

M.D., assistant physician Northern Michigan Asylum; "The Story of the Bacteria and their Relations to Health and Disease," by T. Mitchell Prudden, M.D., author of "A Manual of Practical Normal Histology;" and "Through the Ivory Gate," being studies in psychology and history, by William W. Ireland, author of "The Blot on the Brain."

—Ex-Postmaster-General Thomas L. James has prepared an explanation of needed postal reforms, which will appear in the *October Forum*. Mr. James declares that the railway mail service is twenty years behind the times, and ought to be very greatly improved; that small offices near to one another ought to be consolidated under one management, so as to save expense; and that ocean postage ought greatly to be cheapened. Senator Cullom of Illinois will have an article in the same number on "Protection and the Farmer," to show that the farmers are benefited by a protective system more than any other class. Mr. Edward Wakefield, a member of the Australian Parliament, who has been elected and defeated many times under the Australian ballot system, will contribute to this number an explanation of the practical workings and of some defects of the system which has been so much discussed in this country. Professor William T. Harris, United States commissioner of education, writes a critical examination of Edward Bellamy's "Looking Backward."

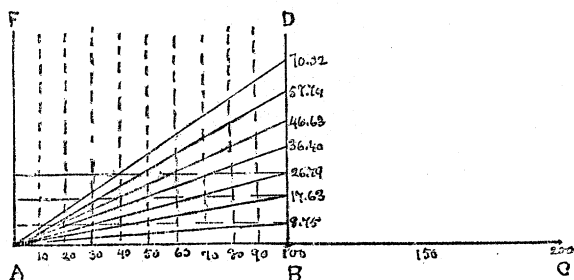
LETTERS TO THE EDITOR.

A New Method for ascertaining Heights and Distances in Right-angled Triangles.

ABOUT four years ago I devised a method whereby the solution of right-angled triangles, for the taking of distances and heights, is much facilitated by a tangent scale on the instrument.

The principle depends upon the well-known fact that the perpendicular of a right-angled triangle is equal to the tangent of the included angle multiplied by the base.

The graduation is accomplished as follows: we take a base-line (say, of 100, for convenience), and an angle of five degrees. Com-



FA and *DB* represent the rights of an ordinary surveying-compass; *DB* containing the scale, and sliding upon *ABC*, which contains the numbers 1-200 marked in equal divisions.

puting this, we find the perpendicular to be 8.75 feet, yards, or metres, in whatever system the base was measured.

This is marked on the arm *BD* instead of five degrees. The computation is continued for the various angles, and the results marked upon the scale. This for a base of 100. Now, if the observer is placed only 50 distant from the object, *DB* is moved to that point on the scale *ABC*, and the height is seen to be the same as before; for, at a distance of 50, an angle of ten degrees, which is observed by going one-half nearer, is subtended by a perpendicular of 8.75, as before: so by moving the scale backward or forward, corresponding to the base-line taken, the height of an object can be immediately read off, provided the side of the object contains the height; if it does not, other means of triangulation have to be adopted, several methods of which can be readily improvised by one accustomed to such work. Horizontal angles can be solved in the same manner by having the rim of the compass-box graduated for a given base-line; then by using this base-line, and taking the distance between the observed points to represent the perpendicular of the triangle, the distance can be read directly from the instrument.

HARVEY B. BASHORE.

West Fairview, Penn., Sept. 13.

Brocken Spectre.

THIS phenomenon has been associated with the Brocken, one of the Hartz Mountains in Germany, about 3,700 feet in height, because more often observed from there. It has given rise to a large number of remarkable theories in explanation, many of which originated with those who had never seen it. An exhaustive article, giving a *résumé* of records regarding it, will be found in the *Quarterly Journal of the Royal Meteorological Society* for 1887, at p. 245. The explanation having the widest acceptance was published in the above article, and later in the *American Meteorological Journal*, August, 1889, and is as follows: the eye is deceived by the apparition, and thinks it much farther away than it really is. It seems to me that this is hardly tenable. The only way in which the eye could be deceived would be in case the shadow were formed a long way off; but, if it were really formed near the eye, it would appear in its natural size. When one looks into a concave mirror, the eye is at first deceived, thinking the mirror plane; but in this case the deception is very plainly due to the action of the mirror.

The very singular explanation is given in "Johnson's Cyclopædia," that "the vapors of the atmosphere act as a vast concave mirror." Singular as it may seem, however, it is probable that this is, undesignedly, more than half correct. A short stay on the summit of Mount Washington has shown this spectre in all its phases. The best time to see it is either in the early morning or just before sunset, and when the fog is not too dense to hide the sun. If the observer turns his back to the sun, he will see on a bank of fog, if it does not envelop him, a slightly diminished shadow of himself. The eye is not deceived in any case as long as the fog forms a nearly vertical wall at fifty or more feet distance. If, now, the fog envelops the person, the shadow appears to start directly from him, and often seems very large. There is no deception of the eye at all, if one is accustomed to careful observations.

The following is advanced as a probable explanation. The shadow of the person is cast upon the fog in solid form; that is, the object shuts off the light of the sun, and one sees only the surface of his own solid shadow looking into its axis. The arms and legs also cast solid shadows, and the person sees the movement of these outside of the shadow of his body. It may be better understood to call to mind the shadow one sees on the ground as the sun is setting. This gradually grows longer and longer, and at last disappears in the distance. The fog forms a sort of "ground," and the shadow is cast upon it. It is possible to form the same shadow with a lantern which concentrates its rays by a reflector. There is no difficulty, in a fog, in seeing the shadow enormously enlarged. Scores have seen it on Mount Washington. It might be thought that the nearness of the light was the cause of the enlargement; but this was not the case, for the shadow began exactly at the person where it could have been only the natural size.

The familiar appearance of "sun drawing water" will help to explain this phenomenon. In this case the air is full of haze or fog, and a small cloud casts a solid shadow thousands of times as long as itself. The surface of this is what we see. If an eye were placed in the edge of the cloud casting the shadow, the latter would appear on all sides. In the case of the spectre, this same solid shadow could be seen by a second person standing and looking across it, provided the light of the sun were not dimmed by the fog. It is to be hoped that we may have more observations of this interesting phenomenon.

H. A. HAZEN.

Washington, Sept. 23.

Note on the Anserine Affinities of the Flamingoes.

A CLOSER study of the structure of a member of the groups of existing birds is throwing a new light in upon their relationships, and at the same time somewhat disturbing some very crude and preconceived notions as to their affinities.

For a great many years past, some of the most distinguished of zoölogists have insisted that the position of the flamingo was "so completely intermediate between the anserine birds on the one side, and the storks and herons on the other, that it can be ranged with neither of these groups, but must stand as the type of a division by itself." Recently, Professor Parker (*Ibis*, April, 1889) has said, in reviewing the structure of the wing in the flamingo (*Phenicopte-*

rus), that "on the whole, this is a very perfectly formed wing, and is more like that of an ibis than that of a goose, as, indeed, is much of the structure of *Phœnicopterus*."

No less eminent an authority than Professor Huxley has strongly contested the point that the flamingoes are more nearly related to the geese than any other birds known to him; and I believe here-

tofore all American ornithologists had the same idea. From my own studies, I am confident that the above opinion of Professor Parker will prevail in the future, and fuller researches into the structure of the several types in question will prove it to be the correct one.

R. W. SHUFELDT.

Takoma, D.C., Sept. 19.

INDUSTRIAL NOTES.

A Good Record from Buffalo.

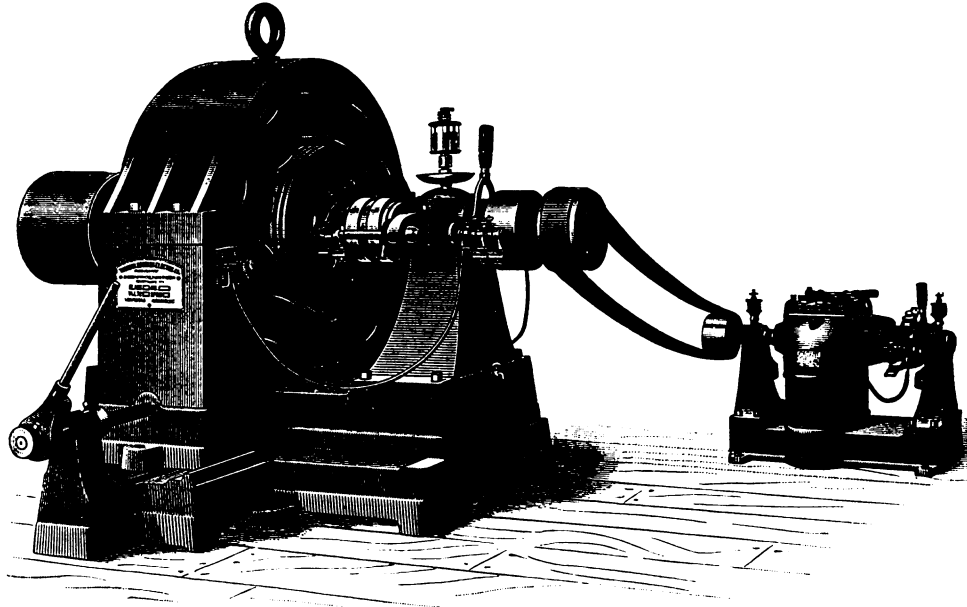
AMONG the cities which are now adopting electricity as a motive power on their roads is Buffalo, N.Y. The Buffalo Street-Railway Company of that city, about two months ago, made a contract with the Sprague Electric Railway and Motor Company of New York for the equipment of four electric cars. This equipment was intended only to try the electric system; and, if the trial should be successful, it was contemplated that an equipment of a very large number of cars would be operated upon this road. The cars have been in operation about four weeks, and carry large numbers of passengers. Upon a recent Sunday, the four cars and four trail cars carried twenty-five thousand passengers without the loss of a single trip. This is a notable record, considering the small number of cars operated and the grades upon this line. The people in Buffalo are enthusiastic over the new system of propelling street-

motors has been built for a long-distance transmission power plant which the Sprague Company have ordered for erecting in South Africa. Other machines of the same size and type go to other parts of the world through the large demand for motors of this size in long-distance power transmissions, mining-work, and general industries.

The efficiency of this machine is claimed to be high, while at the same time the speed is kept quite low; the motor making only about 500 revolutions a minute while operating under full load.

The Thomson-Houston Alternating-Current Dynamo.

UNQUESTIONABLY the most economical and valuable dynamo in central-station use for long-distance lighting is the alternating-current machine; and its recent adoption for its practical working in this country, although but a matter of a short time, has caused a great change in the methods of supplying illumination by incandescent lamps. The economy with which the electric light can be



THE THOMSON-HOUSTON ALTERNATING-CURRENT DYNAMO.

cars, and say that the management will soon give an order for an increased equipment.

New 75 Horse-Power Electrical Motor.

UP to this time, nearly all the electrical manufacturers have confined themselves to small motors; and although all have acknowledged that the transmission of power on a large scale is feasible and practicable, yet, so far, it has been found commercially more desirable to keep down the size of motors to something like 25 horse-power or less.

We understand the Sprague Electric Railway and Motor Company of New York has departed from this routine, and that they have received a number of orders recently for a larger motor, which have had the result of calling forth the present new 75 horse-power motor, which is by far the largest electric motor which has ever been built. This machine is not dissimilar in appearance to the ordinary Sprague standard electric motor of smaller sizes.

The first one of these motors manufactured was for the Kearney Paper Company of Kearne, Neb., where about 120 horse-power of electric motors built by the Sprague Company will be used for operating the entire mill. The current for driving these motors is generated by water several miles away. The second of these

produced is dependent primarily upon the source of power for operating the dynamos, and the use of the alternating current renders it possible to locate a central station with particular reference to coal and water supply; and the fact that a high-potential current can be transmitted long distances over a small wire, and at a small loss, renders it possible to make use of available water-powers, which could not be done by any other system. Then, again, the cost of maintenance and construction is greatly reduced, as a current can be conducted to a centre of distribution, from which the circuits for the immediate supply of current to the lamps can be taken.

We illustrate herewith the improved alternating-current dynamo made by the Thomson-Houston Electric Company, which has met with such a deserved success in central-station work. It is a feature of this machine that it is of simple construction, and can readily be taken apart to allow examination, or replacement of any part which may have become injured. This machine embodies most excellent features in construction of the armature, whereby all tendency to overheating is obviated, and its regulation is such that extreme changes in load do not cause any change in the intensity of the light. The dynamo has been largely introduced by the company, and has everywhere met with success.