was noted on the seventeenth of June. At this time the scale leaves at the points of origin of the apples were slightly lifted. On June 26, the young apples had increased in size so that they could be easily detected with the hand lens or even with the naked eye. All apple trees and other possible hosts were carefully examined and the rust spots showed at that date nothing but the spermogonia. They did not even show the characteristic hypertrophy of the under surface which precedes the formation of the cluster-cups, and the stage of development at present indicates that no mature æcidiospores will be formed until near the middle of July. This apparent retardation of the development over that of last year is to be explained by the general backwardness of vegetation due to the cold spring.

In addition to these observations I should mention that some small cedars were enclosed in glass houses during the spring of 1906. These houses were ventilated by means of windows provided with cotton screens to prevent infection from the outside. The first part of July they were examined and a few cedar apples were found, the small number being due presumably to the fact that conditions in the houses were very unfavorable for growth.

Considering these observations here recorded, two explanations suggest themselves:

1. The fungus is either perennial in the cedar, or

2. The æcidiospores of one season produce the cedar apples which appear in June of the next year and reach maturity in the autumn.

We have some evidence of a perennial character, especially in trees that are badly infected. In such cases it is quite easy to find new apples growing out from the side of old ones, or even from the middle of old ones. It is, however, quite possible that such cases represent new infections rather than the persistence of an old mycelium. The second explanation however seems more probable to the writer. If this is true the cedar is probably infected in the summer and autumn, but no evidence of the resulting cedar apples can be noted until the next season when growth has been resumed. It would then require two full years for a cedar apple to develop. It remains for further observations to completely substantiate this view.

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A BLIGHT DISEASE OF YOUNG CONIFERS[1]

During the past spring there occurred in the large conifer nursery at Halsey, Nebraska, a very serious outbreak of "blight" of the needles of two-year-old seedlings of *Pinus ponderosa* and *P. divaricata*. The damage was very considerable, there being several hundred thousand of the trees affected. What is of more moment than the actual damage sustained, however, is the threatened danger to the many nurseries of the country which are engaged wholly or in part in the growing of young conifers for reforesting purposes. The present outbreak shows that the fungus causing it is capable of very serious and extensive attacks wherever it may happen to be present. The disease is characterized by a gradual dying back of the needles from the tip to the base. The fungus very evidently then proceeds into the stem of the affected tree and finally kills the entire plant. In the specimens of diseased trees examined by the writer no fungous fruiting bodies could at first be detected; upon remaining in a moist chamber for a few days abundant black pustules broke out upon all of the dead tissues of the attacked needles. These were found to be exuding masses of spores of a species of *Pestalozzia*. The pustules occurred universally upon all dead parts and no other organism thus accompanied the disease; it seemed apparent at once that the *Pestalozzia* was closely connected with the trouble. Pure cultures of the fungus were made and then used in making inoculations upon healthy seedlings of *Pinus ponderosa* in the greenhouse, which were about one month old. The inoculations succeeded, causing the typical disease in plants which

[1] Published with permission of the Secretary of Agriculture.

had been previously healthy in every respect.

The various species of *Pestalozzia* have been known as parasites in Europe, causing disease of conifers of one to several years' age. The same fungus was found in 1903 in Texas and also upon young pine trees from North Carolina and New York in 1906 by the writer. There can be little doubt that it occurs generally in the United States, and sometimes at least, as a true parasite. The fact that it occurs as a parasite upon young conifers seems not to have been proved in this country by other workers. The present article may be taken as a warning to managers of conifer nurseries, as it is more than likely that similar outbreaks of this disease will be noted in the near future. Removing the diseased trees and burning them, accompanied by thorough spraying of the remainder with Bordeaux mixture containing some adhesive substance to make it cover the smooth needles, should completely control the trouble and stop its spread into unaffected seed beds.

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NORMAL FAULTING IN THE BULLFROG DISTRICT

THE Bullfrog Mining District is situated in southern Nevada, about ten miles from the California line, and sixty miles south-southeast of Goldfield. The towns within the district are Rhyolite, Beatty and Bullfrog. In 1906 Mr. G. H. Garrey and the speaker mapped the general geology of a strip across the district, seven miles long and three miles wide. The country is a desert, the rocks are bare and exposures are exceptionally good. The relief is about 2,500 feet. Mining exploration has added greatly to the natural exposures, and conditions for field work are unusual.

The oldest rocks form a crystalline complex, consisting in the main of quartz-biotite schists, quartzites, limestone, pegmatite, injection schists and gneisses, which surround small areas of sheared diorites. This complex is the equivalent of a series of sedimentary rocks which has been greatly metamorphosed. Above the schists is a massive limestone, about 100 feet thick, probably Silurian. In faulted contact with the limestone and older rocks is a great series of Tertiary lava flows with subordinate beds of sedimentary tuffs, limestone and shale, altogether about 7,000 feet thick. Of the lava flows there are sixteen separable divisions of rhyolite, five basalt flows, one flow of dacite, and one of quartz basalt. Stratified tuffs of sedimentary origin occur at two horizons, with numerous lava flows between. The Tertiary rocks are approximately conformable one with another in dip, though there are slight erosional unconformities at several places. Basalt dikes, most of which are along fault fissures, cut the older lavas. There was much faulting after the dikes were intruded, and the rhyolite-basalt contacts afforded planes of weakness which were taken advantage of in nearly every instance. Dikes and other intrusive masses of rhyolite also cut the lavas. At three places there are small outcrops of leucite basanite.

The bedded rocks dip eastward at angles averaging 27° and are traversed by faults, most of which strike northeast and dip west. Most of the faults are nearly perpendicular to the beds and all are normal, that is, the down-throw appears to have been down the dip of fault planes and consequently the west block is, in most cases, depressed, or the block east of the fault plane is elevated with respect to the down-thrown or hanging-wall side. Since the dip of the beds is to the east and the dip of the faults to the west, the same beds occur repeatedly. Before deformation the beds were approximately horizontal. In the deformation two processes operated; faulting, which tended to lower the beds to the west or raise them to the east; and monoclinal folding or tilting, which tended to raise the beds towards the west or lower them to the east. A seven-mile east and west section across the area shows that the eastward depression due to tilting is 12,400 feet, which is only 1,300 feet more than the westward depression due to faulting, or that the result of both processes was to leave the beds at about the same elevation at the east and at