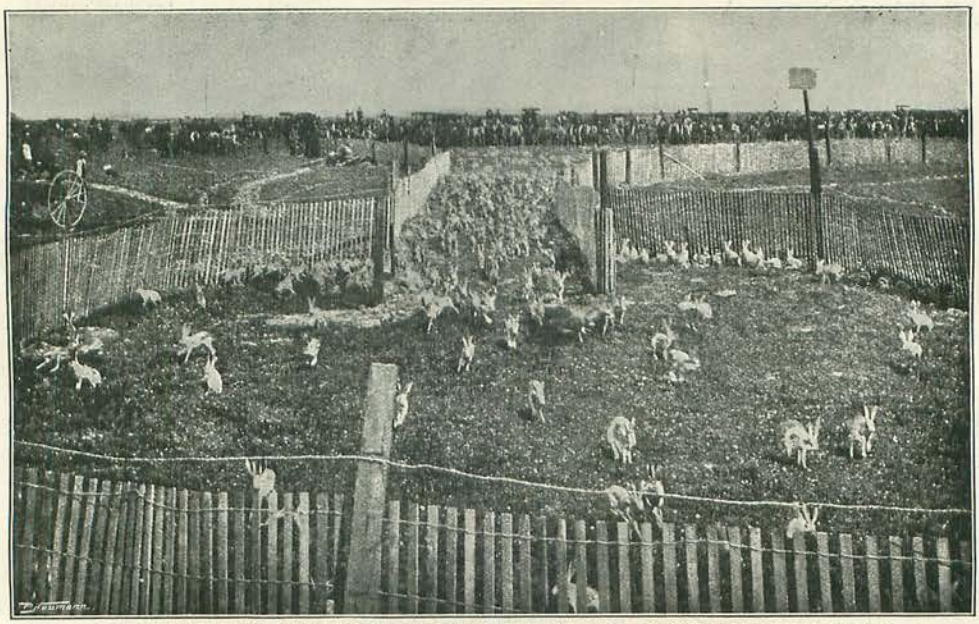
Pests.

By Warren Cooper.

SOME thirty years ago, the common European rabbit was introduced into Australia and New Zealand, and the natives have been regretting it ever since. The rabbits multiplied alarmingly, ate up and spoiled the sheep-food, and ruined the farmers. Devices of all sorts have been tried to get rid of them, but the golden method has not yet been struck. Traps, poison, and the virus of fowl-cholera have been tried; stoats and weasels have been suggested, and thousands of pounds have been sunk in rabbit-proof fences. But all in vain. New South Wales alone now spends over £100,000 yearly in extermination, and in 1887 a reward of £25,000 was offered by the Government for an effectual method of extermination, but no one got the prize.

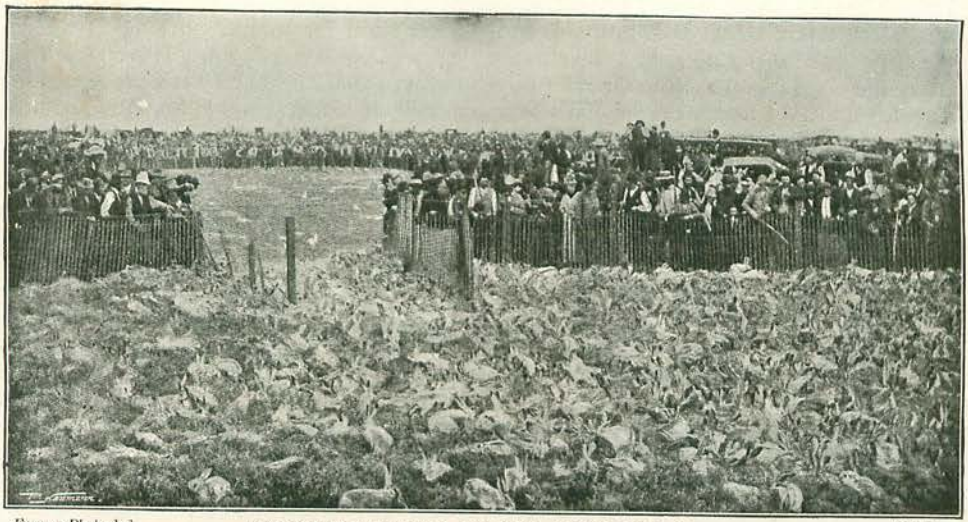
In California the same cry of woe is raised, and the people of Colorado, Idaho, Oregon, and Utah join in with lusty voice. In these places they call the animal "Jack Rabbit" as an abbreviation of "Jackass Rabbit," so named from his long ears. And, without any exaggeration, they *do* get after him. They have raised the system of "drives" to perfection, taking the idea from the Mission Indians, and developing it to such an extent that 10,000 or 15,000 dead rabbits is no unusual booty of a day's hunting.

The way it is done is suggested by our first illustration, which shows a Jack rabbit drive near Fresno, California, on May 5th, 1894. Precautions are taken that no escape is left for Mr. Rabbit when once surrounded. A square or triangular inclosure, open at one end, is constructed of wire netting or of laths securely fastened together. Often a corner of some old corral is simply made rabbit tight, and from the open end of the pen diverging fences or wings are carried out in the form of a wide-mouthed V, sometimes for a distance of two or three miles. The fences are sometimes made in sections, so that they can be transported from one place to another, and thus used for several drives.



A JACK RABBIT DRIVE NEAR FRESNO, CALIFORNIA, MAY 5TH, 1894—RABBITS ENTERING THE CORRAL.
From a Photograph.

In an interesting report on "The Jack Rabbits of the United States," by Dr. T. S. Palmer, of the Department of Agriculture, statistics are given showing that from February, 1892, to November, 1894, 155 drives were held in California, and that 370,195 rabbits were killed by this means. Dr. Palmer also says that a drive always mean a gala day, and is a favourite way of celebrating some special occasion. The announcement is the signal for a gathering of the clans from all the neighbouring country, and the popula-



From a Photo. by] THE GRAND ARMY DRIVE AT FRESNO, MARCH 12TH, 1892. *[Stiffler.*

tion of the place is increased to several times its normal size when such an event takes place. Excursionists are attracted in large numbers, by the special rates offered by the railroads, and sometimes come from points as far distant as San Francisco and Sacramento. Upon the appointed day, large numbers of people turn out armed with sticks and clubs, and, scattering over a considerable area, start the rabbits and drive them toward the mouth of the corral. Every available vehicle is pressed into service, but the larger part of the throng is usually on foot. The lines gradually close in, and the frightened rabbits rush blindly into the opening between the wings, and are gradually crowded toward the narrow end of the pen, where they are soon dispatched. The drives take place in the winter and spring, and the number of rabbits killed varies from a few hundred up to 20,000. The town of Traver regularly celebrates its

From a Photo. by] 25,000 JACK RABBITS KILLED IN THE GRAND ARMY DRIVE. *[Stiffler.*

birthday in April by a rabbit drive and barbecue. On March 12th, 1892, the closing event of the encampment of the Grand Army of the Republic—veterans of the Civil War—resulted in the greatest drive on record, in which 25,000 rabbits were killed.

The ravages of locusts are well known, and newspapers from South Africa are constantly giving remarkable details regarding their flights and numbers. In Cyprus they used to do great damage, but have been almost exterminated by a system of pits and fences. A long zig-zag wire fence is placed across their line of march, and pits are dug at each of the inner angles. It is well known that when an army of locusts are advancing, they go in a straight line, devouring everything, and as they cannot jump these fences they fall into the pits and are there dispatched. Trains have been stopped by these pests, and it has sometimes taken labourers two or three hours to clean the machinery and put the train in motion. The disagreeable sensations caused by such a pest may well be imagined from our photograph, which shows a flight of locusts in Mafeking, Bechuanaland, in June, 1895. During the thickest of the flight, before the picture was secured, white-washed barrack buildings, standing but a few yards away, were invisible.

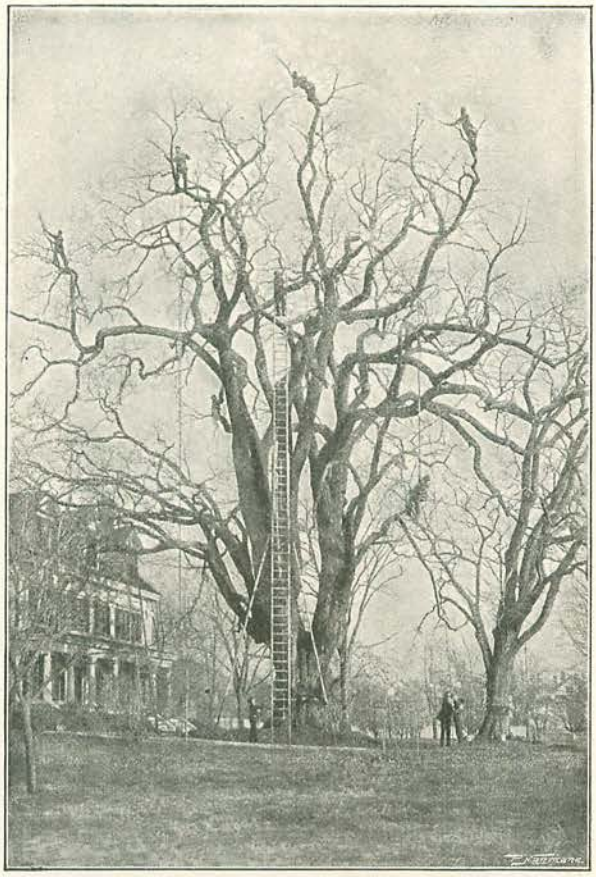
From a Photo. by] FLIGHT OF LOCUSTS AT MAFEKING, JUNE, 1895. *[Mr. Herbert Shaw.*

There are no rabbits to speak of in Massachusetts, but the old Commonwealth will never want for trouble so long as the gipsy moth is loitering about. It will hardly be believed that the State has now spent nearly a million dollars in fighting the moth and caterpillar, that hundreds of men, regularly organized into squads, have, since 1890, personally inspected and reinspected over forty-two million trees, and have killed nearly two and a half billion of these dangerous creatures, and that it will be several years, at an average expense of over £20,000 per year, before the gipsy moth is finally exterminated. But the statement is only too true, and it is certain that if Massachusetts had not quickly taken means to confine the moth within narrow limits, the forests and crops of the United States would soon have been defoliated and exterminated.

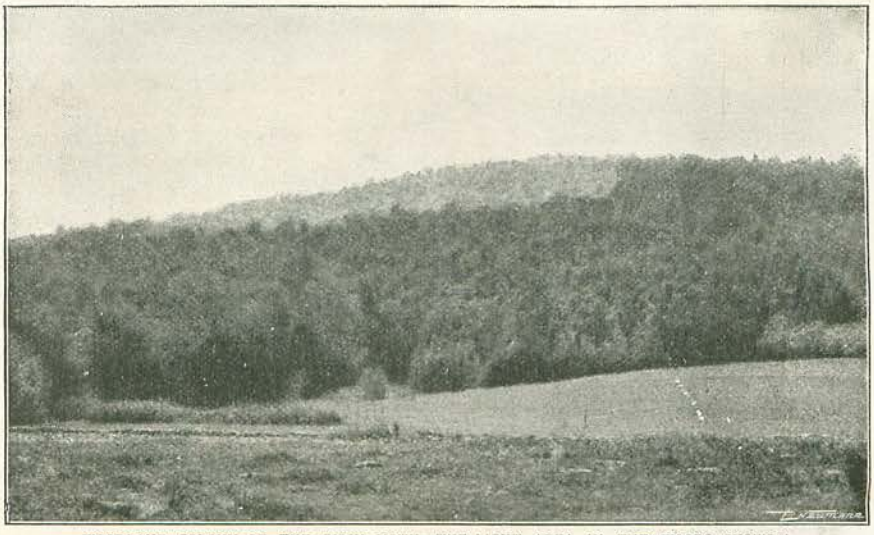
The fight against the moth is without parallel in the entomological history of the world. The insect was imported by a French naturalist, who was experimenting on silkworms at Medford, Massachusetts, and in 1869 a few specimens accidentally escaped. The dangerous character of the pest was immediately made public, but it was not till 1889 that its voracity and reproductive powers became noticeable. Probably the insects were getting acclimatized. At any rate, they soon swarmed upon Medford in hordes, sweeping clean large tracts of land, and marching on to new districts as soon as the old ones were devastated. In a few years they had covered over 220 square miles of territory, but by means of constant effort they have been confined within that limit, and there are now but 75 miles of forest land in which the moth is rampant.

The methods by which the fight has been carried on are many, but a few may be noted here. Our illustration of men at work on the Dexter elm in Malden shows one of the ways—and a risky way it is, too. The men ascend

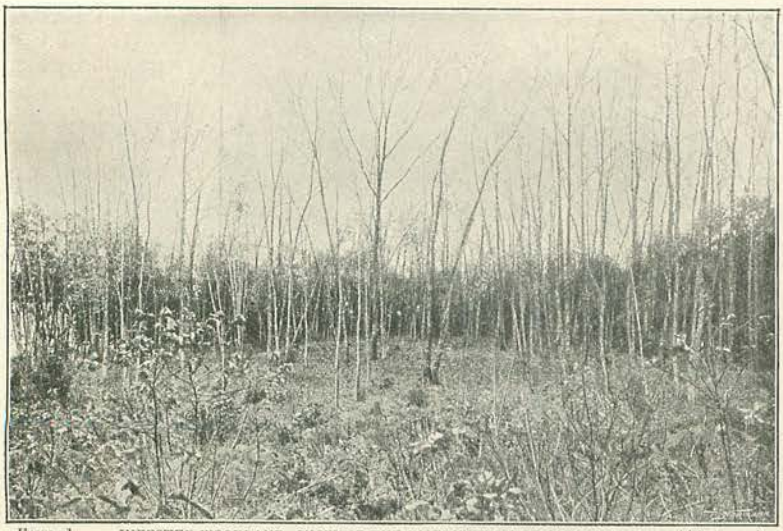
on ladders, or are pulled up by ropes, and carefully search every portion of the tree, not only for caterpillars but for eggs, which they sometimes scrape off in pecks. The denuded tree is in itself a marvellous example of the ravages of the moth. These are also strikingly brought out in the illustration at the foot of this page, which shows a woodland colony of gipsy moths seen at a distance of one-third of a mile. The light area in the woods in the background shows the appearance of a defoliated tract, as compared with the surrounding uninfested trees. Another photograph shows how the caterpillars, having destroyed the vegetation when they first appeared, have spread into the neighbouring woods. In 1889 prominent citizens testified that the "worms" were so numerous that one could slide on the crushed bodies on the side-walks; and that they crowded each other off the trees and gathered in masses on the ground, fences, and houses, entering windows, destroying flowering plants in the houses, and even appearing in the chambers at night. The State began operations against the pest with the arsenic spray, but non-success prompted them to experiments, which showed that a



DESTROYING THE GIPSY MOTH ON THE DEXTER ELM, MALDEN, MASSACHUSETTS. *From a* [*Photograph.*



WOODLAND COLONY OF THE GIPSY MOTH—THE LIGHT AREA IN THE WOODS SHOWS A DEFOLIATED TRACT. *From a* [*Photograph.*

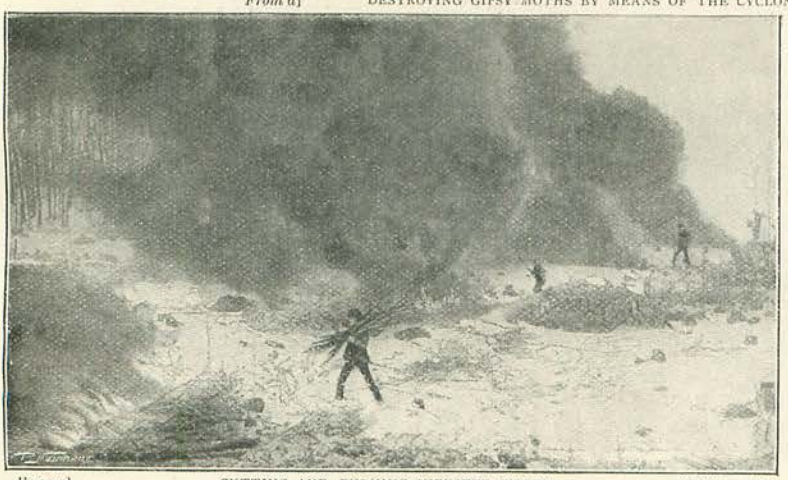


From a] INFESTED WOODLAND, SHOWING THE DISTRIBUTION OF CATERPILLARS. *[Photograph.*

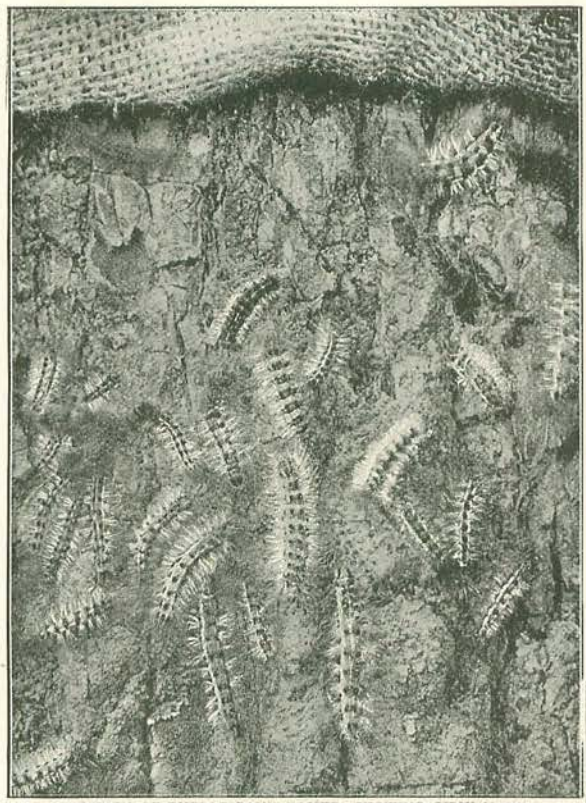
cloth — were put around all the trees in order that the caterpillars and egg-clusters could be collected in mass and easily killed. Our illustrations show the method of using the cyclone burner, and a section of burlap band raised with the gipsy moth caterpillars gathered beneath it on the trunk of an elm tree. Another of our illustrations, which have been lent to us by the Gipsy Moth Commission of Massachusetts, shows how infested woods are cut, and fires started in order that brushwood may be burned. How completely the caterpillar does its work is perhaps best shown by our illustration of the pine and other trees attacked at Lex-

full-grown caterpillar of this species could take twelve times as much arsenic as a man of the same size. The authorities then used the intense flame of vaporized petroleum waste, and destroyed millions of eggs. The instrument is called a "cyclone burner." Insecticides were also used, and "burlap" bands—coarse hempen

From a] DESTROYING GIPSY MOTHS BY MEANS OF THE CYCLONE BURNER. *[Photograph.*



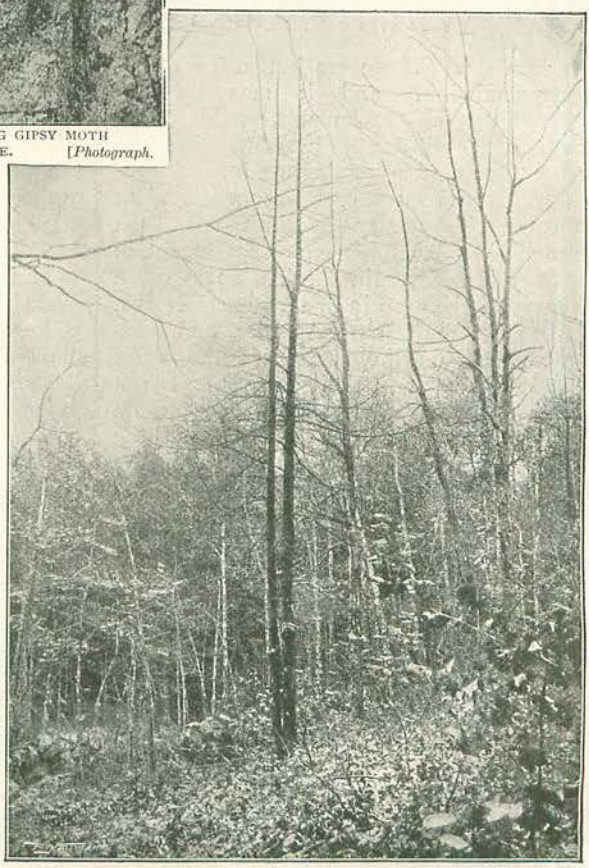
From a] CUTTING AND BURNING INFESTED WOODS. *[Photograph.*



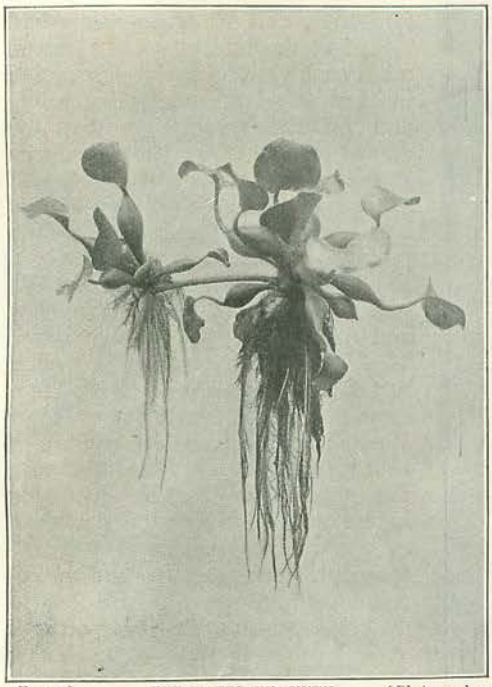
SECTION OF BURLAP BAND RAISED, SHOWING GIPSY MOTH CATERPILLARS ON AN ELM TREE. [*Photograph.*
From a]

ington, Massachusetts. The trees in the foreground are stripped absolutely bare. Birds which feed upon the eggs of the gipsy moth have also been introduced, and no stone, literally speaking, has been left unturned to exterminate the pest. It has been carefully demonstrated by scientists that the unrestricted caterpillar increase of a single pair of gipsy moths would suffice in eight years to devour the entire vegetation of the United States!

The English sparrow question in North America has grown to be a serious problem in economic science, so far as the agricultural interests of the country are concerned. The charge against them is that they do wilful damage to buds, blossoms, and foliage, ruin fruit, eat up sown seed and thereby retard the crops, and molest the native birds. This indictment has been only too well proved. At the close of the year 1886 the sparrow had established itself in thirty-five States and five territories, and in fifteen years had spread at the rate of 59,000 square miles each year, carrying destruction in its wake. Its fecundity is amazing, and on the assumption that the annual product of a pair of sparrows is twenty-four young, of which half are females and half males, it has been estimated that in ten years, provided all lived, the progeny of a single pair would be 275,716,983,698 sparrows, all with a greedy mouth, and all a menace to the land. The ornithologists of the United States Department of Agriculture have now recommended the immediate repeal of all laws which afford protection to this little bird, the enactment of laws legalizing killing at all seasons of the year, as well as laws making it a misdemeanour, punishable by fine or imprisonment, or both, to give food to the birds or to introduce it into



PINE AND OTHER TREES ATTACKED BY THE GIPSY MOTH CATERPILLARS AT LEXINGTON, MASS. [*Photograph.*
From a]



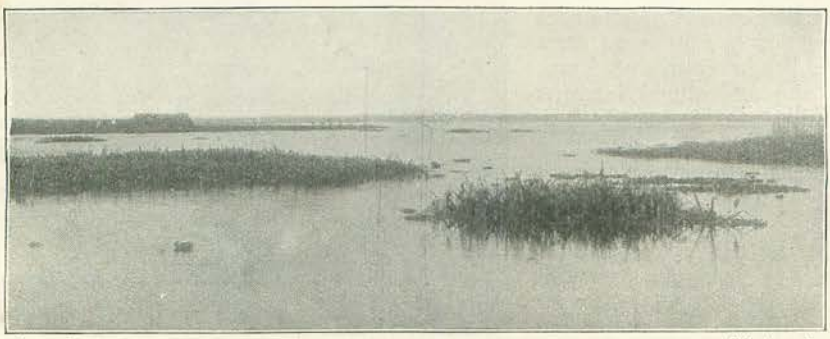
From a] THE WATER HYACINTH. *[Photograph.*

new localities. These are but a few of the recommendations, and it may be well believed that no Government would recommend such apparently heartless slaughter unless there were a pressing need.

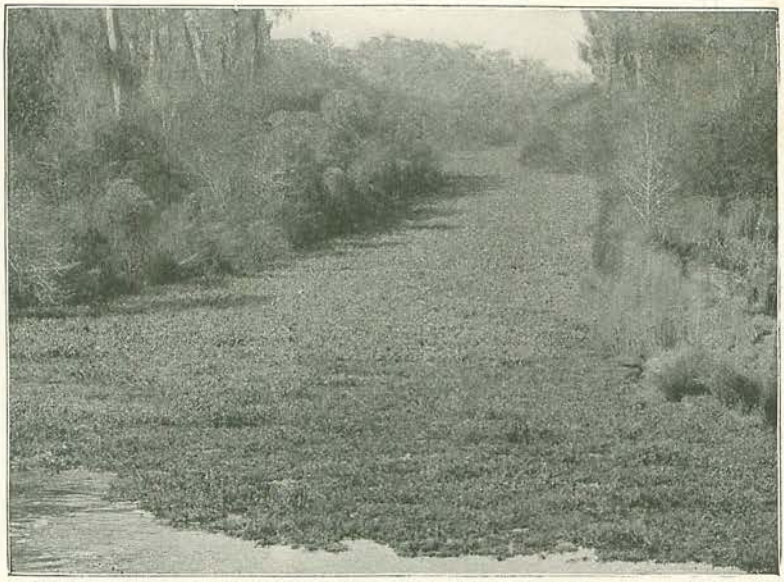
For several years past an aquatic plant known as the water hyacinth has been developing to such an enormous extent in the St. John's River, in Florida, as to cause serious apprehension in that region. It is a native of tropical South America, and commonly floats on the surface of the water without attachment to the soil. It has a fondness for sluggish streams, and in Florida the plants are generally found lining the shores of the lakes and rivers in immense numbers. So long as they can stay near the bank, the water hyacinths cause little trouble, but when the wind springs up, and looses great masses of the plants, starting them down stream or into the middle of the channel, the danger to navigation is very great.

Here is a picture of the little plant which the Floridans so much hate. A glance at its dense bushy mass of roots suggests the possibility of its causing trouble when floating, as it were, with the rest of the family, but our illustration of the "floating masses of water hyacinth" is its own proof. No one knows accurately when this pest was introduced into Florida, but it appeared in the St. John's River about 1890, at Edgewater, about four miles above Palatka. At this place it had been grown for some time in a pond, and when it was desired to clear the place out, the plants were thrown into the river. This is just where the mistake was made. For, being an attractive plant, it was carried by settlers up and down the river, and introduced at different points to beautify the river in front of the settlements, until its rapidity of propagation became a serious menace. The Floridans are now doing their level best to conquer it, and the United States Department of Agriculture has sent a special agent, in the person of Mr. Herbert J. Webber, to visit the region and investigate the question. The very striking photographs of the water-hyacinth pest which we use in this article have been lent to us by the Division of Botany of the Department of Agriculture.

The case against the water hyacinth is overwhelming. Small boats with screw propellers find it impossible to penetrate a large mass of the plants, a they get entangled in the screw. When a large steamer, going at full speed, strikes a bank of the hyacinths it comes almost to a standstill. Floating logs often lie entangled in the mass and injure the boats; while in large lakes, like Lake George,



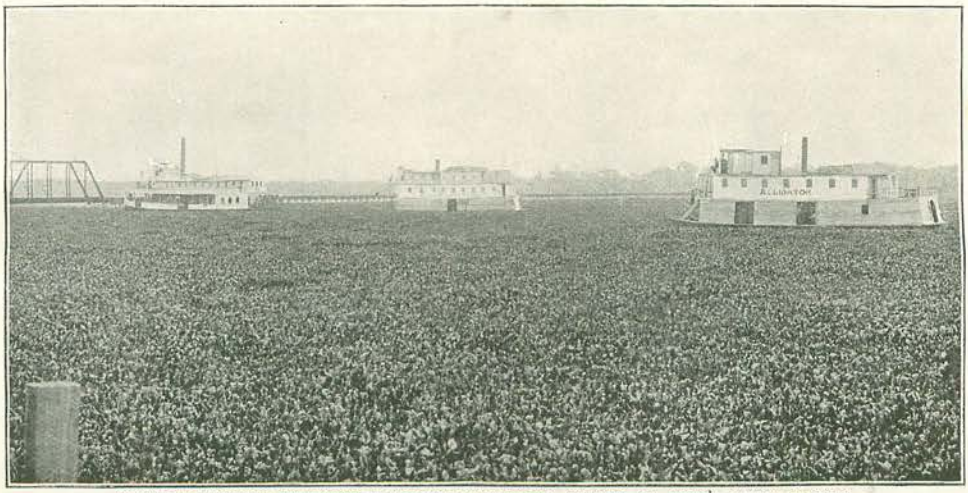
From a] FLOATING MASSES OF WATER HYACINTH. *[Photograph.*



From a] A FLORIDA CREEK COVERED WITH WATER HYACINTH. *[Photograph.*

and in wide portions of the rivers, there is great danger of steamers being caught by the plants, carried out of the channel, and stranded. The *City of Jacksonville*, a powerful steamer, plying on the St. John's River, had great difficulty in avoiding such a disaster during the autumn of 1896. Yet this is not all. It impedes the timber industry, clogs the nets of the fishermen, resists the passage of water under bridges and injures the bridges, and, by accumulating large masses of decaying vegetable matter near the large towns, seriously threatens the health of the inhabitants.

Pests of this nature are often combated by the introduction of their natural enemies, and it is now proposed to introduce into the Florida rivers the destructive red spider of horticulturists for the purpose of destroying the water hyacinth. It ought to be remembered, however, that English sparrows were introduced into the United States to destroy caterpillars, and a leaf might be taken out of the Jamaican note-book, where, as one writer points out, "rats were introduced, and other rats of carnivorous breed to thin their numbers, then ticks to thin these, then snakes to eat the ticks, and then mongooses to eat the snakes, the mongooses becoming a plague which nothing could quell." Certainly a glance at our last illustration, which shows three steamers at Palatka Bridge on the St. John's River, blocked by the water hyacinth, will convince anyone of the necessity of immediate action, but it may be that, after conquering the hyacinth, the Floridans will have to take arms against a sea of troubles in the shape of multitudes of spiders.



STEAMERS BLOCKED BY WATER HYACINTH AT PALATKA BRIDGE, ST. JOHN'S RIVER, FLORIDA.
From a Photo. by A. P. Lewis, Palatka, Florida.