbers of these vermin. The mongoose is also a useful animal in this respect, but there is now some difficulty in getting it exported from India.

The methods adopted for the destruction of rats are:

(a) Poisoning.
(b) Trapping.
(c) Hunting with dogs and ferrets.

(a) Poisoning.

There is a large trade nowadays in the sale of rat poisons, some of which are very effective in killing rats, while others are more or less useless. The active poisoning agent in most of these preparations is usually one of the following: Arsenic, phosphorus, strychnine, squills, barium carbonate, and plaster of Paris.

When using rat poisons, the greatest precautions must be taken to avoid accidents, and it is desirable that notice be given to all concerned when any poison is being laid down. All domestic animals must be safeguarded, and the unconsumed portion of the poisonous bait removed and destroyed, in order to prevent them obtaining access to it; besides there is also a possible risk of prosecution under the Acts relating to the use of poisoned grain, meal and meat. These Acts are: "The Poisoned Grain Prohibition Act of 1863; The Poisoned Fish Prohibition Act of 1864, and the Protection of Animals Act, 1911." The dead bodies of all rats killed by any of the above methods must either be buried or burned, they should never be offered for sale, as there is a danger attached to the handling of sick or dead rats. Poisoning should be carried out over a large area once or twice during the year, i.e., in the spring and in the late autumn. To ensure success the following preliminary measures should be adopted: As large an area as possible should be covered at one bait setting, and a careful survey made beforehand in order to have a sufficient supply of bait to lay down over the whole area simultaneously. One hour should be sufficient time for bait laying. The next day another survey should be made and all the remaining baits collected and counted. It is no good laying down poison in the same area more than twice a year, and it should be followed up by trapping. Sometimes it is advantageous to bait without the actual poison for two or three nights, in order to entice the rats. In this case the number of baits laid down should be counted, and also those remaining the next morning, so as to be able to ascertain the actual amount of bait required, and where to lay the poison. If it is found necessary to repeat the poisoning, an interval of at least ten days should be allowed to elapse. Poisonous baits should be laid well within the burrows, as there is always
the chance of a rat carrying one off, and depositing it in an exposed position, to be afterwards devoured, perhaps, by a domestic animal.

The amount laid in each burrow, or rat hole, should be as small as possible in order to attain the desired result. It should be borne in mind that baits used for rats should always be of a different nature from the food they usually obtain. A change of bait is certain to be of considerable value, and when it is found desirable to lay down the poison a second time a different bait should be used. The bait should be as fresh as possible, as the vermin consume it more readily; if it is kept too long, the toxic properties may become weakened. It must be remembered that rats, especially old ones, are very suspicious animals, and if one of their number die from eating some particular kind of food, they will not go near that food for some time, unless it is artfully concealed, and judiciously placed; this no doubt accounts for the use of poison not always being attended with success, although large quantities of bait have been laid down. It has been suggested that in camps and barracks one bait per yard be laid on runs, and one pound allowed per hut, if badly infested. There is an objection to the use of poison in inhabited buildings, because the rats often die in their haunts (such as in a wall, or under a floor), and then it becomes a difficult matter to get at and remove their decomposing bodies, which consequently become a nuisance and a possible danger to the health of the occupants of the building. The putrifying body of the rat must be found, and it has been suggested that the following method be used in warm weather to detect the whereabouts of the dead rat. A number of blow flies are carefully caught without injury, and let loose in the room from whence the bad odour arises, taking care to close all windows and doors. After a time it will be found that the flies have a tendency to buzz round one particular spot, and this is probably the one where the dead body of the rat will be eventually found.

Professional rat-catchers prepare their bait in various ways, and the oils of musk, aniseed, carraway, rhodium, or cumin, etc., are often incorporated in the bait so as to make it attractive to the rats. Dyes, such as Prussian blue, black aniline, or chrome green, are sometimes used as colouring agents. Soot can also be used for the same purpose.

**Arsenic.**—This chemical is cheap, and has been recommended as a successful but rather slow poison for rats. It gives variable results. Hinton says “Arsenic is recommended by one very experienced rat-catcher as the best and safest poison, because in the small doses necessary to kill rats it entails little risk to domestic animals; if they find and eat the body of a rat so poisoned the small quantity of arsenic in the body is said to act upon them merely as a purgative.” There are various methods of making up bait containing arsenic and the following formulae are recommended:—

1. **Arsenious acid** .... ... .... 1 part.
   **Oat or maize meal** .... ... .... 12 parts.

The ingredients are mixed together into a dough with the white of an egg, a few drops of oil of aniseed being added.
The Prevention and Destruction of Rats

(2) Arsenious acid ... ... ... 1 part.
Wheat flour, or oatmeal ... ... 12 parts.
Lard, or suitable fat ... Sufficient to make a stiff dough.

(3) Mr. Read's Formula—
Water ... ... ... ... ... ... ... ... ... ... 30 per cent.
White arsenic ... ... ... ... ... ... ... ... ... ... 6 "
White lead ... ... ... ... ... ... ... ... ... ... 8 "
Oxide of iron ... ... ... ... ... ... ... ... ... ... 6 1/2 "
Treacle, sugar, and make up with 20 per cent meal of aniseed.

(4) Make a dough of wheat flour, oatmeal, etc., with lard and treacle, and add 10 per cent arsenic, or 2 1/4 per cent croton oil.

(5) White arsenic ... ... ... ... ... ... ... ... ... ... 1 lb.
Cheese ... ... ... ... ... ... ... ... ... ... 1 "
Glycerine ... ... ... ... ... ... ... ... ... ... 1 1/2 oz.
Water ... ... ... ... ... ... ... ... ... ... 3 pints.
Corn meal ... ... ... ... ... ... ... ... ... ... 2 3/4 lb.
Oil of aniseed ... ... ... ... ... ... ... ... ... ... 1/4 oz.
Black aniline ... Sufficient to colour.

Melt the cheese and the glycerine in one-third of the water; add corn meal and remainder of water, while heating; continue heating until meal is cooked; stir in arsenic, aniline and oil of aniseed, and pack in tins.

N.B.—In each of the above add a globule of mercury per lb. of bait.

The following is an old English formula:

(6) Oatmeal ... ... ... ... ... ... ... ... ... ... 1 lb.
Brown sugar ... ... ... ... ... ... ... ... ... ... 1 "
Arsenic ... ... ... ... ... ... ... ... ... ... 1 teaspoonful.

Strychnine.—This chemical is sometimes used as a poison for rats; its action is rapid, and may cause the rodents to die in their holes. It can be made up into a suitable bait with sugar and powdered biscuit, oatmeal or flour, with the addition of one of the essential oils mentioned previously, to make it attractive to the rats. The crystals of strychnia sulphate may be inserted in pieces of raw meat, fish, etc. The solution can be prepared by dissolving half an ounce of the salt in one pint of boiling water, adding one pint of syrup; the bait, such as maize or wheat, being afterwards soaked in the diluted syrup.

The following formula containing strychnine is recommended by Rosenau:

Strychnine ... ... ... ... ... ... ... ... ... ... 1 oz.
Cyanide of potassium ... ... ... ... ... ... ... ... ... ... 2 "
Eggs ... ... ... ... ... ... ... ... ... ... 1 doz.
Honey ... ... ... ... ... ... ... ... ... ... 1 pint.
Wheat or barley ... ... ... ... ... ... ... ... ... ... 30 lb.

Stir eggs well, then mix in honey and again stir. Then put in dry powdered strychnine and cyanide and stir until well mixed. Put wheat in large box or can and pour in the mixture of poison and stir until it is well distributed over the wheat. Stir two or three times during twenty-four hours, then spread out and dry.

The greatest care must be exercised in the preparation of bait containing strychnine, owing to the very poisonous nature of this chemical.
Phosphorus.—Preparations containing phosphorus are effective when consumed by rats, and a large proportion of the rat poisons on the market contain this chemical. Phosphorus is, however, a somewhat dangerous substance on account of its inflammable nature. Very quickly, however, rats learn to avoid this poison, and its use should alternate with others. It can be made up into the form of a paste, which is prepared by using a fat base, such as lard, in which one to four per cent of yellow phosphorus has been dissolved; the paste is afterwards spread on bread, cheese or meat for use as bait.

The following method of placing the bait is recommended: Two wooden boxes are used, one considerably larger than the other, and each having two or more holes in the sides large enough to admit rats. The bait is placed in the bottom and near the middle of the smaller box, the larger one being then inverted over the smaller one. The boxes should be painted a distinctive colour. A receptacle containing water is placed in the vicinity of the bait for the rodents to drink; this accelerates the effect of the poison. Phosphorus does not mummify the dead rat’s body, as popularly supposed.

Barium Carbonate.—This is a very efficient and safe rat poison; it is tasteless and odourless when conveyed in a proper medium, and has a corrosive action on the mucous lining of the stomach, causing thirst, thus inducing the vermin to seek water (which should be supplied for their use) in the open, where they die. In small doses barium carbonate is harmless to the larger domestic animals, but baits should not be placed where cats, dogs or poultry can obtain access to them.

The bait can be prepared as follows:

1. Barium carbonate... 1 part.
   Meal... 4 parts.
   Water... A sufficient quantity to make a stiff dough.

2. Mr. Read’s Formula—
   Barium carbonate... 6 oz.
   Flour, meal, &c... 16 "
   Salt... 4 "
   Butter, lard, &c... Sufficient only to bind the mixture.

The above quantity is sufficient for 1,000 baits.

Knead into a dough, roll out, and cut into ½ inch cubes. Barium carbonate may also be used in a dry form mixed with meal, etc., in the proportions of one part to eight parts of meal, or spread on fish, or moist toasted cheese.

3. Prepare a dough as for ginger nuts, only thinner, and omit the ginger and fat, but add a few drops of oil of aniseed, rhodium, or carraway. Thicken the dough with twenty per cent by weight of barium carbonate, and bake in greased tins, with divisions of the size of an “oxo” cube. These biscuits baked hard will keep some time, and one of them is the proper size for laying out. The use of barium carbonate as a poisoning agent in bait is said to retard decomposition to a certain extent.

Squills.—The diluted extract of squills (sea onion) has now been added to the already large number of rat poisons, and it has an apparent action on the heart of the rodent. It is put up (1) in a proprietary article, called “Ratinol,” made by the “Ratinol Company,” 30, Mark Lane, London.
The Prevention and Destruction of Rats

(2) The Extract of Squills, which can be obtained from Haller and Co., 60, Bishopsgate, London, E.C.2. The extract is in two forms: (a) in a state in which it requires dilution with two parts of milk or broth previous to being mixed with grain or bread. Directions for use: To one gallon of squills extract add two gallons of boiled milk sweetened by one pound of sugar, or two gallons of meat broth, and mix together. Pour the three gallons of liquid over thirty pounds of flaked oats, or stale bread cut into small pieces, and mix thoroughly by means of large spoons or flat sticks. The bait will then be ready. It should be laid in the afternoon, placed in small heaps wherever the rats are likely to find it. Spoons should be employed in laying the bait. The squills extract should be used without delay after it has been received, and the bait must be laid the same day as it is made. (b) As a mixture, "Danzo Rat Killer," containing the squill extract and a suitable broth in proper proportions, ready for use after being mixed with grain (flaked oats) or stale bread cut into small pieces.

(3) Mr. Read's formula is as follows: Red squills, in bulbous form; squeeze out the liquid; dilute one part with two parts distilled water; to this add an equal volume of milk or meat broth; cut up a two-pound loaf of stale bread into small cubes and soak thoroughly.

(4) *Scilla maritimus* preparation: A well-known Continental way of destroying rodents is to bake a pancake-egg (pancake not essential, but beef-dripping advisable) to which twenty 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 half an inch square and laid in the rat runs or holes. Rats are particularly susceptible to the effect of *Scilla ar.* (squills).

*Plaster of Paris.*—This is sometimes used to kill rats when mixed with flour, oatmeal, grated cheese, or other suitable ingredients. Fletcher-Barrett, on the subject of this rat-killer, says: "Plaster of Paris (dried calcium sulphate), mixed with sugar and flavoured, has long been used as a rat poison, the modus operandi being to place the mixture in accessible places, and near thereto to place bowls of water, the theory being that the rats will eat freely of the mixture, which creates an intense thirst, and then drink of the water. The calcium sulphate is thereby hydrated, and, setting hard in the interior of the rat, literally 'stiffens' him. It seems an unnecessarily cruel method of killing, but, fortunately for the rat in this instance, theories do not invariably work out in practice."

*(To be continued.)*