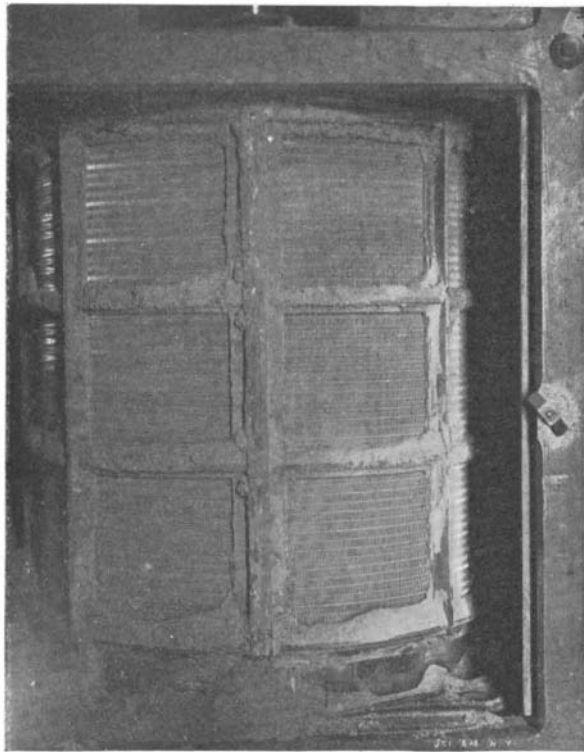


A WHEAT HOSPITAL ON LAKE SUPERIOR.

The loss to American farmers every year through wet, dirty, or diseased wheat is very large. It is estimated that the loss from the loose smut alone is at least eighteen millions of dollars per year. Much in-



JACKET OF SCOURING MACHINE.

formation has been disseminated among the farmers in the way of bulletins from the Department of Agriculture in Washington, and from the various State Experiment Stations in wheat-raising States, describing the various diseases of wheat, showing how to treat the seed wheat so that it will not continue the infection, and providing remedies of various kinds.

The same conditions prevail in Canada, in the large wheat-raising regions in Manitoba and the Northwest. In order to prevent this great loss, or, at least, to reduce it to a minimum, a wheat hospital has been established at the northwestern end of Lake Superior, in Ontario, at a lake port, the little city of Port Arthur. In this hospital diseased and damaged wheats are restored to health by an elaborate system of treatment. Indeed, so apt is the figure, the institution where the work is done has come to be known in current phrase as "the hospital," and the name fits well.

It is, in reality, a large elevator in form, having many of the accessories of the common grain elevators of the States and Canada. It is built in the lake itself, upon piling and strong crib-work, so that ships which carry the cured patients to the larger cities of Canada, or to the East for shipment direct to England, may come alongside to take on their cargoes. The hospital receives and cares for two millions of bushels of wheat per year.

Of course it would be impossible for the attendants to restore to health a patient suffering from the more virulent type of smut, the "stinking smut" or "bunt," as it is called, for, in the advanced stages of this dis-



"WHEAT HOSPITAL," PORT ARTHUR, CANADA.

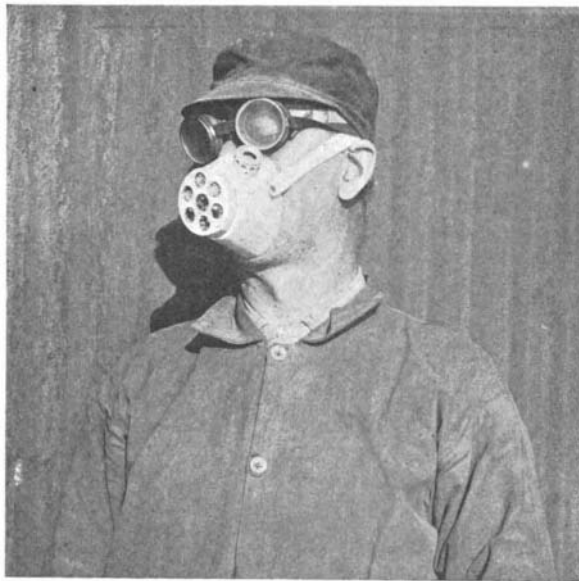
ease the whole kernel becomes infected and is but a mass of germs or spores, which have appropriated to themselves all the nutritive parts of the wheat and rendered it but a thin shell, the breaking of which sends forth a countless number of spores bearing a pungent, fetid odor, very disastrous in its effects upon any flour with which it might come in contact.

But such kernels as are not injured inside the brown skin that surrounds the healthy wheat, are susceptible to treatment even though they be so black with smut or dirt that their original color cannot be distinguished. In addition to all the wheats which may be thus afflicted, there is a large class which may be said to have dropsical tendencies—such wheats as are so saturated with water from one cause or another, that they are unfit for milling and, as a rule, are either burned or thrown away or utilized, as far as possible, for the feeding of stock. In certain seasons there is much of this wet wheat. Frequently it causes great loss to the farmers, sometimes the total loss of an entire crop. Methods of home treatment are not likely to prove availing, and the patients are given up for lost.

The hospital contains an elaborate drying plant in which six thousand five hundred bushels of wet wheat may be dried per hour. It consists of a series of upright frames, perhaps an inch and a half in thickness and about three feet by ten in size. These are made of perforated metal; they are, in fact, huge flat cases in which the wheat is held while streams of hot air, or warm air, are passed through them to reduce the moisture. The wheat which must pass through this treatment comes in three classes:

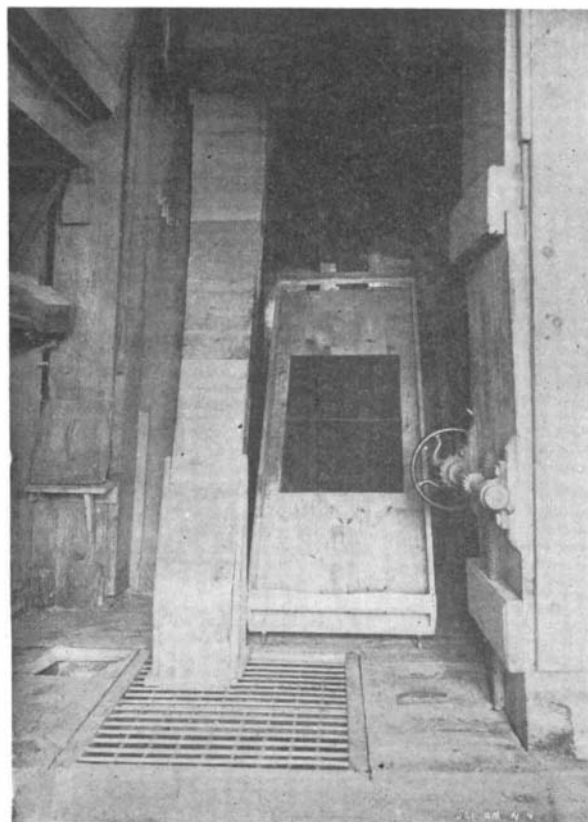
1. "Tough" wheat, which contains about four and one-half per cent of water above the normal amount.
2. "Damp" wheat, which has seven and one-half per cent of moisture.
3. "Wet" wheat, having an excess of from eleven to fifteen per cent of water.

Normal wheat contains about four per cent of mois-



ATTENDANT IN A WHEAT HOSPITAL, SHOWING FACE PROTECTOR.

ture. When the wheat having an abnormal amount of moisture has been given the hospital treatment it comes out in fine condition for milling and has lost



DISTRIBUTING ROOM.

all the way from one-half a pound in weight to five pounds, the excess being water.

The entire treatment of wheat which comes in for treatment for dirt or smut might be condensed into one word—scouring. The wheat which is dark with



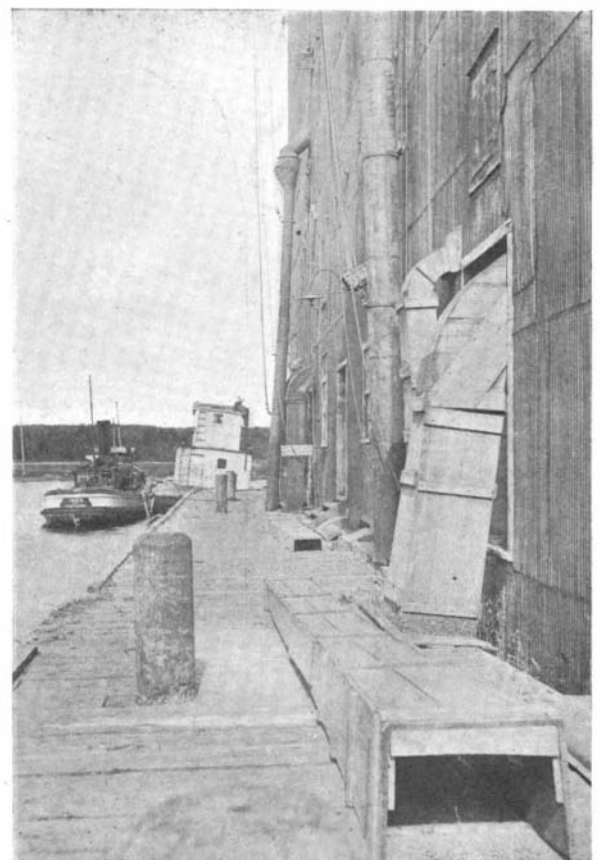
PLANK SHOWING EROSION BY WHEAT KERNELS.

dirt, but which has an honest kernel beneath its coat of black, is literally scoured between pieces of metal, passing through a rapidly revolving machine which so turns and tosses and burnishes the wheat that it comes out as clean as though it had never been contaminated.

Naturally, a large amount of dust is thrown off in the hospital, so much, in fact, that the employes are compelled to wear face masks, which are made of a hard white rubber with holes in the sides in which are pressed bits of sponge to absorb the dust as the workmen inhale the air. The workmen present a curious appearance when, in addition to these masks, they wear a pair of huge, close-fitting goggles, completely covering their eyes. One might easily imagine them strange, half-human animals, so unreal are their looks.

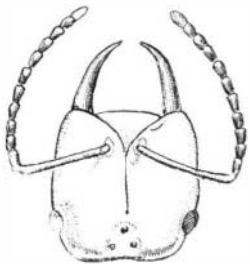
In certain phases of the treatment the wheat falls from the upper portion of the elevator a long distance down to a lower floor, or may be, in other cases, flung out against the sides of covering frames. In either case, a remarkable thing is observed—the flying wheat will, in the course of a few months, completely wear out a pine plank two and one-half inches in thickness.

The wheat which is thus put through a course of

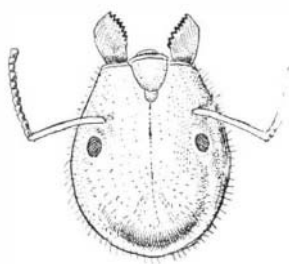


"CURED" WHEAT BEING LOADED.

treatment in this Canadian hospital is said by those who conduct the treatment to be in a better condition for the miller than it would be if it had come in as regular normal wheat, the reason for this claim being found in the fact that when the wheat has recovered from its illness it has lost a non-essential part of its outer coat which would have to be removed anyway when put through the regular milling process. So far as I know, none of this wheat is ground for flour in the United States, all of it going to Europe, mainly to England, or to various Canadian towns and cities in the eastern part of the Dominion. Whether the millers of the United States would consent to use the flour which had passed through a similar hospital treatment on this extensive scale or not, is a matter of question, though in seasons of shortage it might be found practicable, provided the kernel was up to the proper grade. There can be no question, however, as to the



HEAD OF WARRIOR ANT. Showing pointed and curved mandibles unfitted for work.



HEAD OF WORKING ANT. Showing toothed mandibles.

interest such a hospital in this country would have for such farmers as suffer loss from any one of the various diseases which the Canadian hospital treats.

SOME NEW FEATURES IN ANT LIFE.

BY J. CARTER BEARD.

The recent discoveries of Wasman, Florel, Belt and others, added to the wonderful results of the investigations made a few years ago by McCook, Moggridge and Bates, have deservedly awakened a new interest in everything connected with the lives and habits of ants. The remarkable evidences they exhibit of something which, notwithstanding its limitations, seems akin to human intelligence; the perfection, as compared with other insects, of its physical structure; the greater proportion borne by the brain to the rest of the body; and its wonderful social life, so much more highly developed than that of the bees or of the wasps, have inclined those who study it the closest to believe that, making allowance for the great inferiority of the class of invertebrates, the Formicidæ certainly hold among invertebrates a rank commensurable with that sustained by Primates, including man, among vertebrates.

Taking into account the comparatively enormous masses of brain matter belonging to a number of large animals which exhibit a marked degree of incogitance, and the intelligence manifested by members of this division of Hymenoptera, the claim made by Darwin that the anterior ganglion in the head of an ant constituting its brain "is the most marvelous atom of matter in the world," is justified.

The hippopotamus, in the tremendous lapse of time which has attended its evolution, has learned scarcely more than to fulfill the simplest and most obvious requirements of nature, while the ant has developed competence that in some instances has anticipated mankind in acquiring arts and industries indispensable to the well-being of social life, and a practical wisdom in adjusting the conditions which govern them in their association in communities quite beyond anything mankind has yet been able to achieve.

It is interesting to notice how diverse are the methods adopted by invertebrate intelligence from that of man in attaining a desired result. Man looks entirely to the outside world about him for the means of accomplishing his purposes; insects, on the contrary, drawing upon the resources of their own natural constitutions, often adapt themselves to the conditions and requirements of their lives by structural modifications. For instance, men make the tools they require for carving or for digging, insects grow them; vessels being needed as receptacles for liquid food, man learns the art of the potter, but the curious honey ants (*Myrmecocystas melliger*, of Llave; *M. nortusdeorum*, McCook; *Camponotus inflatu*, Lubbock) transform themselves into living bottles, to which the working members of the commune resort for refreshment.

The tools of insects, exquisitely fashioned and finished, are much more perfectly adapted for the purposes they serve than are any con-

trived and manufactured by human beings, but there is a disadvantage connected with them—they cannot be laid aside. The tools dominate the tool-bearers and check development in any direction not connected with their use.

This leads to the extreme specialization we find among insects. Species or varieties among species become mere functional organs in the sense that the liver or the kidneys are such, devoted and limited to some one particular use, and in some cases scarcely retaining a suggestion of possible action in any other. The egg producer, the queen of the termites, although she possesses the usual number of limbs belonging to her species, is totally incapable of locomotion, as are the living bottles of the honey ants. The queen lays eggs; she can do nothing else; the living bottles store up and yield food to other members of the formicary, and are as incapable of performing other uses as if they were mere lifeless cells in a honeycomb.

Among the Formicidæ this tendency to specialization has resulted in establishing species limited to particular industries or to particular methods of living. Some species of slave-making ants, for instance, confine themselves so entirely to military affairs, and have so entirely lost the arts of peace and efficiency in domestic matters, that they are not only obliged to depend upon their slaves to care for the young in the formicary, but to have the food placed in their own warlike mouths, and would starve in the midst of plenty were this not done.

The mandibles of these ants, *Polyergus rufescens* and *P. lucidus*, the former a European, the latter an American species, are entirely unfitted for work. They can neither crush, cut nor saw; but, being sharply pointed and curved, they make most serviceable weapons; with them in attacking an enemy, *Polyergus* seizes the head of her foe between the points of these curved poignards and penetrates the brain at once.

It sometimes happens, however, that either the conditions are such that the instincts common in a greater or less degree to all species of Formicans cannot be followed out in any ordinary manner, or that Nature has failed to provide in the structural development of the insect proper appliances necessary to its domestic economy.

Such instances, when they occur, are not only extremely interesting, showing as they do the Formicidæ capable of utilizing in the most ingenious ways what-

ever can be made to answer their purposes, but the extraordinary and unexpected manner in which this is done is apt to awaken in the observer, as if he saw some comical trick performed, a mingled sense of admiration and amusement. A number of ants among those of very different species are distinguished by possessing relatively large heads, the use of which is extremely problematical. The workers of the East Indian *Pheidologeton diversus*, for instance, spiteful little things that bite venomously, have among their giant soldier ants, a hundred times as large as them-



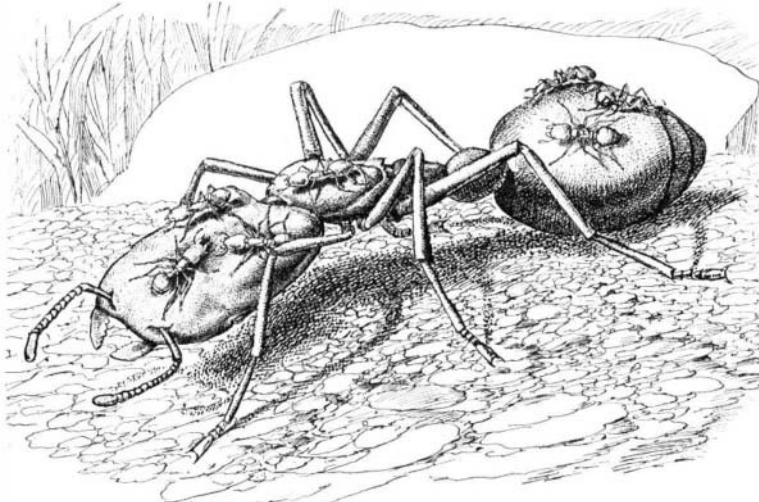
NEST OF THE TREE ANT, INDIA.

selves, and it would naturally be supposed that these big creatures with enormous heads would prove formidable defenders of the formicary, while the truth is that, so far from this being the case, they cannot bite at all, even when provoked to do so.

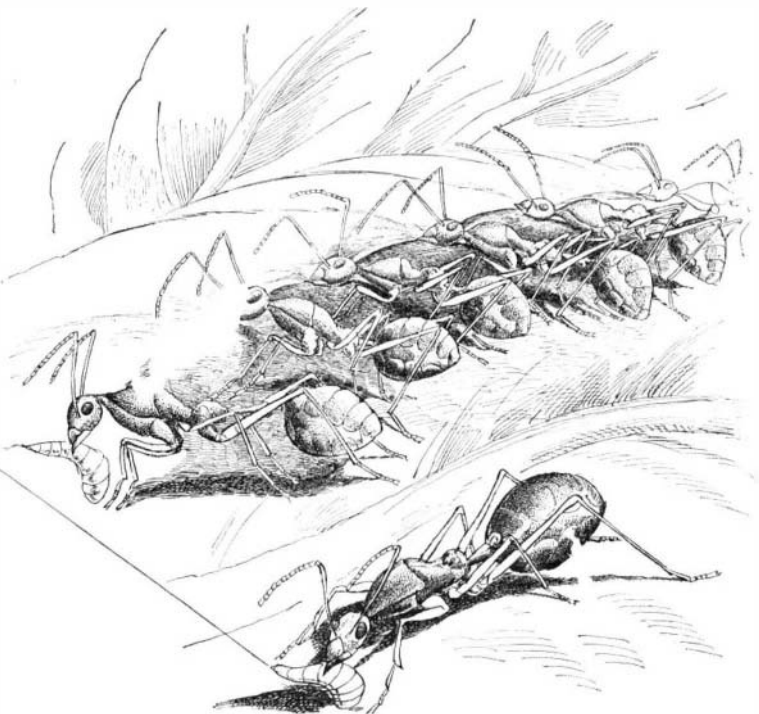
And yet the smaller members of the *Pheidologeton* commonwealths find a use for the great creatures. Numbers of them may often be seen riding about, as human beings do upon elephants, upon the backs and heads of their gigantic confreres. Even this use, however, does not account for the disproportionately large heads of the giants. But the *Colobopsis* ants, which burrow in branches, seem to have discovered how to profitably employ the big-heads among them. They are placed at the entrances of the Formican dwellings, their great heads fitting in and filling the dorways. As a worker belonging to the household approaches she is recognized by "the animated and intelligent front door," which draws back sufficiently to admit the entrance of its friend and then resumes its double office of sentry and of barrier.

The *Eciton* are the Arabs of the ant tribes, always at war with all other animals, with no settled places of abode, but ever wandering in journeys that have no end. Yet in their temporary resting places the necessities and instincts common to the whole Formican family impel these nomads to build habitations which conform to the character and style of the fixed and permanent abodes of ordinary ants. As, however, both the time and natural apparatus for digging possessed by the latter are wanting to excavate galleries and apartments necessary for feeding and sheltering larvæ and pupæ, these remarkable animals overcome the difficulty in a most astonishing manner by constructing living habitations, using their own bodies as building materials. Belt writes: "They make their temporary habitations in hollow trees, and sometimes underneath large fallen trunks that offer suitable hollows. A nest that I came across in the latter situation was open at one side. The ants were clustered together in a dense mass, like a great swarm of bees hanging from the roof, but reaching to the ground below. Their innumerable long legs looked like brown threads binding together the mass, which must have been a cubic yard in bulk, and contained hundreds of thousands of individuals, though many moving columns of ants were outside, some bringing in pupæ, others the legs and the dissected bodies of various insects. I was surprised to see in this living nest tubular passages leading down to the center of the mass, kept open just as if it had been formed of inorganic material. Down these holes the ants that were bringing in booty passed with their prey. I thrust a long stick down to the center of the cluster and brought out, clinging to it, many ants holding larvæ and pupæ."

But the most amusing instance of the manner in which an ant left by Nature to her own devices overcomes a difficulty is perhaps that



STATE ELEPHANT OF THE PHEIDOLOGETON—LARGE WORKER CARRYING THE SMALLER ONES.



WORKERS HOLDING LEAVES IN PLACE WHILE OTHERS USE LARVÆ TO BIND AND CEMENT THE LEAVES.