on account of high-priced cotton is a humorous bluff." This view is of course taken up by the farmer, who is not in a position to see the seriousness of the situation.

The American Cotton Manufacturers' Association issues in the *Textile Manufacturer* the following reply to President Barrett, of the Farmers' Union:

The recent utterance of President Barrett, of the Farmers' Union, and the editorials of the *Cotton Journal* are in bad taste, and show a surprising lack of grasp of the situation.

The cotton manufacturers of the south are interested in the development and welfare of the south and are big and broad enough to realize that a fair price for cotton means prosperity for this section.

The farmers are in the midst of prosperity while the mills are in distress. Both are linked together in the general prosperity of the south and the farmer should show his willingness to cooperate.

This relation between the two great factors of the cotton industry of the south grows a little more critical with each report that comes from either side without any possible means for either side to know the status—the real status—of the other. The writer is inclined to believe that such a matter is of national importance and should call for the best thought of the country. If these two great organizations, the producers, on the one hand, and manufacturers, on the other, could be made to more clearly understand the other by a National Industrial Commission or Arbitration Board, the country would be the gainer far out of proportion to the cost of maintaining the commission.

The mills concede that the price of cotton is not too high, yet they can not fail to see that such action as they have taken actually cost the farmers of the country right about $450,000 the tenth day after the meeting of the Industrial Association. Possibly the farmers should help bear the burden, but the real issue is this—the mills should not have the privilege of passing judgment on the matter for all concerned, which it virtually amounts to, since their action seems to vitally affect the price of cotton. The point uppermost in the mind of the writer is that all should help bear the burden, but let the matter be submitted to an arbitration commission, whose duty it shall be to investigate the cost of raising cotton, and the cost of manufacturing, and such report as they make annually, or oftener, be distributed among all people. The commission need not confine its work to any particular line of industry, but should turn its attention to all matters of national importance about which there is likely to arise a misunderstanding. This commission could well be considered a common resort for justice in proportion to its authority and influence.

When we contemplate the fact that Great Britain is developing cotton growing in all her colonies, and will sooner or later be in position to supply her own mills with the raw material, the matter assumes a new interest. A letter comes by this mail from the director of agriculture, Zomba, Nyasaland, British East Africa, that the cotton crop will be increased over 29 per cent. this year over last year's crop. The general outlook for the British government is very bright, and surely there is no time for delay in adjusting our own affairs to the best interests of the nation. England is in doubt as to the meaning of the inconsistency of the present situation in America, as shown above, since short crop means high price for raw material, and yet an overplus of manufactured articles seems to be the explanation of the low price of finished material. "It is difficult to get at the truth from contradictory statements of this kind," comes from an English review.

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SPECIAL ARTICLES

RESTING SPORES OF THE POTATO FUNGUS (PHYTOPHTHORA INFESTANS)

THE potato fungus, *Phytophthora infestans*, has been carried in pure culture in the botanical laboratory of the University of Vermont continuously since 1904. Various natural and artificial media have been tried in the hope of securing additional information as to the ability of the fungus to produce

sexual or resting spores. As reported in our earlier paper,[1] oogonium-like bodies were found almost immediately after the inception of this work, in cultures on raw potato, lying in the mycelium close to the surface of the substratum. Subsequently they were found in greater abundance in potato gelatin cultures, here imbedded in the culture medium. Growth with varying degrees of vigor has also been secured upon several other synthetic media, including some modifications of the lima-bean agar, recommended by Dr. G. P. Clinton. The oogonium-like bodies have, however, been found but rarely upon any medium except the potato gelatin and the lima-bean agar. Under favorable circumstances they have been obtained in these in sufficient abundance to permit much more convincing study of the details of their development than was reported in our former paper. The most important advance, however, is the discovery of what appears to be fully matured resting spores. The oogonium-like bodies are about 30 microns in diameter, hence distinctly larger than the regular sporangia (conidia) and so different in appearance and mode of production as to preclude the idea that they are closely related to them. The character of the wall especially differentiates these two reproductive bodies, the oogonium-like bodies soon developing a thicker wall, immediately in contact with cytoplasm, which may show stratification and which in turn may be enveloped in an external envelope, of which the details as to development and structure vary with the medium in which they lie. No body clearly comparable to an antheridium has as yet been discovered. Nevertheless numerous examples have recently been found where these oogonium-like bodies have apparently developed into mature resting spores. These have a thick spiny brown exospore with dense granular contents, bearing a general resemblance to the oospores of related Peronosporales. None have as yet been germinated hence it remains to be proved whether they do actually function as resting spores. We have found similar bodies in potato leaves rotted by *Phytophthora*. There is need of further painstaking work, including cytological studies now being made by Dr. Lutman, before final conclusions are justifiable, but the evidence at hand encourages the hope that we have in hand the long sought for resting spores of *Phytophthora infestans*.

[1] A paper dealing with this subject was read by the present writer and N. J. Giddings before the last meeting of the Botanical Society of America and abstracted in Science (N. S., XXIX., 271). The removal of Mr. Giddings to West Virginia has left the responsibility for directing further study with the writer, who is fortunate in now having the assistance of Dr. B. F. Lutman and Mr. C. R. Orton. Professor H. A. Edson has also assisted, especially in devising culture media.

L. R. Jones

Botanical Laboratory,
University of Vermont,
October 15, 1909

Collection of the Æcial Stage of Calyptospora columnaris (Alb. & Schw.) Kühn

The æcial stage of the blueberry rust, *Calyptospora columnaris* (Alb. & Schw.) Kühn, was collected on *Abies balsamea* near Pictou, N. S., by the writer on July 14 of the present year.

Wintered telial material of this rust which is abundant on the blueberry (*Vaccinium pennsylvanicum*), was sent to Dr. J. C. Arthur for his culture work. He found the teliospores viable and on his suggestion search was made in the vicinity of the collection for the æcial stage. A *Peridermium* was found on the leaves of *Abies balsamea*, which agreed with the description of *Peridermium columnare*. Part of the collection was forwarded to Dr. Arthur, who determined it as the æcial stage of *Calyptospora columnaris*, and this as the first collection in North America.

This *Peridermium*, which could be easily recognized in the field by its yellow color, due to the orange-colored spores, was found sparingly distributed over an area of several square miles on the young leaves of the lower branches of its host. In no case was it abundant, only a few leaves being affected. In several places the leaves of young trees a few inches from the ground showed a more pronounced infection,