When they reach favorable conditions germination takes place and a somewhat different form of structure results than that in bunt. Here, too, we have a series of generations termed *primary*, *secondary* and *tertiary sporidia* or *sporules*. (See fig. 3, A, B, C) The last gives rise to the mycelium, which reaches the young plant, and a course is followed much the same as referred to when describing the growth of bunt in the affected plant.

Investigation indicates that the trouble in plants attacked comes from the ground and travels upwards; that the results of the attack manifest themselves in the head and especially in the grain; that seed, dusty from smut, sown results in much of the grain being smutty.

With such facts before us, we are in a position to suggest some remedies:—

REMEDIES—1. Sow clean seed.

2. Steep seed five minutes in a solution of copper sulphate (1 lb. to 1 gallon of water); constantly stir so as to wet the grain evenly, then spread on a floor to dry; or, add some land plaster or slacked lime and mix until dry. One gallon is about enough for four bushels. Some prefer using a weaker solution and allowing longer time to steep. The strength then is 1 lb. copper sulphate to 4 gallons water, and let steep 24 hours.

3. One pound caustic potash in 6 gallons water. Let seed soak a day; or, take 40 lbs. hardwood ashes to 10 gallons water. Let this stand a day, stirring from time to time. The water poured off will be a solution of about the same strength as the preceding.

4. Brine strong enough to float an egg does very well if the seed is kept in it for several hours with occasional stirring.

5. It has been found that immersing the seed in hot water (135° F.) for five minutes destroys any smut spores without injury to the grain. A temperature 5° above or below this fails in its results.

Note:—By keeping the seed in a sack it may be readily dipped in and out of any of the solutions recommended.

Ustilago Maydis—CORN SMUT.

In this case the smut is not so local as in the preceding. The affected parts are not confined to the ear alone, but sometimes found elsewhere. The spores form inside of the mycelium threads, and thus differ widely from those of the preceding types considered. When the spores germinate they give rise to a sort of tube-like structure, in which several cross partitions are formed, and the tube divides into several cells. (See fig. 6, C.) At the tip of these sporidia form which germinate singly, and produce mycelial threads that may penetrate the tissues of the corn plant at its most tender point (the lowest joint of the stem) when the plant is young.

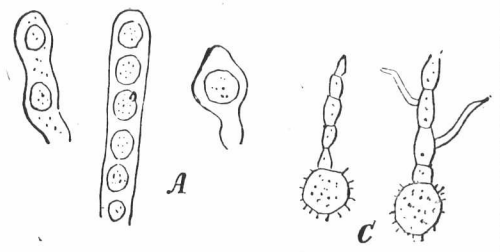


FIG. 6—CORN SMUT.

During the growing period of the fungus, up to the time when spore formation takes place, it consists only of mycelium, which necessarily begins its growth near the surface of the ground, since it enters when the corn is very young. As the plant increases the fungus grows upward to the place where it forms spores. The fruiting time of the corn marks also the period, when spores are usually developed upon the young kernels.

About this time the mycelial threads branch where spores are to be formed. The tips of the branching threads swell and granules appear in the contents. These finally develop into spores (see cut 6, A), which are thus imbedded in the substance within the threads. The cell walls become gelatinous as spore formation proceeds, and this gives a slimy character to the mass of smut, but in the course of time further changes take place, and very little remains but the dry, dusty round spores represented in the cut B.

It is generally admitted now that smutty corn should not be fed to cattle, as its effects are highly injurious, acting upon the animals much the same as ergot of rye does. Passing through the animal system does not destroy the germinating power of smut spores, consequently the spores in manure are in a condition to spread the trouble.

REMEDIES—1. As soon as observed pull it and destroy it. It is not sufficient to pick off the affected part and throw it upon the ground, but utterly destroy it by fire or otherwise.

2. Sow clean seed.

3. Dip seed in a solution of copper sulphate. (See remedy for smut in wheat.)

4. Treating seed with hot water (132° and 135° F.) five minutes is likely to be successful with corn as well as wheat.

Garden and Orchard.

Insecticides.

By Prof. A. J. Cook, Michigan Agricultural College.

(Continued from September issue.)

Last summer, 1889, the mills in Toronto, Canada, became infested with an imported moth, the Mediterranean moth, Ephestia Kühniella. The mills were fairly overrun with the pests, which brought no slight consternation to the mill owners of the Dominion. It is more than probable that, if they had known the virtues of bi-sulphide of carbon in such warfare, or had known of the experience of the Michigan miller already referred to, they might have been less nervous. Of course, in the constant warmth of a mill or house, the transformation of insects become less marked in their periodicity. Instead of the larva appearing in one certain month or season, the pupa in another and the adult in a third, as we find them outside, we may find the inchoate and the mature, in fact all stages of the insect at the same time, and all at any time. Therefore, as there may be eggs and pupæ at any time in house or mill insects, and as very likely, these are proof against the carbon, it may be necessary to treat the insects at two different times, separated by three or four weeks. Yet I can but feel with the gentleman already referred to, that by thoroughness even this new comer from Europe may be overcome by use of this insecticide. If all insects that work in our houses can be destroyed by use of this insecticide, as seems probable, and if it can be used without danger, then surely this is to become one of the most valuable of all our insecticides.

KEROSENE OINTMENT.

This is made by simply mixing kerosene and lard, or, better, kerosene and sulphur. I know of nothing so good to rid the poultry of lice. It should be kept in a closed can in the poultry house, and in summer the roost poles should often be rubbed with the ointment. An old rubber or leather glove makes this an easy and not unpleasant task. After the poultry are on the roost, some of this ointment should be placed under the wings, about the breast and legs, once in four or five weeks in the late summer. If, in addition to this, we frequently spray the house and yard, when the fowls are out, with diluted crude carbolic acid, and whitewash the house once a year, we shall not only have a neat house but healthy birds, if the other requisites are provided. Chickens ought to be a very profitable adjunct to every farm, and will be if the above suggestions be carried out, and the birds well fed and housed.

CYANOGEN.

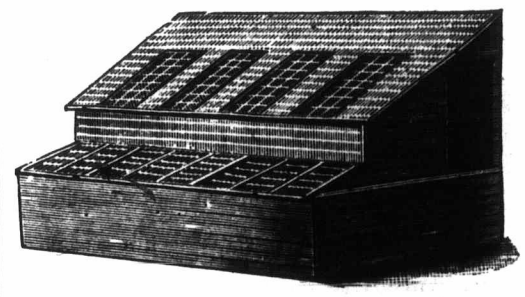
Every collector of insects knows what a cyanide bottle is. Such a bottle has in its bottom a lump of cyanide of potassium about the size of a hickory nut, which is covered with plaster of Paris. The bottle if kept tightly corked will be full of the cyanogen fumes, and any insect put into it will die almost immediately. If we place a small piece of cyanide of potassium in a tin dish and pour on a little dilute sulphuric acid, the deadly cyanogen gas is speedily formed or liberated, and if confined with insects or any other life, it brings quick death. Years ago our college museum, of which I am curator, was in the old College Hall, and the specimens in not over-tight cases. Often the various museum pests would attack the specimens. I would liberate the cyanogen as explained above, and frequently the escaping gas would even kill the flies and other insects on the windows, outside the cases. Of course with so deadly a gas great care must be exercised in its use. In California they are destroying the terrible scale insects that attack the orange trees by covering the tree with an air-tight tent, and using the cyanide of potassium and sulphuric acid as described above. Although this is some trouble and expense, one who has had experience with this terribly noxious gas can readily believe in its effectiveness. The only caution to be observed in this case is to pay most earnest heed and not breathe the gas. It is so virulently poisonous, and so speedy in its action, that no risk should be taken. But if confined there is no insect that can endure this noxious substance. Even the cyanide of potassium is exceedingly poisonous and must be handled with exceeding care.

Poultry.

A Two-Story Poultry House.

We have had several inquiries regarding plans for a poultry house. The following was sent us by Mr. James Anderson, Guelph Ont.:—

This house is 16x30 feet, and the lower part may be underground if preferred. The upper story is 12x30 feet. The basement part is 7 feet high. The upper is 9 feet high at the rear and 3 in front. There is a three-feet passage-way in both upper and lower parts. There are two tiers of nests in basement next to walks, with



A TWO-STORY POULTRY HOUSE.

roosts over nests. Nest boxes with trap-doors on side next to walk and opposite side also. When setting, open door next to walk and close one into pen, to prevent hens laying in nests. Both upper and lower stories divide into four pens. Upper and lower rooms may both be connected, or nests and roosts placed in upper part and used separately. Trap-door with stairs to basement near entrance to building. Water in basement seldom freezes.

The material necessary is: Seventeen posts, 6x6x7, $3.50; hemlock plank, 1,400 feet, $7.00; 3 sills, 6x6x30; 2 sills, 6x6x16; 11 floor timbers, 2x6x12; 10 rafters, 2x6x14; 325 feet of 2x4 scantling; the whole costing $8.00. Also, 2,000 feet of boards, costing $13.00; 700 feet half-inch and three-inch, for partitions, $4.90; tarred paper, $5.00; nails, $7.60; 4 windows, 3x6, $6.00; 8 windows, 3x4, $10.00; excavating for basement, $15.00; labor, $30.00; 1,000 shingles, $5.00; total, $115. If clap boarded and painted, $15 00 extra.

If any of our readers have the plan of a smaller and cheaper poultry house, we would be pleased to receive it.