

with a few hundred pounds of sand. If the envelope were absolutely tight, this would be ample for several ascents to 10,000 feet, or to keep the balloon in suspension many days. Nothing of scientific accuracy can be had at a high level without a practised hand on the spot. Questions of exposure of instruments, observations of clouds, etc., demand an immediate answer at each record, if we desire valuable observations. Glaisher made thousands of observations of the moisture-contents of the air in his memorable scientific ascents, but, though these have been utilized by others in doubtful computations, he himself does not summarize them in considering his results. All who have tried to make humidity-observations in a room, with no air stirring (which is precisely the condition in a balloon), know how exceedingly unsatisfactory they are.

I believe that the investigations needed may be made at an expense much less than is ordinarily supposed. There is needed a balloon of about 60,000 cubic feet capacity (a larger one would be too unwieldy, and is not necessary for ascents up to 20,000 feet). The gas for inflation should be the last that comes in the process of manufacture: this is poor in illuminating power, because it has less carbon, but it is nearly one-fourth more buoyant than ordinary coal-gas. This is not exactly a refuse product, yet it can be had very cheaply. It would be a most excellent plan to send up four balloons at once, about two hundred miles from the centre of a storm, in the north-east, north-west, south-west, and south-east quadrants. But, as this would be rather expensive, we must explore the most interesting point first. I would send up the balloon either to the south-west or west of a storm: at a height of 6,000 feet, it would, in all probability, outstrip the storm, and the descent could be made either in the centre or a little to the east of it. We could then either make another ascent immediately, or wait till the storm has passed overhead, and then make another trip just as at first. This will enable us to determine, not only the vertical distribution of temperature and moisture in the neighborhood of the storm, but also the action, whirling or otherwise, that takes place at the seat of the storm, or where the 'power' of the storm is developed. When the balloon is no longer able to rise, a fresh supply of gas may be carried to it in a small balloon, or in a long flexible cylinder (as suggested by Professor King). If near any gas-works, the balloon may be towed near enough to obtain a fresh supply. As about 30,000 feet of gas would be needed to float the balloon and all its appliances, it will be seen that this would effect a great saving. I understand perfectly that carrying out such suggestions as these may be a very difficult matter in practice, and often impossible in a high wind. For ten thousand dollars, I think, fifty or sixty ascents might be made, which would be of incalculable importance in the study of the origin, development, and progress of storms. Such investigation is absolutely necessary if we would advance our knowledge of the generation of storms. Any advance in this direction is of such moment to almost all classes of people, especially to farmers and mariners, that we may hope such a small sum will be volunteered, or obtained from government, ere long for this study.

H. ALLEN HAZEN.

Washington, D.C., July 19.

Cloud-Heights.

THE following method, which can often be used to determine the elevation of certain clouds, may interest some of your readers, particularly topographers and meteorologists.

I was watching to-day, from Little Monadnock, the shadow of a dense cumulus moving slowly along the southern slope of Monadnock, until finally the edge touched the hotel about half-way up the mountain. It occurred to me, that, if the point where I stood and the hotel were plotted on a plane-table sheet, and the sheet oriented, the elevation of the cloud could easily be found in this way. At the moment the shadow reaches the second plotted position, draw, through the station occupied by the observer, a line, and read a vertical angle to the edge of the cloud that casts the shadow. Then, through the second plotted position, draw a line in the direction of the sun. The point of intersection of these two lines is the horizontal projection of the position of a point on the edge of the cloud at the time the shadow has reached the second plotted position. The distance (to be scaled from the map) from this intersection to

the point occupied, is the base, and the vertical angle of elevation the adjacent angle of a right-triangle, of which the altitude is the height of the cloud above the observer. This may be corrected for curvature and refraction.

When a plane-table sheet is nearly complete, with many located points on it, the same cloud may be observed several times, and the determinations of altitude compared.

This method is extremely simple, and I am very anxious to have it tried. I shall not be able to do this myself for several weeks, but I hope some one who is working with a plane-table will, and let me know his results.

H. L. SMYTH.

Dublin, N.H., July 2.

The Wholesomeness of Swill-Milk.

THE discussion carried on in the pages of *Science* for some weeks past upon the healthfulness of milk from cows fed upon distillery-swill has, in my opinion, failed to definitely settle the question. There can be no doubt of the vital importance of the matter, and all physicians and sanitarians will agree that a solution of the problem is highly desirable.

1. I venture to say that no positive evidence has been submitted showing any ill effect of swill upon cows fed with it. The evils attributable to it are largely, if not entirely, to be ascribed to the unsanitary surroundings of the animals.

2. Whatever evidence has any positive value indicates that swill is equally as good and proper food (used with judgment) as hay, dried fodder, ensilage, or bulbous roots. These all differ widely in chemical composition from the green foods (grass, clover, green oats, and corn), which may be looked upon as the normal food of cows.

3. It may be worth while remembering that lactation in a dairy is not a normal process. Dairy-cows are 'milk-machines.' The dairy business would not be very profitable if lactation were not forced to some degree.

4. Experienced agriculturists, like Professor Armsby and Dr. Sturtevant (*Science*, ix. pp. 602-3), have failed to see any ill effects attributable entirely to swill, and such veterinarians of ability as Professor Law and Dr. Salmon (*Ibid*, p. 552) corroborate this testimony.

5. The facts collated by Professor Brewer (*Ibid*, p. 550), showing the ready absorption of germs and odors by milk, the transmission of the flavor of various odoriferous substances eaten by the animal to the secretion, the passage of certain drugs administered medicinally into the milk of nursing women, or the notorious fact that swill-milk stables are 'proverbially foul and stinking,' have no bearing upon the case. The evidence required to establish the unwholesomeness of swill as food for milk-giving animals must be of a different character.

6. While it may be conceded that 'chemical analyses will not settle the question' of the wholesomeness of swill-milk, the fact remains that we have at present no other way of determining the physical qualities of a specimen of milk. Bacteriological investigation may determine the presence of the germs of tuberculosis, typhoid, and, in view of recent discoveries, of scarlet-fever, but will not enable us to ascertain the relative proportions of saccharine, fatty, aqueous, or proteid matters present. Chemistry is here still our main-stay, and, other things being equal (more definitely, disease-germs being absent), a specimen of milk nearly approaching the chemical standard established by Koenig may be looked upon as a wholesome food. Other factors besides the food of the animal enter into the production of milk. The age of the animal, period of lactation, time when the milk is drawn, and general sanitary condition, must not be ignored.

7. The asserted greater firmness, and consequent indigestibility, of the coagulum in swill-milk is not based upon a sufficient number of observations to admit of unquestioned acceptance. It should be easy to determine this in any chemical laboratory. No single series of observations would decide this, however. It would be necessary to test milk from cows fed upon swill but kept under good sanitary conditions, side by side with milk from animals kept under the ordinary conditions of city stable-life, and fed upon various foods.

8. A scientific solution of the question will not be furthered by

prejudiced appeals or unreasoning denunciation. Patient investigation, keeping in view all circumstances of the question, and avoiding all one-sidedness in considering the matter, will alone bring about the object desired. Personally I at present occupy the same stand-point as Professor Armsby (*Science*, x. p. 4), "Much of the common prejudice against the use of distillery-slops appears to be occasioned by their irrational application, and frequently by the filthy surroundings of the animals, rather than by any thing injurious in the feeding-stuff itself." GEORGE H. ROHÉ,

Baltimore, July 15.

The Hudson Bay Route.

IN your article on 'The New Route from England to Eastern Asia, and the Hudson Bay Route' (Vol. x. No. 231), you show the advantages offered by the Hudson Bay route, as the most direct available line between Yokohama and Liverpool in connection with the Canadian Pacific Railway and their line of steamers between Yokohama and Vancouver. I should like to add a few remarks on that part of it known as the Hudson Bay route.

The Canadian Government decided, that, before any such line was encouraged by subsidy, it would be advisable to determine by actual observation what difficulties were likely to be met with; and, with this object in view, established several observing stations in the Strait and Bay, with men and material sufficient for continuous residence there during 1884-6. Complete details of these observations are published in the annual reports of the Marine Department.

A fact well established by these observations was that navigation was limited in these years to three months for the ordinary ocean-steamer; and that for a class of steamer specially constructed to withstand the lateral thrust of the ice, and to push her way amidst the outflowing arctic ice, four, or at most five months would be the limit, depending on whether the season was a late or early one. We must not forget, however, that in the earlier days at least of this route, before the telegraph and cable will have reached these waters, steamers will not attempt the passage at these earlier dates, fearing an arrival off the mouth of the Strait and an inactive wait for a late season's opening, so that practically such an advantage would be lost, and two months and a half become the period over which a steamer could be certain of making an uninterrupted passage during any season.

In considering the possibility of the route being equipped with a special class of steamer, we will have to remember that the required conditions will be strength and power rather than speed, and that therefore their field for employment outside of these few months' service would be of very limited extent.

The special objection I would point out as to this route, apart from the ice-question, is the difficulty of the passage itself: an unknown, an unlighted coast-line, with very few harbors of refuge, or none at all, and very little room to ride out a gale; extreme depths of water, one hundred fathoms being often found right up to the shore, with generally very foul holding-ground where the depths are more moderate. In foul weather, no sounding being possible that would be of value, a vessel would receive no warning of her proximity to the coast until the information would be of little or no avail.

Although fogs are of less frequent occurrence than off the Newfoundland coast, where the necessary conditions are most favorable, they are not infrequent during the season of navigation, Belle-Isle having an average of 1,600 hours fog during the year, as compared with 420 for the Strait during the same period. On the other hand, although the total amount of precipitation, in the Strait, was not great, rain or snow fell on an average of a little more than every other day, with its attendant thick weather.

In addition to and connection with these difficulties, we must not forget that the proximity of the Strait to the Magnetic Pole results in the horizontal, or directive, force of the magnetic-needle being so diminished that the common compass is perfectly useless; and even in the case of the Thomson compass, disturbing elements on ship-board have, in consequence, their values so increased (relatively) that sources of error might arise, the effects of which could not be counted on during thick weather.

That the people of Manitoba are seemingly satisfied with the feasibility of this route, there can be no doubt, if we may judge from the advance they have made with the construction of the railway from Winnipeg to Churchill; but, in face of the facts obtained from the observations made in the Strait, one must conclude that the resources of Hudson Bay itself and the country intervening are looked upon as reason sufficient for the construction, independently of the value of the road as a connecting link to the Hudson Bay route.

In conclusion, although it would be difficult to say that, with the appliances science is constantly developing to meet particular cases of difficulty, the navigation of Hudson Strait will not be possible for five or six months when the necessity arises, we cannot but conclude that, with the means at our disposal to-day, the navigation of Hudson Strait is possible for such a limited period, and under such serious disadvantages, that as a development of the 'New Route from England to Eastern Asia' we need not consider it as an immediate probability.

W. A. ASHE.

The Observatory, Quebec, July 16.

The Wanton Destruction of the Florida Heronries.

CANNOT general legislation, cannot State legislation, or cannot somebody raise a hand to stay the terrible, the shameless extermination of the herons at their breeding-grounds in the south-western parts of the State of Florida?

As I pen these lines this murderous work is being actively carried on, and apparently in the most lawless and reckless manner possible, — a disgrace to the entire country, — for one of America's grandest and most interesting natural features, her heronries, are simply, and without a check of any kind, being ruthlessly wiped out of existence. Prompted by an insatiable greed for gain, the 'plume-traders' of the markets are upon their grounds in numbers, and hundreds of these birds are now daily falling to their unceasing fire, simply that they may have their backs robbed of a few feathers to gratify a passing fashion. *The Auk* is now publishing an admirable series of articles on this subject from the able pen of Mr. W. E. D. Scott, at present on a scientific expedition in Florida, and I have just read his contribution to the July number of that journal. Mr. Scott has very recently made camp at a number of these heronries, and I quote a few of his words in order to show what work is going on there. At Matlacha Pass, near Charlotte Harbor, Pine Island has a heronry, and here one Johnson was at work. "A few herons were to be seen from time to time flying to the island, and presently I took the small boat, and went ashore to reconnoitre. This had evidently been only a short time before a large rookery. The trees were full of nests, some of which still contained eggs, and hundreds of broken eggs strewed the ground everywhere. Fish-crows and both kinds of buzzards were present in great numbers, and were rapidly destroying the remaining eggs. I found a huge pile of dead, half-decayed birds, lying on the ground, which had apparently been killed for a day or two. All of them had the 'plumes' taken, with a patch of the skin from the back, and some had the wings cut off; otherwise they were uninjured. I counted over two hundred birds treated in this way." In some places, Mr. Scott found hundreds of the young herons just starving in their nests; in others, the gunners beneath the trees shooting down the magnificent birds in hundreds, stripping their backs, and leaving their carcasses to rot upon the ground. Instances were noted without number where, during the breeding-season, the poor, affrighted survivors were driven to strange islands, dropping their eggs in quantities from the trees where they fearfully roosted for the night. A few more years, one or two at the most, and this disgraceful murder will cease, for the simple reason that there will no more victims for the murderers to prey upon, — and in the name of nature, and in the name of the shadows of the sweet old romances that have come down to us of the heronries of history, are these timid, and most engaging of all our larger water-fowl, our own American herons, to be destroyed in this manner!

Twenty years ago southern Florida was the site of the grandest heronries in all the world, and to-day this State is making enviable progress, and many cultured people are flocking to her for a permanent home: is she to stand idly by and watch what will surely