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THE RECENT FAILURES OF ARCTIC EXPEDITIONS.

It is hard to believe that the resources of mankind are unequal to traversing the few hundred miles of ice or water which intervene between the most northerly point reached by Nansen and the north pole. The lesson of the day is that man's powers are constantly on the increase, and that new fields of achievement are opened up to him by the greater extension of mechanical and scientific operations.

The general feeling is that man can make almost anything if the means in the shape of money are provided. It seems impossible that his powers in other directions than that of mere construction should not also be increased by the improved appliances at his command.

It is a fair assumption that even twenty or thirty years ago it would have been pronounced a more difficult task to bridge the Forth in a single span than to reach the north pole. The laying of the first short-lived Atlantic cable was thought a great feat, while to-day a new transatlantic cable receives but a passing notice from the press.

The tendency of the day is to attack the world's problems on new lines of united effort rather than of individual action. One of Stockton's clever stories tells of the great war syndicate, which waged a war by contract. In view of the fact that so much can be done by association, polar expeditions are open to criticism as being carried on upon the old principle of individual effort.

The open polar sea theory was a great reliance with those interested in Arctic work some years ago. Man has a taste for the paradoxical, and there were pretty good grounds for believing that there might be a polar ocean free or nearly free from ice.

When the Jeannette was abandoned and the journey to the south was begun, the northward current for the first ten days was so strong that seven miles were absolutely lost, observations showing at the expiration of that period that while the party traveled due south the current had carried them to the north faster than their rate of progress.

Nansen, in his specially constructed vessel, with his crew of selected men, relied on getting into such a current to be swept across the pole, but failed. The dreariness of the work in the light of the experience of others is great. The wretched two years' drifting of the Jeannette, during which time but six degrees of northing were made, and the long drift of the Fram, open up a vista far from alluring for those who work upon similar lines.

The Arctic expeditions generally are conducted on very primitive lines. Peary's party of ten men, Nansen's party of twelve men, Andrée's party of three men, go bravely to the north, relying on personal and individual effort for success.

greater possibilities might follow upon a better equipped organization. If the work were undertaken with adequate capital and resources to back it, a better chance would be presented.

If, by the definite location of the exact limits of land in the north, and by the demonstration of the impossibility of reaching the north pole, these expeditions could be stopped, some good would be done. There seems to be a fascination in Arctic research which would cease were the region explored and mapped. But, until this is done, explorer after explorer will go north and seek for the unknown.

The meeting of Stanley and Livingstone in equatorial Africa is recalled by the equally romantic meeting of Nansen and the Jackson party an earth's quadrant distant in the icy north. In our columns we have given full accounts of Nansen's work. It is to be hoped that before the century is over the north pole may be reached by the intrepid Scandinavian or by some equally endowed explorer.

Phosphorescence and X Rays in the Geissler and Crookes Tubes.*

We have communicated to the Acc. di. Sc. fit. e mat. di Napoli (February 25, 1896), that a spark introduced into the circuit of a Ruhmkorff coil and of a Crookes tube modifies the action of X rays.

We call positive air spark the spark introduced between the positive pole and the tube, and negative air spark the spark introduced between the negative pole and the tube.

With rigorous experiments we have found that a positive air spark increases the effect of X rays and a negative air spark diminishes it.

By means of various arrangements, we have also obtained the Crookes phosphorescence and the X rays from the Geissler tube.

The following arrangement (bipolar inductive) gives the best results:

On the outside of a Geissler tube are glued two pieces of tinfoil, which are connected to the poles of an induction coil. These are also in communication with a graduated spark stand. When the coil acts, at every spark passing between the balls of the spark stand, a discharge passes through the tube and illuminates it. Contemporarily on the wall opposite to the positive tinfoil appears the Crookes phosphorescence, which is accompanied by the X rays. The Geissler tube in this side is transformed, momentarily, in a Crookes tube, while it maintains in the other regions the properties of the low vacuum tubes.

J. D. Whitney.

Josiah Dwight Whitney, professor of geology at Harvard University, died in New London, N. H., on August 19, at the age of 77 years. He was graduated from Yale in 1839, and the following year he made a survey of New Hampshire. A geological exploration of the Lake Superior region, made by him in 1843, was followed by a survey of the mining regions of all the States east of the Mississippi.

*By F. Campanile and E. Stromei, in the English Electrical Review.

The Colossal Cavern of Kentucky.

BY HORACE C. HOVEY.

The announcement of a new Kentucky cavern ought to cease to cause surprise. There are literally thousands of caves and grottoes in the Ohio Valley, few of which have been thoroughly explored. Each has its own peculiarities, and the time will come when what the French call the science of "speleologie" will not only have its isolated devotees, but its organized and endowed societies. Why not have an American Cavern Club as well as an Alpine Club? No field would more richly reward systematic and elaborate investigation. I am, and always have been, an enthusiastic admirer of the Mammoth Cave, and still regard it as without a rival or a peer. Yet that is no reason for not exploring and admiring other remarkable underground regions. The Diamond Cave, and Dixon's, White's, Proctor's, Salts, and Grand Avenue caves, and many others that are found in the vicinity of the Mammoth Cave, would be regarded as wonderful were it not for their more famous neighbor.

The latest discovery, and one that is attracting many visitors, was made July 16, 1895, by Mr. Pike Chapman, and has been named "The Colossal Cavern." Its wonders have only been partly opened up as yet, and great disclosures are expected from the judicious use of dynamite. Meanwhile what has already been made accessible to the public is worthy of description in these columns. From my intelligent guide, Mr. John Nelson, I obtained many facts to be added to my own observations and inquiries during a hurried visit to the region, supplemented by the notes taken by the distinguished cave photographer, Mr. Ben Hains, of New Albany, Indiana, although I regret to say that no views have as yet been taken that are suitable for purposes of illustration.

In order to reach this new wonder of Kentucky, the tourist stops at Proctor's station on the Mammoth Cave short line railway, where he finds a comfortable hotel, with the usual display of stalagmites and other fantastic cave ornaments piled in profusion in the door yard and elsewhere. A fairly good road has been constructed, leading for three miles to the foot of the hill in which the cave described is located. The entrance is half way up the hillside, and it is unique in that access is gained through the tip of a subterranean dome, laid open by the washing down of the eminence, and that is made accessible by a series of steep ladders whereby we climb down for 66 feet to the floor of the dome, which at the bottom is 15 feet in diameter.

A winding path from the north side of this dome continues for several hundred feet and is made picturesque by numerous curious niches and small pits. This passage finally brings us abruptly against the perpendicular wall of *Quinque Dome*, whose floor is visible about 36 feet below where we stand. Two ladders lead down to the floor, and on descending them we note the five rocky projections that have suggested the peculiar name of this dome. The walls between these five sections are very thin and have been carved by the water into strange and fantastic shapes. Standing on the floor of *Quinque Dome*, we are more than 100 feet lower than the entrance to the cavern, and most of this descent, as has been remarked, is made by the use of ladders. The exit from *Quinque Dome* is by a low passage enlarged by blasting so as to obviate the necessity of crawling. After going along for about 200 yards the greatest feature of the cavern is reached, namely, the *Colossal Dome*. Our path leads directly across the very tip of the dome, planks being laid for the purpose for fully 50 feet; by lifting one of which we may peer down into the dark abyss that measures by the plumb line fully 137 feet. Dropping a fire ball through this crevice, the corrugated sides of the dome below us are lighted up, and we watch the flaring mass of flame as it slowly circles around, until after many gyrations it touches the distant floor.

Following the passageway for 150 feet further, we are confronted by an opening into what the guide tells us is the "main cave," which is about 40 feet high and 60 feet wide. Again availing ourselves of the aid of a ladder, we reach the floor and then turn to the right and descend a steep slope to a great gateway, 20 feet wide and 60 feet high, flanked by enormous pillars formed by erosion, and springing aloft in majestic proportions. The slope of debris continues beyond the gateway, while the walls around us tower to an immense height; and presently the fact dawns upon us that we are now within the vast dome of which we had obtained a glimpse by lifting the plank in the bridge overhead. At every step, as we advance, the subterranean scenery grows more and more wild and imposing. At length we find ourselves on the edge of an inner pit, like a cistern, whose bottom is the true floor of the dome. Descending into it by a ladder, we stand at the very lowest level of the cavern, which is really the third tier or level, 240 feet vertically below the entrance. It will also be noticed that in order to reach this we have descended successively into three pits or domes—the terms being used according to the point of observation. By burning magnesium we follow with the eye the fluted walls until we are barely able to see the snow-white fungus growing on the

under side of the bridge over which it seems strange that we had dared to go. Large drops fall like shot from the apex of the dome to the floor, adding by their music to the majestic impression made on the mind; and we try to imagine how it would seem to have a winter cascade fall thundering down for 137 feet on the rocks where we stand, as it is said to do in the rainy season.

The visitor returns by the ascending path by means of which he had previously descended. In doing so he has a better opportunity to examine the peculiar formations that offer their attractions to his gaze. A digression is made through what is termed "the short route," in order to inspect a fine group of stalactites, which do not elsewhere abound in this cavern. After passing the mouth of a broad pit that nearly fills the pathway and that is 86 feet deep, we come to a small body of water called the "Pearly Pool." This is a depression lined with tufts and sprigs of alabaster crystals, and the edge is crested with the same material. The water being exquisitely clear, the general effect is very fine. Around the pool are stalactites and stalagmites uniting to form pillars 20 feet high. The roof for many yards is hung with countless smaller stalactites. Beyond this spot the cavern is occluded by debris, and we retrace our steps to the regular path which we had left for this excursion into fairyland.

The main cave continues to the north for several "cave miles," to explore which takes two full hours of continuous walking, sometimes over rough rocks and again over a sandy floor or some bank of clay. The avenue varies from 40 to 80 feet in width and from 20 to 40 feet in height. The special objects of interest here are the gypsum crusts and flowers (oulopholites), which being fresh and uninjured by the smoke of lamps and fire balls, sparkle with dazzling whiteness. Sections a yard square often hang down for six inches from the roof, ready to drop on the floor when jarred. Here and there large clusters of cave flowers may be seen. This crystal gallery is several hundred feet long. Interspersed amid extremely delicate lacelike formations are enormous rosettes of gypsum, and beyond these for a long distance the roof is covered by broad crystals of selenite. There are also patches of fibrous gypsum, the single spikes often being many inches long. What is called the "Bear's Robe" is of these fibrous crystals, softly tinted with gray instead of pure white. Staglike branches of crystals occasionally stand out from the wall for a foot without any support.

Here the cave divides into two branches around an "island," and at the farther end a broad passageway is piled with enormous rocks, one of which is 6 feet thick, 20 feet wide, and 60 feet long. Some distance on we pass by two very deep and symmetrical pits into which the water incessantly drops. From here on the cavern is wild and highly diversified in its appearance, until at the farthest point of exploration we find a recently discovered dome that is entered from the side by climbing down a mass of debris to the bottom. Its symmetry is surpassingly beautiful, the wavy walls rising to the height of perhaps 120 feet, as if cut from a seamless mass of stone. This is really one of the finest things in the cave.

On returning to the entrance our attention is directed to an opening to the left, said to lead four miles to a considerable underground river. But this region has not yet been opened for visitors. Indeed, there seems to be a good deal of mystery about certain explorations, the conjecture being that the *Colossal Cavern* is connected with two others that have long been known, namely, the "Bed-quilt Cave" and the "Salts Cave." It would evidently be to the advantage of the managers if they could find some way of obviating the necessity of climbing down and up again those long, steep, and somewhat dangerous ladders. But even as the cavern now stands it is worthy of being mentioned amid the wonders of America.

Big Machinery Export.

An entire locomotive making plant will be taken soon to St. Petersburg from Philadelphia on the British steamship *Laleham*, which has been chartered for the purpose. The plant is to be erected at Nijni-Novgorod, the commercial metropolis of the interior of the Russian empire. Contracts for machinery for the plant amounting to over \$500,000 were awarded to American manufacturers, most of them going to Philadelphia firms.

The plant is to be built for the *Sarnova Works*, an extensive establishment engaged in manufacturing cars, steamboats, steam boilers, and employing 5,000 hands. The locomotive plant will have a capacity for building 200 engines a year, and will employ about 1,000 hands. All of the foremen and engineers will be Americans. The buildings have been completed and are now ready to receive the machinery.

The Czar has given valuable encouragement to the enterprise. Nearly 85 per cent of the railways in the empire are operated by the government, and the new company will get a great share of the work for them. The company will be known as the *Russian-American Manufacturing Company*. The consignment will aggregate over 3,000 tons.

Roller Ship Launched.

In the presence of numerous foreign engineers and a large crowd of onlookers the so-called "roller steamer," the invention of M. Bazin, a well-known marine engineer, was launched August 19 at the Cail dock yards, at St. Denis, France. The vessel will traverse the Seine, cross the English Channel, and go to London.

The boat is a large rectangular iron box about 120 feet in length, 40 feet wide, and 5 feet high. It is mounted on six lenticular disks or rollers 30 feet in diameter and sunk in the water 10 feet, while the lower floor of the box is at an equal distance from the level of the water. In the sides of the box is the machinery, which is of 750 horse power. This sets in motion a screw and the rollers. In the upper part of the vessel, between the disks, which pierce the box and extend beyond it about seven feet, are comfortable cabins. This strange looking vessel has a displacement of 280 tons.

M. Bazin's first experiments were made with a small model, the rollers of which were moved by clockwork, the propeller being replaced by a weight, which was attached by a string passing over a pulley to the front of the boat. When the rollers were not working the miniature boat took 22 seconds to cross from one side of the large vessel in which it was placed to the other side. When they were working it took only 11 seconds. As the power necessary to keep the rollers at work is only one-quarter of the power that is required to keep the screw going, the mathematical result is that the speed of the vessel is doubled by an extra expenditure of power which amounts to only one-quarter. But a vast increase of speed is not the only advantage claimed for these rolling steamers. It is pointed out that when they shall be used the length of voyages will be diminished, the consumption of coal will be lessened, and, as a natural result, passengers and freight will be transported at far less expense than heretofore. Moreover, experts assert that the stability of the rolling boats will be far greater than that of the steam vessels at present in use. It is also asserted that the catastrophes at sea would practically cease by the use of rollers. In case of a collision or other accident, though some of the rollers might be damaged, some would almost certainly escape damage, and two would suffice to keep the vessel afloat and take her into port.

M. Bazin expects the boat to make from 45 to 50 kilometers an hour while crossing the channel. The theory of the inventor is that boats should roll over the water instead of cutting through it.

He has designed a large steamer on the same principle, which he estimates will make the voyage from Havre to New York in four days, but of course this speed is largely problematical.

Recent High Balloon Ascensions.

In the *Comptes Rendus* of the Paris Academy of Sciences for April, 1896, vol. cxxii, page 849, Messrs. Hermite and Besancon give the principal results of the last scientific balloon ascension, which started at 11:30 A.M., March 22, after consulting the weather predictions of the Central Meteorological Bureau. The small balloon with its apparatus weighed 32 kilogrammes (70 pounds), and started with a vertical pull of 106 kilogrammes (235 pounds); consequently the balloon rose perpendicularly for three or four minutes with a steadily increasing velocity. For nearly half an hour the balloon scarcely moved from the vertical, so that the velocity of ascent certainly exceeded 5 or 6 meters (16 to 20 feet) per second. After three and a half hours the balloon descended near Cambrai. The self-registers show that it attained a maximum height of 14,000 meters (42,933 feet) within about forty-five minutes after starting, and a minimum temperature of -63° C. (-81.4° F.) The temperature at the surface of the earth beneath the balloon at that moment was $+14^{\circ}$ C. ($+57.2^{\circ}$ F.) Consequently the average rate of decrease was 1° C. (1.8° F.) for 182 meters (597 feet). This value does not much exceed that found in their voyage of October 20, 1895, when the aerostat at an altitude of 15,500 meters (50,854 feet) experienced a temperature of -70° C. (-94.0° F.), while the temperature at the surface of the ground was $+11^{\circ}$ C. ($+51.8^{\circ}$ F.) The registering thermometer has been tested in a very cold inclosure, and records properly down to -80° C. (-112.0° F.).—Monthly Weather Report.

The Majestic Beats Her Best Record.

The *White Star* steamship *Majestic* clipped 12 minutes from her own record on the voyage she finished August 19 from Queenstown. Her time was 5 days, 17 hours, and 56 minutes. From Daunt's Rock to Sandy Hook Lightship the seas were unruffled and the air was almost flawless.

College Laboratory Burned.

The chemical laboratory building at the University of Illinois was destroyed by fire August 17. It is supposed to have been struck by lightning. The building was three stories high above the basement and contained five laboratories. It was one of the largest and best of its kind in the country and was erected at a cost of \$40,000. The fittings, apparatus, and supplies are estimated to have brought the entire value to \$75,000.