move *en masse* and in the direction of common pull exercised by the wind-driven masses of ice. By reason of friction the motion will be communicated to lower layers of the sea. This cause of surface currents is of importance to the theory of movement of those polar waters which, for several months after the winter ice begins to break up, are free from larger wind-waves. Deprived of its chief sails, the Labrador current, always sensitive to wind conditions and at times subject to temporary reversal with contrary winds, yet preserves and perhaps exceeds, during the period of ice-drift, the average velocity of current-flow for the year.

NOMENCLATURE OF TERMS USED IN ICE NAVIGATION.

A USEFUL 'list of some of the terms used in ice navigation by whalers, sealers and others' has been prepared by Commander William Wakeham, of the Canadian Marine and Fisheries (Report of the Expedition to Hudson Bay and Cumberland Gulf in the steamship *Diana*, 1897, Ottawa, 1898). Among the terms, the following are here noted with their definitions as expressed by Commander Wakeham :

Floe—A large mass of floating ice.

Pan—A small floe or small piece ; one that can be forced aside or slewed.

A field—A large body of ice that may be seen around.

Land floe—Ice frozen fast to the shore.

Collar ice—Is the margin of ice frozen fast to an island or shore, presenting an abrupt wall against which the floating ice rises and falls with the tide.

Growler—Is a more or less washed and rounded lump of ice which rolls about in the water, formed from broken up bergs or detached pieces of heavy old Arctic floe ice. [So called from the sound of heavy churning as the swell breaks at the undercut portion of the pan.]

Packed ice—Are small pieces closed together and held by the pressure of ice and currents.

Batture—Rafted ice [described on page 12 of the report].

Pressure ridge—Is the ridge or wall thrown up while the ice has rafted.

Slack ice—Is detached, so that it may be worked through. Ice is said to be slacking when it begins to be open so as to be navigable.

Running abroad—Ice is said to be running abroad when it opens out or slacks away so as to be navigable.

A nip—Ice is said to be nipping when it begins to close by reason of the action of winds or currents, so as to prevent the passage of a vessel.

Calving—Ice is calving when the small pieces break off from the bottom and rise to the surface of the water.

Slob—Is snow afloat and forming into ice.

Sish—Is thin young new ice, just formed in thin sheets.

Lolly—Is loose new ice.

Porridge ice—Is small, finely ground up ice.

Rafting—Occurs when two pans meet by force either by the action of wind or currents ; the edges are broken off and either rise on top of or pass under the body of the pans.

A lead—Is a strip of navigable water opening into the pack.

Slatches—Are considerable pools of open water in the ice.

Swatch—Is a small pool of open water in the ice.

Wash—Is the sound of the sea breaking against ice.

Rote—Newfoundland term for wash.

Water sky—Is a dark or bluish appearance of the sky indicating open water beyond the pack.

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AMERICAN ELECTRICIANS IN LONDON.

THE Central London Railway, the 'Electric Underground,' of London, the 'two-penny tube,' is one of the most important and, in some respects, far the most remarkable example of the work of the American electrician and engineer in Europe, perhaps in the world. It is a subterranean road running from Shepard's Bush, at the west, to the Bank in the city. It was opened last June by the Prince of Wales. Its 5¾ miles of route have seen the expenditure of about $15,500,000 during the four years of construction, and many minor bits of work remain to be performed. The original engineer of the work was the late Mr. T. H. Greathead. It was found necessary to come to the United States to secure its exceptionally large and powerful machinery and motive power. It is, in fact, an American electric railway in operation in London, the center of the brains and business of Great Britain. In one respect at least, however, it is novel as to its roadbed :

it is an 'undulating railway,' its stations are all set on the crest of gradients rising from either side, illustrating the plan proposed in Robert Stephenson's day by Badnall with the published approval of that great engineer.* This arrangement is perfectly feasible whereas here, the stops are all made at precisely the same points and with practically similar intermediate speed of trains. It insures gain in operation by the utilization of the stored energy of the train at a stop, instead of its waste by the use of the brake. Leaving the station, the descent is utilized in securing the required acceleration, thus again saving power. The gradients are 1.66 to 2.33 per cent., and the latter is equivalent to 74 pounds per ton on the draw-bar. One hundred horse-power minutes are thus gained at each stop and at each start.

The electric locomotives were supplied by the General Electric Co., the converters by the Thompson-Houston Co., the electric 'lifts' at the stations, dropping the passenger 60 to 90 feet at the start and raising him to the surface at his destination, were furnished by the Sprague Electric Co. The tunnel is double-barreled, each tube being 11 feet 6 inches in diameter. There are 13 stations and the running speed ranges from 14 to a maximum of 25 miles an hour between stations. Twenty-eight locomotives are employed; each hauling a train of seven carriages, conveying at most 336 passengers, the train weighing, empty, 105 tons, exclusive of the locomotive. The latter weighs about 50 short tons. Power is supplied also by an American firm, the E. P. Allis Co., who furnish six cross-compound engines, designed by Reynolds, of 1,300 to 1,900 horse-power each, and these are supplied with steam by 16 Babcock & Wilcox water-tube boilers—another American invention. The generators are three-phase, alternating current, with revolving fields. The armatures weigh 48,000 pounds. The output is 850 kilowatts, each, at 5,000 volts, 25 periods per second. Four six-pole exciters, driven, each, by a compound engine at 450 r. p. m., direct, supply to each generator 50 kilowatts at 125 volts. The switchboard is of marble. There are 19 miles of cable, weighing 78.4 tons. The engineers of the line are Messrs. Benjamin Baker and Basil Mott.

R. H. THURSTON.

* Treatise on 'Railway Improvements,' by R. Badnall; London, Sherwood, Gilbert and Piper, 1833.

WIRELESS TELEGRAPHY.

PROFESSOR J. A. FLEMING writes to the London *Times* the following letter on recent advances in wireless telegraphy:

As the subject of wireless telegraphy has not yet apparently lost interest for the general reader, I venture to ask a little space to make known for the first time some recent achievements by Mr. Marconi which have astonished those who have been allowed to examine them. Every one is aware that in his system of electric wave telegraphy an important feature is the employment of an elevated conductor, which generally takes the form of a wire suspended from a mast. When Mr. Marconi attracted attention by his feat of establishing communication across the Channel without wires, critics raised a not altogether valid argument against its commercial utility, that a wave or signal sent out from one transmitter would affect equally all receivers within its sphere of influence and hence the privacy of the communication would be destroyed. No one felt the force of this objection more strongly than the distinguished inventor himself, whose original work has caused so many others to attempt to follow in his steps. For the last two years he has not ceased to grapple with the problem of isolating the lines of communication, and success has now rewarded his skill and industry. Technical details must be left to be described by him later on, but meanwhile I may say that he has modified his receiving and transmitting appliances so that they will only respond to each other when properly tuned to sympathy. I am well aware that other inventors have claimed to be able to do the same thing, but I do not fear refutation in saying that no one has given practical proof of possessing a solution of this problem which for a moment can compare with that Mr. Marconi is now in a position to furnish.

These experiments have been conducted between two stations 30 miles apart, one near Poole in Dorset and the other near St. Catharine's in the Isle of Wight. At the present