study of the crop, its attributes and its capabilities. They are also in line with experience in this country in the use of ashes and bone meal, and intelligent alfalfa-growers are pointed to this as a most promising line of experiment, and a probable avenue of very profitable enterprise.

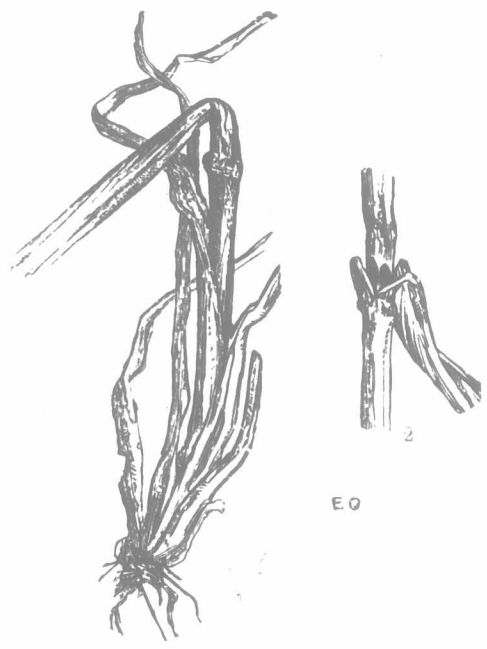
It may be all right to use a top-dressing of barnyard manure on land where lucerne is to be sown; it may help in getting a catch. It may be all right to put manure on established fields of lucerne if one has more manure than he knows what to do with. But, as a rule, we are convinced that it will pay handsomely to buy lime, ashes (or a substitute in the form of potash salts), and acid phosphate, bone meal or basic slag to put on lucerne fields, saving the barnyard manure for other fields where the nitrogen it contains will be utilized, as well as the mineral elements.

Buying potash and phosphoric acid to apply to lucerne fields when the lucerne is being grown for feeding on the farm, is an economical way of buying potash, phosphoric acid and nitrogen for the whole farm. Incidentally, a similarly profitable operation is manuring ordinary clover with the three mineral elements mentioned, as clover has the same power of extracting nitrogen from the air, and requires only plenty of the ash constituents to induce a vigorous growth.

Hessian Fly and Jointworms.

By James Fletcher, Dominion Entomologist, Ottawa, Ont.

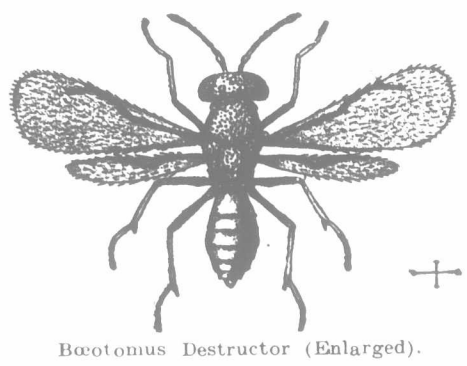
THE HESSIAN FLY.—The injuries by the Hessian fly have, in certain years, been so serious in Canada that any reference to it in the press attracts attention. The occurrence of the Hessian fly in Canada at the present time is, perhaps, less than it has been for many years, and the satisfactory state of affairs is due, probably, to no one cause, but to several. In the first place, the farmers of Canada are now learning the advantage of reading carefully and taking note of the



Hessian Fly; attacked stem. 2. Showing "flaxseeds."

advice given in the agricultural press with regard to combating injurious insects of all kinds. The Hessian fly commits its most conspicuous injuries on the fall wheat during the autumn, particularly when this is sown at the usual time at which farmers have learnt that they get the best stand; that is, if the young plants are not attacked by various insects from which they are liable to suffer. In addition to the injuries to the wheat fields in autumn, there is considerable loss from the attacks of the summer brood which appears in May and June, and the flies of which lay their eggs on the leaves of the young wheat plant. In late springs these eggs hatch, and the maggots destroy many of the young tillers at the root. As a rule, this attack is largely overlooked by farmers. In early springs, when the young wheat plants make rapid growth and have begun to shoot up their stems, when the flies emerge the maggots occur in the stems. This is the well-known attack, by which the stems bend over at about the first or second joint, as soon as the head becomes heavy, and, as a consequence, there is much shrinkage in the grain. It is not only fall wheat that suffers from the Hessian fly, for spring wheat often suffers severely, and in Manitoba, where no fall wheat is sown, and where there is only one brood of the Hessian fly, enormous injury took place in 1902 in the crop of spring wheat throughout the Province. During the past summer there have been several reports in newspapers of injury by Hessian fly in Manitoba; but in all the cases which I have had an opportunity to investigate, these reports have been very much exaggerated, attacks by other insects or fungi having been in many instances confounded with it. The life history of this insect is well understood, and the best remedies are founded on this knowledge. In autumn small whitish maggots may be found imbedded in the crown of winter wheat, and also sometimes in the same position in early summer. In the regular summer attack these occur just above the first or second joint of the stems of wheat, barley and rye, where they lie beneath the sheath of the leaf, and outside it, but sometimes sunk into its surface. These maggots suck the sap from the stem and cause it to fall over, so that the grain cannot fill properly. When full grown these maggots harden and turn brown, when they resemble small flaxseeds. From these, in due time, the flies emerge—the first brood in late May and in June, and a second brood in August and the beginning of September. The small black midges, in shape resembling very small mosquitoes, lay their bright red eggs on upper side of the leaves of the growing plants. As soon as the maggots hatch they work their way down to the base of the leaves, and remain there until the flies emerge.

REMEDIES.—These are founded chiefly on the time when the eggs are laid, and the most important one is:



Bœotomus Destructor (Enlarged).

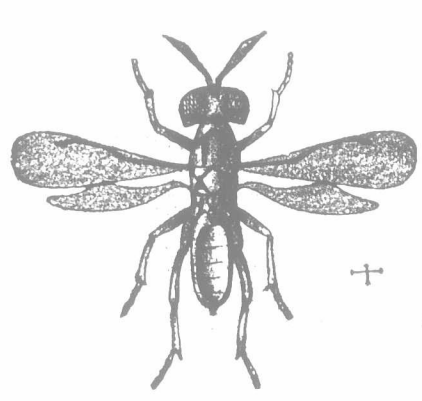
Late Sowing, or the delaying of sowing fall wheat so long that the egg-laying flies will have disappeared before the young plants have made sufficient growth to be in a proper condition for the flies to lay upon them. This means not sowing until the latter part of September, instead of in August. This plan was widely adopted in the fall-wheat districts of Ontario two or three years ago, when this insect was so prevalent.

Burning Refuse.—Many of the flaxseeds are carried with the grain, and at threshing time fall beneath the machine, or are left in the straw. All dust and screenings should, therefore, be destroyed, and all straw and small seeds should be used up during the winter, or burnt before spring.

Treatment of Stubbles.—Most of the flaxseeds of the summer brood are so low down on the stem that they are left in the field when the wheat is cut. These may be destroyed by burning over the fields, or by deep plowing directly after harvest.

Parasites.—There are several kinds of parasites which sometimes do good service by destroying the Hessian fly while in the flaxseed condition. One of these is referred to in an article on the Hessian fly in Wallace's Farmer for August 24th last, and the whole credit of the disappearance of the pest in certain seasons is given to this friendly parasite. In Canada this is not the case. We have reared no less than six different parasites from the Hessian fly; the most important of these friends being Bœotomus destructor, presumably the one referred to which is usually to be found in some numbers when the Hessian fly is abundant; Eupelmus Allynii, reared in large numbers from Prince Edward Island material in 1899, and a minute species, several of which occur in the same flaxseed, Polygnotus hiemalis. This last was very abundant in Manitoba in 1902.

JOINTWORMS.—Prince Edward Island has suffered some loss in her grain crops for some years from the jointworms which attack the small grains. These are tiny four-winged flies, quite different from the Hessian fly, which is a true fly, with only two wings. The jointworm flies are only 1-10 of an inch long, jet black and with pale legs. The females pierce the straw, and lay from 6 to 12 eggs inside its tissues. As the young grubs grow they cause a distortion of the stems a little above the first or second joints from the root.



Eupelmus Allynii (Enlarged).

Flaxseed containing six cocoons of Polygnotus Hiemalis (Enlarged).

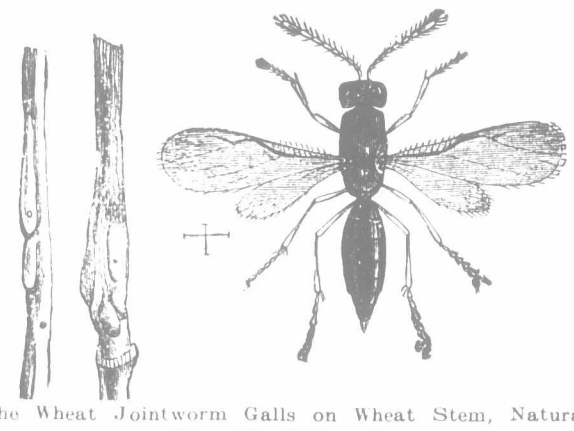
REMEDIES.—There is only one brood of these insects in Canada, and the winter is passed in the straw, mostly so low down on the stem that they are left in the stubble on the fields. These can be disposed of by burning over the stubble, or by plowing it down deeply. The broken-off hardened pieces of straw (which are galls containing larvæ), which become separated from the straw in threshing and are carried through with the grain or rubbish, should be carefully gathered up and burnt. A regular short rotation of crops, while reducing the number of bad weeds and preventing them from increasing, will also do much to reduce the numbers of the jointworms.

Heart-wood and Splint-wood.

In the old stems of oak, walnut, larch, yew and other trees, the wood of the annual rings in the center of the tree is heavier, harder, darker in color and drier than that of the younger rings near the cambium. The dark wood is known as heart-wood or duramen, while the light-colored, softer wood surrounding it is termed splint-wood, sap-wood, or alburnum. The width of the splint-wood, or the number of annual rings over which it extends, is not the same in all trees, nor is it always the same in the same species of the same age.

The splint-wood is the part which conducts the "sap," and many of its parenchymatous cells are still living. Starch, sugar and other compounds readily attacked by fungi are generally stored in it, and, from its liability to rot, it is valueless as timber.

The heart-wood acts as a strong support for the rest of the tree; its vessels no longer conduct water, and the parenchyma of the wood and medullary rays have lost their living contents. Various gummy and resinous compounds block up the cell cavities, and, in some cases, calcium carbonate is present in them. Tyloses or peculiar, bladder-like protrusions from the adjoining thin-walled cells, also block up the cavities of the vessels. Tanning and coloring matters are also present in the cell-membranes and cavities of the heart-wood of many trees. Some of these substances act as preservatives against the attacks of insects and fungi, and to them the durability of the heart-wood is due. Whilst in oak, ash, elm, walnut, apple, laburnum, larch, various pines, and many other trees, a considerable difference in color is observable between the heart-wood and the splint-wood, in beech, hornbeam, scyamore, lime, silver fir and spruce no such distinction of color is visible to the naked eye; but the heart-wood of these trees can frequently be distinguished from the splint-wood by its dryness, although small numbers of living cells are sometimes present in wood of this character right through to the pith, even in trees of considerable age. Trees of the latter type are more liable to become hollow than those in which a colored heart-wood is present.



The Wheat Jointworm Galls on Wheat Stem, Natural Size (Fly Enlarged).

THE DAIRY.

Sources of Germs in Milk.

Experiments to determine the germ contents of the milk and udder resulted as follows, according to the Journal of Comparative Pathology:

1. In cows which are regularly milked and are kept clean, no plug of dirt is usually to be found on the opening of the teat. In cows which are not milked, such a plug is usually to be found. The formation of the plug usually requires some days, and its bacterial content increases with time.

2. The canal of the teat in milch cows contains a column of milk.

3. The teat canal and milk cisterns generally contain bacteria.

4. The bacteria to be found in the milk within the udder obtain entrance through the opening of the teat.

5. The gland tissue of the udder contains bacteria, though in small numbers.

6. The gland tissue of the udder possesses a strong bactercidal power.

7. The first jet of milk withdrawn almost always contains the greatest number of bacteria.

8. The greatest proportion of bacteria in milk withdrawn by milking machines is due to the difficulty of cleansing such machines.

9. Straining milk has no effect on its bacterial contents; it only removes palpable dirt.

"We are shut up in schools, and colleges, and recitation rooms, for ten or fifteen years, and come out at last with a bag of wind, a memory of words, and do not know a thing."—[R. W. Emerson.