

gine, whether the locomotive is at rest or running. One pole of the dynamo is connected to the locomotive, and the other to the tender, which is electrically insulated from the former except through this connection; and the circuit is normally completed through the rails on which the wheels of both are resting or running. In this circuit, within reach of the engineer, is a pair of coils whose armature is tightly held as long as the circuit is closed; but, when it is broken, the armature is drawn away, and opens the valve of a shrill whistle; and it stays away, though the circuit may close again and the whistle continues sounding, until the engineer reaches out and presses the armature up to the coils again, thus compelling his attention and voluntary action to stop the whistle. At any point or series of points in the line, where it is desired to signal to or from the approaching train, pairs of rails are inserted, electrically insulated from each other; so that, during the instant while the locomotive-wheels are on one pair and the tender-wheels on the other, the circuit will be broken and the alarm-whistle set going, unless these rails are otherwise connected.

They are thus connected by wires leading from the pairs of such rails ahead to any desired points,—to signal-stations, to switches, to drawbridges, to culverts, or bridges, or any part of the track or road-bed liable to be washed away or rendered dangerous. Thus, so long as the signal-man does not open this circuit, so long as the switch or drawbridge is not open, and the culvert, bridge, and road-bed are safe, the circuit keeps closed through these loops, the engineer gets no signal, and he runs on with confidence. But if any thing is wrong ahead, or if the man in the signal-tower wishes to signal the oncoming engineer, these loops will be open, the circuit will be broken, and the whistle set going till the engineer voluntarily stops it. Moreover, the instantaneous current sent from the dynamo over these loops when closed can signal the approach of a train, from as far as desired, to the signal-man at a crossing, to the train-despatcher, to the switch or bridge tender: in fact, to any points from one end of the line to the other the continuous flashes of this dynamo-current can be made a perfect tell-tale of the progress of the train. Moreover, these same currents can be made to lock switches and drawbridges ahead of the approaching train from pairs of rails preceding the danger-signal ones; and the engineer can thus confidently approach such places at full speed, knowing that no careless or confused switchman or bridge-tender or evil-disposed train-wrecker can have thrown these open after he has passed the locking signal-rails, and then, from another pair of rails beyond, the dynamo unlocks them after the train has passed. A signal on the throttle-valve lever warns the engineer if he attempts to run out of the round-house without starting up the dynamo, and any subsequent failure in the dynamo also, of course, blows the warning-whistle till it is set right. This system, in which each locomotive is its own unfailing battery, has certainly important advantages, especially in compelling the attention and voluntary action of the engineer whenever danger is ahead.

### THE COMMITTEE REPORTS OF THE AMERICAN ASSOCIATION.

ALTHOUGH several committees were discharged last year for making no report, there were no less than eleven to be called on at the session on Monday morning. Of these, six made no response whatever: others, only a verbal and partial statement. The following reports are of general interest:—

Dr. E. B. Elliott of Washington, the chairman of the committee on the registration of births, deaths, and marriages, said that this committee was created many years ago to petition the United States congress for the establishment of a system of registration of births, deaths, and marriages. Since many states have established systems of registration of their own, the committee has petitioned, not for a separate system, but for the co-operation of the general government in securing uniformity and efficiency in the several state systems.

The first report of the committee on stellar magnitudes (*Proc. Amer. assoc.*, xxx. p. 1) included a plan for the determination of standards for stars fainter than the tenth magnitude. Twenty-four bright equatorial stars were chosen; and the standards were to be selected from the regions following them from two to six minutes of time, and not differing in declination from the leading stars by more than five minutes of arc. The second report presented this year consists of charts of all the stars visible with the fifteen-inch telescope used at the Harvard college observatory, in all but three of the regions from which the standards are to be selected. These observations have been verified by the fifteen-inch telescope of the Washburn observatory. The report was referred to the publication committee.

The committee to confer with committees of foreign associations for the advancement of science, with reference to an international convention of scientific associations, reported that they had succeeded in conferring with a like committee from the British association.

A motion to have the committee discharged, as it had completed its task, having been made, Prof. H. Carvill Lewis of Philadelphia asked whether the committee might not continue to be efficient in extending courtesies from our own association to kindred foreign associations. Many gentlemen felt that some steps should be taken whereby members of our association going to England may become members of the British association while there, and a like courtesy be extended to members of the British association while in America. He therefore suggested that the action on the motion to discharge the committee be deferred for the present, in the expectation that arrangements would be made for the holding of joint meetings by the two great associations.

Mr. Trelawney Saunders of London, Eng., said he should like to respond in a few words to the kindly sentiments that had been expressed from the platform. As an Englishman, he said that he was delighted to hear the sentiment—a general sentiment, he thought, or it would not have been ex-

pressed here — which had been uttered. "You came from us," said Mr. Saunders: "if you return to us, you will meet a welcome which has in it as much warmth as that which you have accorded to us. Upon all occasions, whether they be international or inter-scientific, I assure you that the American people, particularly the English-speaking American people, will find a cordial greeting on the part of any Englishman to whom they appeal."

The chair announced that the motion to discharge the committee had been withdrawn.

The only other response to the call for reports was made by Professor Young of the committee in relation to duty on scientific books. He said that the committee had prepared, and, he believed, had presented to congress, a bill on the subject stated, which had failed to reach congressional attention.

#### THE BOTANICAL CLUB OF THE AMERICAN ASSOCIATION.

THE meeting of the American association last year at Minneapolis attracted a larger attendance of botanists than usual. Without much consultation, a meeting of those interested in botany was called, a president and a secretary were chosen, and discussions, short communications, and papers upon botanical subjects, listened to. The Botanical club was thus inaugurated; and before the close of the session it was decided to do what was possible to secure a larger attendance of botanists at the next gathering in Philadelphia.

Although during the interim the prospect of a good attendance at the Philadelphia meeting had been fair, the most sanguine were surprised to find, that, as early as Monday preceding the opening, a number of botanists had arrived in the city; and by the following day a larger gathering could have been assembled than the total attendance at Minneapolis.

The first meeting of the club, of which several were held between Friday and Wednesday, was responded to by an attendance of about thirty, — a little below the average attendance for the subsequent meetings. Prof. W. J. Beal of Lansing, Mich., the president, took the chair; and Prof. J. C. Arthur of Geneva, N. Y., was appointed secretary to fill the vacancy caused by the absence of Professor Coulter. A paper by Dr. N. L. Britton of New York, on the composition and distribution of the flora of New Jersey, was read. The surface-features of the state were given, and the corresponding vegetation described. The work of cataloguing the plants is being done under the supervision of the State geological survey. The list at present has reached the very large total of nearly fifty-five hundred.

Prof. C. R. Barnes of La Fayette, Ind., spoke of the course of the fibro-vascular bundles in the leaf-branches of *Pinus sylvestris*. The two needle-leaves at the end of each short lateral axis contain each a paired bundle. The question at issue was whether this structure represented one or a pair of bundles, or whether it might not be a segment of the fibro-

vascular ring of the stem. A study of the early stages shows that the first change in the stem is to divide the fibro-vascular ring into halves at right angles to the plane of the leaves; and subsequently these divide again, sending one branch of each to each leaf. The paper led to much discussion by Professors Buckhout, Macloskie, and others.

Dr. Bessey of Ames, Io., described the opening of the flowers of *Desmodium sessilifolium*. They expand partially in the usual manner, then remain stationary till a particular sensitive spot at the base of the vexillum is touched by an insect, when the wings and keel descend with a jerk, the stamens are released, and the insect dusted with pollen.

Professor Mackloskie of Princeton, N. J., described the method of cross-fertilization of *Geranium maculatum* by bumblebees. Professor Dudley of Ithaca, N. Y., spoke of the torsion of stems of *Eleocharis rostellata*, and also on the protogynous character of some species of *Myriophyllum*. Mr. William H. Seaman of Washington, D. C., advocated the use of rather thick oblique sections in studying the structure of the fibro-vascular bundle, — a method that called forth a very strong protest.

Professor W. J. Beal gave a paper concerning the manner in which certain seeds bury themselves beneath the soil, which was discussed by Professors Bessey, Rothrock, and others. A paper by Prof. W. R. Lazenby of Columbus, O., on the prolificacy of certain weedy plants, embraced careful estimates of the average number of seeds produced by individual plants among various kinds of weeds. Dr. J. T. Rothrock of Philadelphia addressed the club on some phases of microscopic work, alluding particularly to micro-photography, its importance to the investigator, and the ease of execution.

Dr. Asa Gray called attention to the interesting discovery of Mr. Meehan regarding the mode of exposing the pollen in the common sunflower. He had found, that, contrary to the teachings of the textbooks, the pistil and stamens develop together until reaching full length, when the filaments rapidly shorten, and the anther-tube is retracted, exposing the style covered with pollen, the further changes being the same as usually stated. This Mr. Meehan construed to be a device for self-fertilization; while Dr. Gray showed, that, although bees carried pollen from one flower to another of the same head, they also carried it from head to head, which constituted crossing in the fullest sense. An interesting discussion followed, in which Professor Beal suggested that an excellent experiment would be to cover up the heads, and ascertain if any fertile seeds were produced. Dr. Gray thought it very likely there would; for, when cross-fertilization is not effected, self-fertilization often takes place. Mrs. Wolcott had proved this to be so; for, in covering up the flowers to keep birds away, she found that plenty of seeds were formed.

Dr. George Vasey of Washington gave some notes on the vegetation of the arid plains; which was followed by observations on the curvature of stems of conifers, by Dr. Bessey, in which he noted the bending of stems one, two, and even three years old.