

ORGANIZATION OF A BUREAU OF PLAGUE PREVENTION IN PORTO RICO

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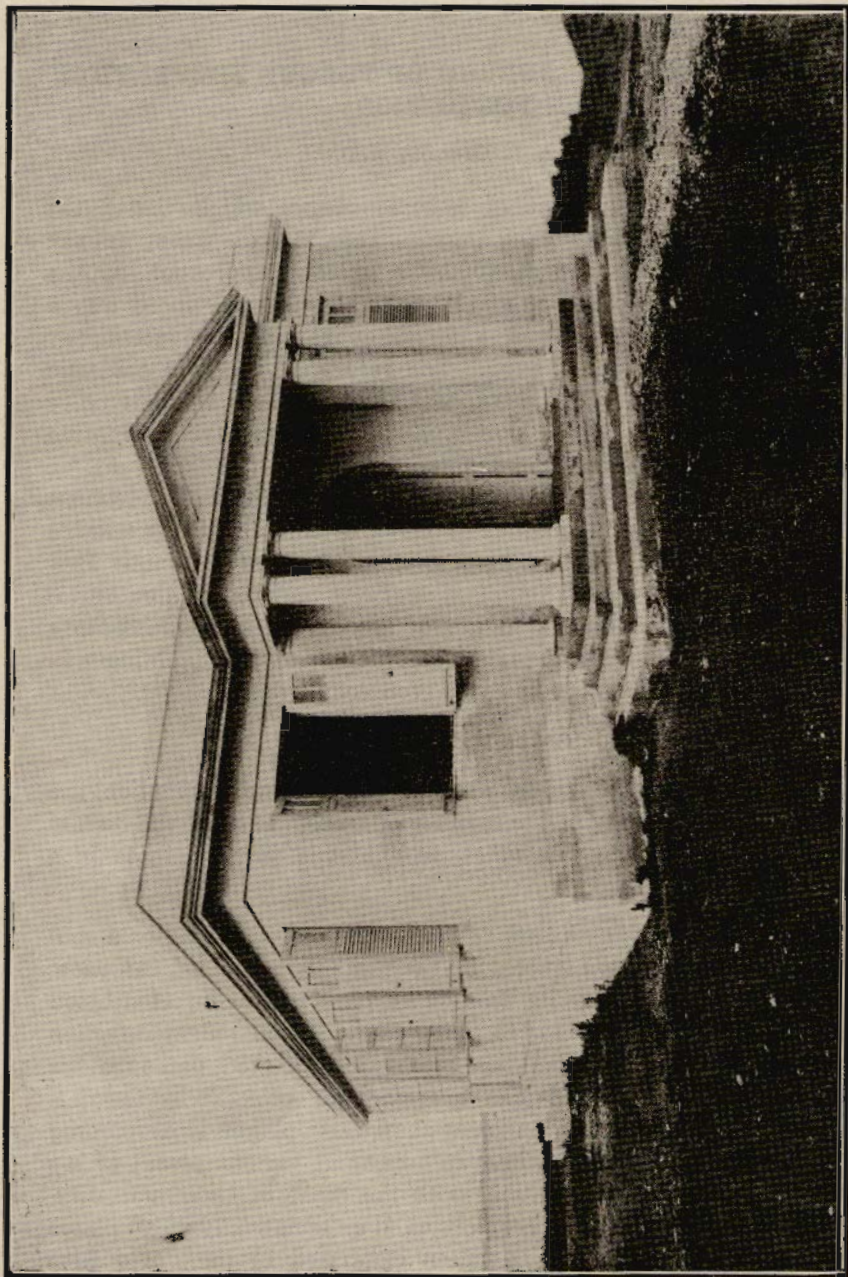
During the last epidemic of bubonic plague which visited the Island there were thirty-three persons infected, of whom twenty died; the Government spent \$500,000 in the suppression of the disease; an intense panic swept all over the Island; there was a great business depression and a strict quarantine obstructed our commerce for more than a year. The results of the first epidemic of plague in the year 1912 were even worse. There were fifty-five cases in that instance with a mortality of 65 per cent, the quarantine lasting one year and four months.

The circumstances clearly demanded that the Health Department do its utmost to prevent another outbreak of this deadful pestilence in Porto Rico. With this in view a new "Bureau of Plague Prevention" was created last year. A spacious and commodious building was planned to lodge the offices of the bureau and a laboratory for the examination of rats. The construction of this building was begun in May, 1924, and it has just been completed.

ORGANIZATION OF THE WORK

Fundamental Principles.—Our plans for plague prevention are based on a careful study of the manner of transmission of the disease to man and of the ways in which an epidemic may originate in a locality.

Transmission of the Disease to Man.—Plague is primarily a murine disease which is transmitted by the flea. It is a blood infection. After a rat dies of plague its fleas which have sucked infected blood migrate conveying the disease to a new host. When rodent infection has spread considerably and the number of infected parasites has increased to a large extent, man is accidentally infected by the flea. It is worthy of note at this moment that while plague is developing in the species, dead rats continue to appear at various places of the locality without any explanation as to the cause of their mortality. This phenomenon, which has been observed systematically in all places where plague has occurred, has been confirmed in the Porto Rico epidemics.



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Origin of an Epidemic.—Plague may be imported through rats brought in by ships coming from infected ports. This fact is universally accepted. Another theory to account for the origin of plague in a locality is that an outbreak may develop from a latent infection in the rat. A rodent affected with chronic plague might be considered as a germ carrier. Under proper conditions the infection would become acute giving rise to an epizootic and to human infection; or the diseased animal might fall a prey to a susceptible healthy one producing an acute infection in the latter.

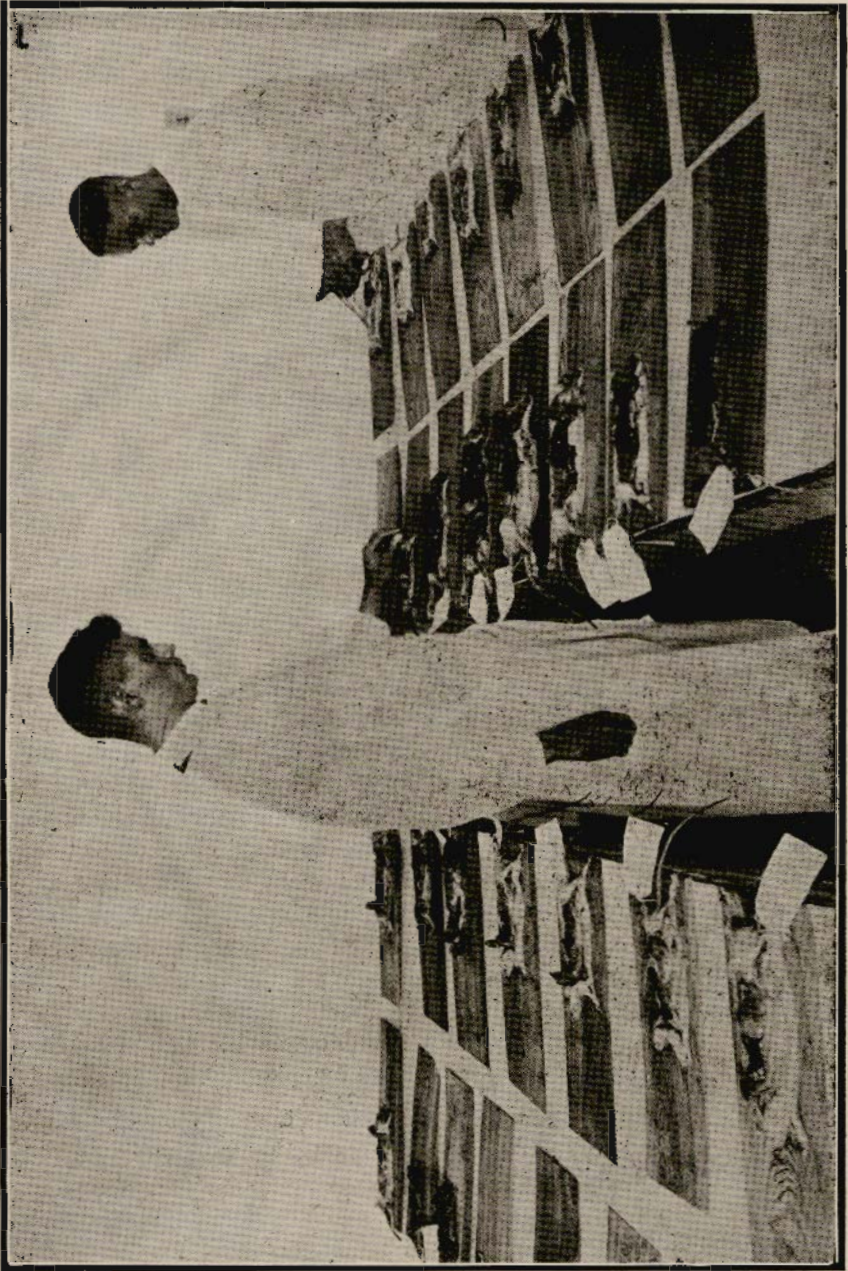
This last theory has met with a great deal of opposition. No authority rejects the possibility of a chronic murine infection. "The Indian Plague Commission encountered a considerable number of cases among 'mus rattus' in the Punjab villages of Kasel and Dhand. . .", yet, "no evidence was forthcoming to show that this chronic rat-plague had anything to do with the recurrence of acute Plague among the rats,"¹ and most authors have concluded that chronic Plague bears no influence in the propagation of the disease. Such chronic cases, moreover, are far from being frequent. "We have diligently sought for chronic Plague," says George W. McCoy, "among the rats in San Francisco, but . . . invariably with a negative result." "Only one case was found among the many hundreds of plague rats examined by the Indian Plague Commission in Bombay." So far as we are concerned it may be positively asserted that no chronic-plague rat has been encountered in the course of any of our epidemics or thereafter. It may be added that the period elapsed between the two outbreaks was too long (nine years) to justify any presumption that the epidemic of 1921 was in any way related to the first outbreak of plague in Porto Rico in 1912.

The consensus of opinion is evidently against the second theory. In the development of our plans, accordingly, a greater importance has been conferred to the probability of an imported infection. No measure has been neglected, however, to avoid the possibility of an outbreak arising from chronic plague among the rodents.

A knowledge of the preceding principles has led to the taking of measures necessary for the prevention of plague in this Island. These measures may be summed up as follows:

1. Preventing the importation of murine or human plague;
2. Rat-proofing and flea-proofing;
3. Deratization;
4. Rat examination;

¹"The Technique of the Laboratory Examination of Rats for Plague," by Geo. W. McCoy, page 7.



The rodents are outstretched, tacked upon shingles and dissected for examination.
The appearance of gross lesions is mainly depended upon for diagnosis.

5. Enlisting public coöperation;
6. Notification and inspection of suspicious illnesses or deaths;
7. Keeping a good provision of anti-plague vaccine and serum.

PREVENTING THE IMPORTATION OF MURINE OR HUMAN PLAGUE

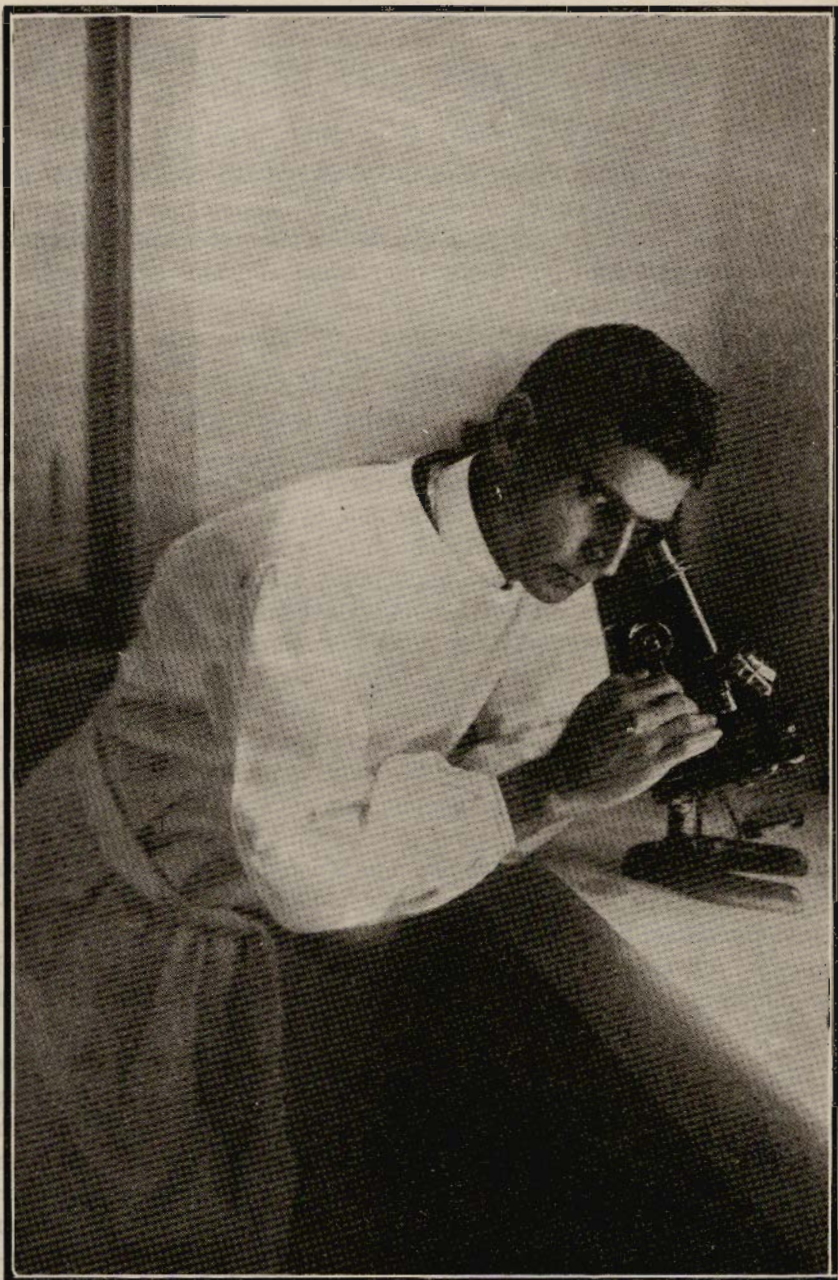
The United States Public Health Officers at the port of San Juan are constantly at work to prevent, as far as possible, the importation of plague. It is their business to examine carefully all immigrants and to fumigate and put under quarantine all ships arriving from infected ports.

RAT-PROOFING AND FLEA-PROOFING

The health regulations numbers 3, 12, 15 and 28 as compiled and proclaimed in January 3, 1921, established the rat-proof requirements for the construction of buildings in the Island of Porto Rico. Rat-proofing consists in creating such adverse conditions to the existence of the rodents that they will not be able to survive. William Colby Rucker,² in his article "The Eradication and Prevention of Bubonic Plague," speaks of the great importance of rat-proofing. "Of all anti-plague measures yet devised by man," says he, "the one which is of greatest and most lasting value is permanent rat-proofing. A rat-proof city shall not fall from plague. Rat-proofing acts not only as a means of plague eradication; it is the fortification against its subsequent attacks. The subject is therefore of great importance to the general public both from the sanitary and commercial view points. Rat-proofing serves the purpose of protecting the inmates of the building from plague and of excluding the rat from its food supply and habitation. It is the insulation against the rat which is to be applied as a general measure in all plague-infectible localities, especially those which have suffered from predations of the disease. Permanent rat-proofing costs money but it must be regarded as plague insurance both from the commercial and the humanitarian aspect."

The ordinary inspectors of the Insular Health Department have always endeavored to have the people comply with the rat-proofing requirements and they have been successful, in a general way, in this respect. We consider the problem so essential, however, that we are urgently planning to obtain an old-time experienced inspector in rat-proofing for this special work in our bureau. It is our aim to reach the greatest possible perfection as far as rat-proofing is concerned, keeping our eyes constantly open to any possible defect

² Assistant Surgeon General, Public Health and Marine Hospital Service.



In positive cases the microscope generally reveals the presence of bipolar bacilli in the smears.

which might exist anywhere and especially along the waterfront of San Juan, including the wharves and warehouses. This is undoubtedly the zone that is mostly exposed to plague infection on account of its geographical position, as shown from our last epidemics.

DERATIZATION

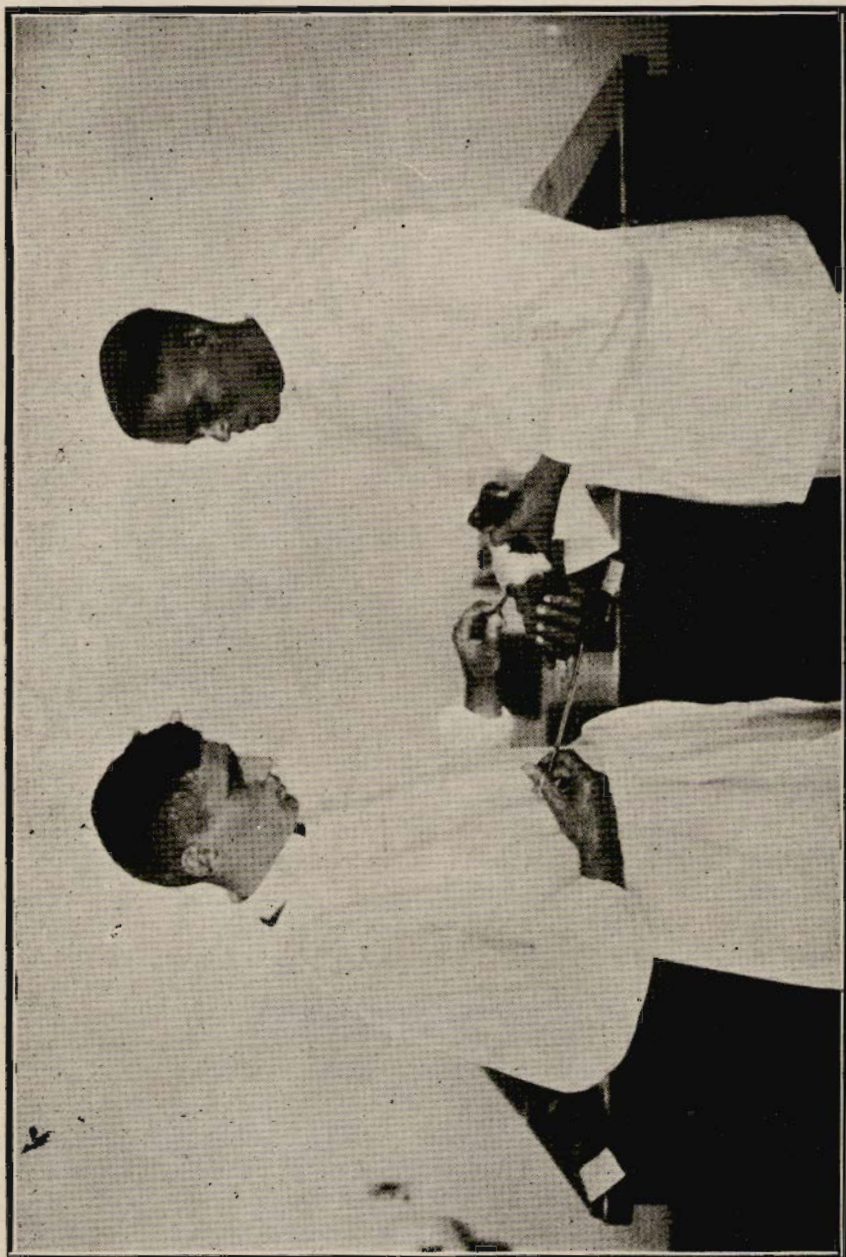
"The eradication of bubonic plague means the eradication of rodents." "It is probably impossible to absolutely exterminate the species in a given city, but this is not absolutely necessary to the eradication of plague. If the rat population is kept within fairly few limits and is not congested, rat plague will die out from purely natural causes. Or, should it be introduced into a sparse and scattered rodent community, the disease will soon exhaust the material necessary for its perpetuation."³ During the Porto Rico epidemics (1912-1921) the campaign against the rodents in San Juan greatly reduced their number, but the rat population of the city was far from being extinguished; yet there is no question as to the decided influence which the decrease in the number of rats exercised upon the suppression of plague in this city.

The deratization plan followed by us has varied in intensity according to the likelihood of infection in different localities. As already established at the beginning of this article, the greatest danger of plague infection in Porto Rico lies in the possible immigration of plague rats. It is of the first importance, therefore, to guard seaports against this contingency. With this end in view we have organized permanent deratizing posts in all important seaports, and chiefly at the Capital, which has been the port of entry on two different occasions. In other inland towns where infection occurred in 1912 and 1921 the anti-murine campaign has been limited to short periods of two or three months a year, the aim being to avoid any possible outbreak arising from chronic plague among the rats.

Campaign at San Juan.—San Juan has been divided into four zones. Zone No. 1 comprises the waterfront and commercial districts, including the wharves, warehouses, the railroad station, etc. This is undoubtedly the most dangerous section of the city from the standpoint of plague infection. Zone No. 2 embraces that portion of San Juan situated within the old city walls. Puerta de Tierra and Santurce form zones numbers 3 and 4, respectively.

To each zone has been assigned a brigade consisting of a foreman and a number of rat-trappers which varies according to the im-

³ From "The Eradication and Prevention of Bubonic Plague," by William Colby Rucker.



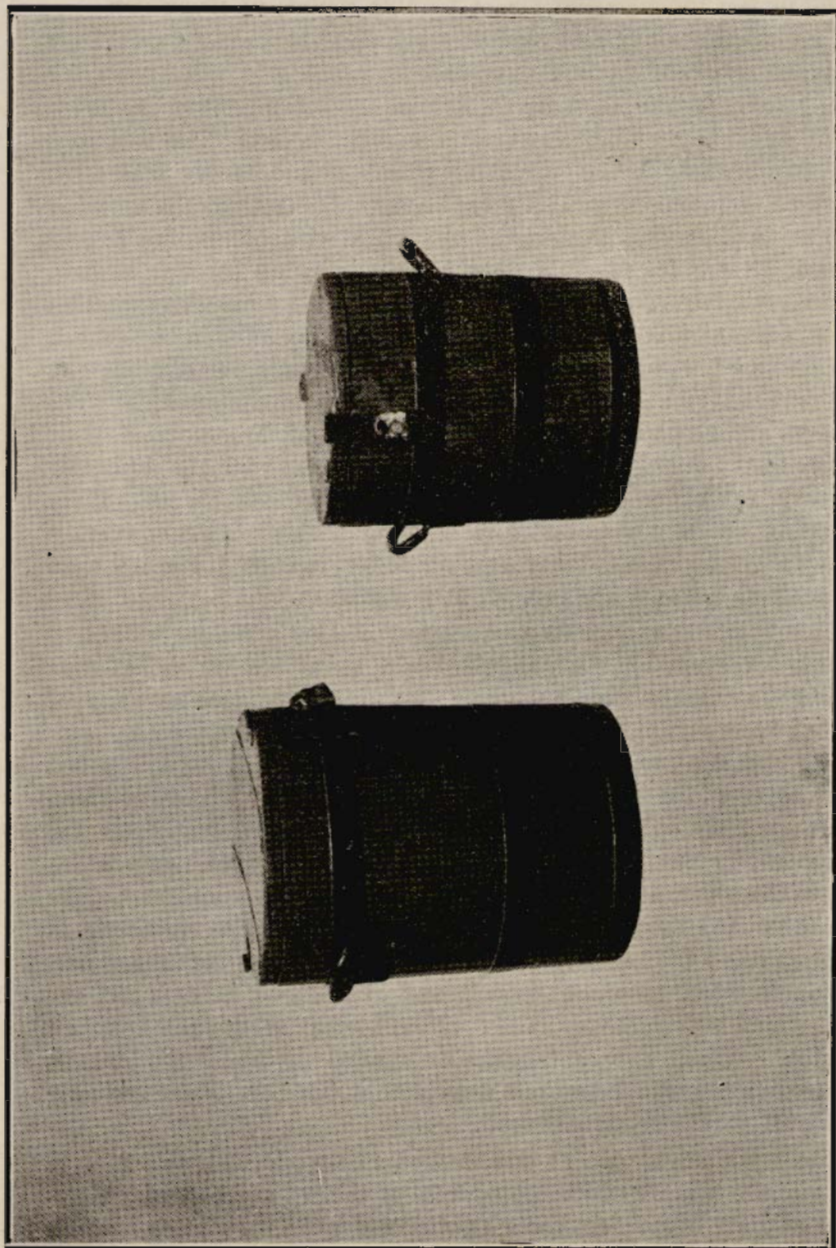
Guinea-pig inoculation is required for the purpose of confirmation of diagnosis.

portance and extension of the place. A supervising inspector has charge of the foremen and makes regular rounds of inspection.

The rat-trappers are engaged to work eight hours per day. They are given seventy-five traps each and they are held responsible for them. Early in the morning these men set out to collect the traps at the places where they were left the night before. The rats captured are brought to the "counting office" of the bureau where the record of each man is carefully registered. The rest of the morning is spent in a careful washing of the traps with boiling water and preparing them for use. We are habitually using coconut as bait. It is a very attractive food to the species and its cleanliness makes it most convenient. In the afternoon the workers meet in the bureau yard and are there kept for any possible emergency until 2:30 p. m. At this hour each brigade is directed to an appointed zone. The foremen are responsible for the traps of their brigade and their proper distribution. They receive instructions from the inspector and they give orders in turn to the men under their charge. Fifty rats per week have been found to be a reasonable minimum average for a rat-trapper, and those keeping lower records for more than two successive weeks are permanently dismissed.

To protect these men from contagion in case a plague rodent be captured everyone has been supplied with a rat box which has been specially devised for this purpose. The average murine capacity of this box is twenty. In one of its corners there is a tin pocket containing a small bottle with chloroform. A loop has been attached to the cover of the box and a piece of cotton placed within this loop is saturated with chloroform every time the box is opened for the admission of a rat. We have made a number of experiments which confirm the conclusion that fleas are very sensitive to chloroform. We have submitted this insect to a definite amount of the anesthetic in a limited space of determined capacity. Under these conditions narcosis is produced in a few seconds and after three minutes not one of the fleas is left alive. Hence the efficiency of the rat box just described. When the contrivance is opened to admit the rodents captured in a given house, all fleas within the box, if not actually dead, will surely be anesthetized.

The great advantage of our method is that it will not spoil in any way the tags on which the address of the rat is recorded. Kerosine and other liquid depulizing agents render the inscription illegible very often and we have had considerable trouble at times in reading it.



A special contrivance has been devised for the transportation of dead rodents from distant towns. The apparatus is made in two different sizes.