Most of the lower leaves were entirely dead. On the under surface of the spots there was apparent the characteristic red crust or scabs. This crust consisted of dry bacterial ooze which had come from the interior of the blade. When sections of the younger spots were put in a droplet of water and placed under the microscope the bacteria could be seen oozing from the infected portions in enormous numbers. Pure cultures were readily obtained; some of the plates contained practically no other organism but the causative agent. Colonies on nutrient neutral agar formed rather slowly, being circular, white or pearly-white in appearance. On putting a platinum needle into a colony and lifting it, it was noted that the organisms adhered in such a way as to be stringy or sticky and could be drawn out to considerable length.

It was at first thought that the organism might be one previously described by Smith[1] as *Bacterium andropogoni,* but there seems to be little doubt that the disease is due to the broom-corn bacterial organism first studied by Dr. Burrill, namely, *Bacillus sorghi* Bur. This disease is one of the chief drawbacks to the culture of Sudan grass on the Gulf Coast, but whether it will be serious or not in the Salt Lake Valley remains to be seen. During the present season the month of May was very rainy and humid and this probably accounts for the rather serious infection of the plants. Under normal weather conditions it is quite possible that the disease will not prove a serious drawback to growing Sudan grass as a forage crop.

P. J. O'GARA

SALT LAKE CITY, UTAH,
June 28, 1915

THE PENDULUM KEY AND ITS USE FOR RECORDING THE BEATS OF A METRONOME

THE pendulum key is a short lever, pivoted at one end, and held vertically. It is so arranged that a slight lateral displacement of its lower end causes it to make an electrical contact. A platinum pin in this part of the lever strikes against a platinum plate fastened to the insulated piece from which the lever is suspended. This simple apparatus is an excellent arrangement for recording the beats of a pendulum or a metronome. The writer has found it easy to construct such an instrument by making a few additions to a key with a platinum contact made by the Harvard Apparatus Company, and used in physiological laboratories to make and break a current by hand. The sketch shows the key with the additions to hold it in a vertical position. The

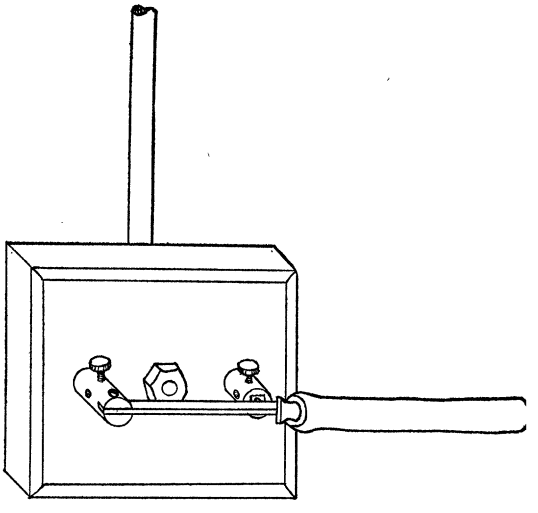

FIG. 1.

end of a short stud passes through a hole drilled in the middle of the slate base, and is held by a nut. A steel rod is screwed into the other end of the stud with its axis parallel to the plane of the base, and at right angles to the axis of the stud. The rod is held horizontally by a clamp fixed to the vertical rod of a tripod stand. By slightly rotating the key around the horizontal rod as an axis, the distance separating the platinum point from the plate against which it strikes can be varied to any desired extent. The lever can be lengthened by slipping one end of a short piece of rubber tubing over the handle, as is indicated in the figure. The tubing acts as a spring in breaking the shock of the impulse of the vibrating rod. The apparatus is placed in such a position that it receives a slight tap at the end

[1] "Bacteria in Relation to Plant Diseases," Vol. 2, 1911, Erwin F. Smith.

of the swing of the pendulum; the pin is brought in contact with the plate, closing an electric circuit, which actuates a time-marker writing upon the recording surface. As the lever rebounds, and does not make contact again until it has received another impulse, the electric closure is almost instantaneous.

The great advantage of this simple arrangement is that it does not involve any alteration in the apparatus with which it is used. A cork disc or ball slipped upon the end of the vibrating rod is the only addition to the metronome that is required. The disadvantages of a mercurial contact are avoided, which is always desirable, unless special reasons require it.

The apparatus has been tested with a recording tuning fork and it has been found to give satisfactory results with the metronome, which, of course, should only be used in experiments of moderate accuracy. The key is probably much more reliable than the metronome with which it is used. Comparative tests of the key and the well-known tambour device for recording the beats of a metronome were also made, and the key was found much more convenient and accurate.

I have ventured to describe this inexpensive piece of apparatus, as its simplicity and efficiency would seem to commend it to all those who employ the metronome in recording time.

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SOCIETY OF AMERICAN BACTERIOLOGISTS

V

Industrial Bacteriology

Under the supervision of R. E. Buchanan

Problems in Soil Bacteriology: Jacob G. Lipman.

The student of soil bacteria, and of other soil microorganisms, is often struck by the fact that there is, apparently, localization of one or another of the species in certain spots. To what extent is this localization characteristic of fields, small areas in any one field, or soil particles of different mineralogical or other origin? We know, of course, that the water films surrounding the individual soil particles represent solutions of varying composition and concentration. But we have no knowledge, except of an indirect character, as to the very interesting differences which must exist as to the numbers and kinds of bacteria in the water film surrounding individual particles.

From other fields of bacteriology, we know that there may be associative action, and likewise antagonism, among species of soil bacteria. But we know practically nothing of these relations in the soil, nor how these relations may be modified by soil treatment or by climatic conditions.

It has always been my belief that the beneficial results ascribed to applications of commercial fertilizers or of other materials may be due as much to the action of such materials on soil microorganisms as to the action on the crops themselves. There is need now for the study of soil bacteriological problems from this point of view.

Another problem which is widely recognized of importance to soil fertility is the formation of so-called humus in the soil. Admitting that humus is the result of biological activities, it is for us to discover how the composition of the resulting product is affected, not only by vegetable and animal substances from which it is derived, but by the type of microorganisms concerned in its formation.

To the problems already mentioned, I might add the systematic study of temperature, moisture, aeration and pressure as factors in influencing bacteriological activities in the soil. It is possible also, that so-called stimulants, like manganese, copper, zinc, etc., may react on the activities of soil microorganisms. These problems should receive the attention of, preferably, a large number of workers. It may be added that these and other problems studied systematically will help to throw light on the production and modification of plant food in the soil and on the great industry of crop production.

The Solution Versus the Soil Method for the Bacteriological Examination of Soils: P. E. Brown.

From a careful study of the methods which have been employed for the bacteriological examination of soils, it is concluded that the "fresh soil" method is the most rational which has yet been devised. A recently proposed modification of the solution method, while eliminating some of the objections to the old method, is considered to possess many objectionable features, so many as to be of very questionable value for the interpreting of results from the fertility standpoint. It is urged that careful comparative tests be carried out, in order to settle definitely the question of which is the "best" method for the bacteriological examination of soils.