a million square miles, that much of it was imperfectly explored, especially in the north-west. Mr. Riley had to cut short his investigations in British America both for want of time and want of funds. For similar reasons, and on account of Indian troubles, Montana, Wyoming, and Dakota, have been but superficially explored.

The year 1877 was an abnormal year, *i.e.* the insect had, the previous year, overrun a large section of country in which it is not indigenous, hatched in such country in the spring. This was most fortunate for many reasons, as it enabled the Commission to carefully study the insects in this their unnatural condition, and to carry on experiments with a view of learning how to control them. Much of the work of the Commission was with these young insects. The losses sustained through the devastation of the pest by young and struggling frontier populations, ill able to bear them, were immense; and there was so much discouragement that hundreds and thousands of persons were on the point of abandoning their new homes last spring. At this juncture the Commission went into the field, and by its encouraging predictions (which were all verified) and recommendations, imbued the people with hope and confidence, and drew westward again the emigration that had almost stopped. All this work, however, interfered with needed investigations into the proper range, the native home and breeding grounds, the source of swarms, and many other important questions which can only be properly studied during a normal year. It is, therefore, very important that the investigations be continued until every question is settled that human investigation can settle.

For the proper settlement of some of the questions the co-operation of the Dominion Government is desirable, and has been promised by the Canadian authorities if the work of the Commission should continue.

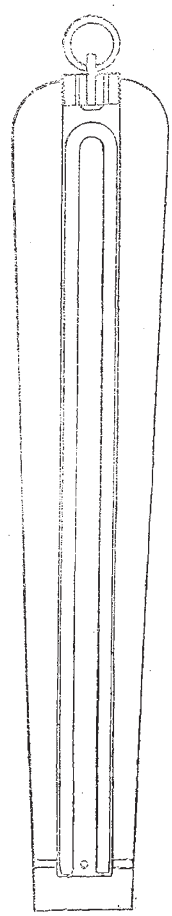
It will be unwise to stop the work of the Commission before completed. The work should be made so thorough as to obviate any necessity in future years of creating another commission for the same purpose. After careful estimates it is concluded that the work can be satisfactorily completed only with two more years' investigation and experiment. The Commission therefore ask for a continuance of the appropriation of 25,000 dols. asked for a year ago.

There are various other injurious insects of national importance, of which much has yet to be learned, and in addition to completing the locust investigation, the Commission contemplate, during the coming two years, studying and reporting on some of these worst enemies to American agriculture. They are especially desirous of reporting on the cotton-worm of the south, which, though often so disastrous to the cotton crop, has never been fully studied, and in the mere natural history of which there are yet many mysteries and conflicting theories.

Much has yet to be done in giving practical form to the conclusions arrived at and plans proposed by the Commission to enable the work already done to bear proper fruit. To bring about the needed co-operation of the two Governments, to cause proper laws to be enacted in all the states interested, and to enforce the truths that alone will make man master of the situation, is largely the work of the future.

SOUNDING APPARATUS

THAT Sir William Thomson's recent application of the pianoforte wire to sounding in small depths for the ordinary purposes of navigation is of great value, will be admitted readily by those who are familiar with the present process. But it occurs to me that a formidable objection to its general introduction into naval or mercantile vessels is to be found in the necessity of using chemically-prepared tubes for determining the depth of water. Sir William's latest device is (I believe) a straight glass tube two feet long, open at one end and inclosed in a brass tube attached above the sinker, in which air is compressed by the pressure of the water, the amount of compression being determined by the height to which the water rises in the tube. This height is marked by the decolorisation of a coating of chromate of silver on the inside of the tube, effected by the sea-water. A number of such tubes, properly prepared, must therefore be kept at hand, and when once used they must be coated anew, an operation of no little difficulty.



I have suggested a form of sinker in which these objections are obviated, while the principle is retained. The sinker is of iron three inches in diameter at the bottom, five inches at the top, and 26·5 inches long. It is cast with a cylindrical cavity, two inches in diameter, extending from the top to within an inch of its base. This cavity contains the glass tube by which the depth is determined. A tube about forty-eight inches long is taken, closed at one end and bent back on itself at its middle point, so as to make two legs each twenty-four inches in length. This is placed inside the sinker (the bend upward) and a screw tap, carrying a swivel-link for the sounding line, is screwed over it. Holes in the bottom of the sinker and through the screw tap allow the water access to the tube. As the sinker descends, in sounding, the air within the tube is compressed and the water rises in the open leg. When the column of water reaches the highest point of the bend, the pressure then corresponding to a depth of about five and a half fathoms, any further descent of the sinker will cause the water to pass over into the lower end of the closed leg. The compression of the air will then take place in the *upper part of the closed leg*, the maximum compression being indicated by the length of the column of water remaining in that leg when the sinker is lifted again to the surface. As the sinker is being raised, the air, expanding under the diminished pressure, drives the water out of the open leg. The inside and outside pressures are therefore equal at any instant. The tube may be graduated in inches and tenths, and a table will give the depth from the reading of the tube. The tube is then easily emptied and is ready for another cast. The form of the sinker is such that the bend of the tube is kept at a higher level than the open end in case the sinker should fall over when it reaches the bottom—the entrance of surplus water is thus prevented. An ordinary cup attachment for a bottom specimen can be applied to the end of the sinker.

The tube described will not indicate a depth less than five and a half fathoms. If it is desired to obtain casts in shoaler water a tube with the open leg shorter than the closed leg may be used. One in which the length of the open leg is one-fourth that of the closed leg will indicate depths of two fathoms and upwards.

I am aware that Sir Wm. Thomson has a tube for bringing up the column of water, but it requires the use of valves, which can never be kept tight under such enormous pressures as those to which the sounding-tubes are exposed.

I inclose a sectional drawing of the above-described tube and sinker.

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