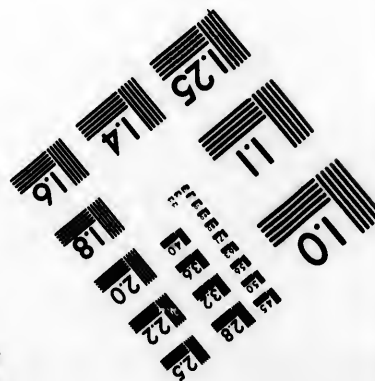
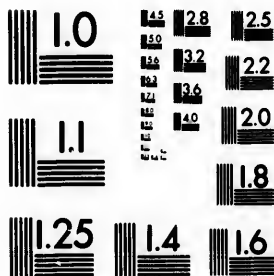


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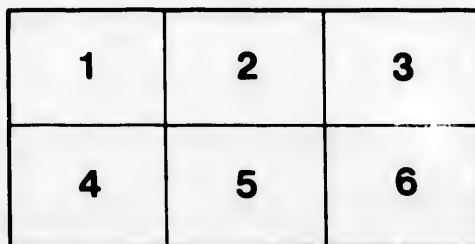
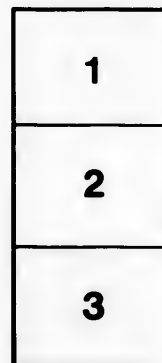
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ARCTIC TEMPERATURES AND EXPLORATION.

By STUART JENKINS.

AT the recent annual meeting of the Association of Ontario Land Surveyors, held in the city of Toronto, the statement was made that, if the Canadian Government determined to run a meridian to the north pole, Canadian surveyors would carry the work through. As a proof of the faith that is in them, they have appointed a committee to consider and report upon the matter.

The assertion is not as wild as it may seem, and I think it will prove interesting to the public to show what Canadian surveyors have already done, and compare their methods and experience with those of arctic explorers.

The extreme cold of the arctic regions is generally looked upon as the principal bar to exploration in that direction, notwithstanding the fact that men have endured its rigors for years without injury. Take some of the cases on record. In 1743 four seamen went ashore on the island of Spitzbergen from a Russian vessel. A heavy storm drove the ship away before they could rejoin her, and they were left with nothing but a gun and enough ammunition to kill twelve deer. That was their entire outfit, yet they managed to live and keep their health for six years, when three of them were rescued, the fourth having died. No properly organized polar expedition would have to submit to the hardships which they must have endured.

In 1819-'20 Parry wintered on Melville Island in latitude $74^{\circ} 26'$. The greatest cold was experienced in February, when the thermometer fell to -55° F., and for fifteen hours was not above -54° F. The expedition was absent eighteen months, and out of two ships' crews only one man died—of a disease in no way referable to the hardships of the voyage.

Between 1853 and 1855 Dr. Kane passed two winters in Smith's Sound in latitude $78\frac{1}{2}^{\circ}$, and he records the mean temperature of the three summer months as $+33^{\circ}$ F., and of the nine winter months as -16.8° F. As to the possibility of traveling under the conditions existing in these high latitudes, it may be considered as established by the experience of McClintock, who in 1851 reached one of the western points of Melville Island, distant from his winter quarters three hundred and sixty miles in a direct line, a journey which required eighty days going and returning for its accomplishment. Among the things said to have been experienced by arctic explorers three may be mentioned: 1. That men issuing suddenly from their shelter into a temperature of -60° F. fell senseless. 2. That a man rushing out bare-handed

to extinguish a fire, when the thermometer stood a little below -50° F., had his fingers immediately frozen, and as it was found impossible to restore the circulation they were amputated. 3. That when it was extremely cold it was almost impossible to make the wood burn. I will come to these later.

Now for the experience of a Canadian surveyor. It was my privilege to be connected as instrument-man with a survey party which went out to the Canadian Northwest under the command of Mr. G. B. Abrey, D. L. S. (now engineer of Toronto Junction). The party consisted of fourteen men all told, and was out under canvas for twelve months, from June, 1882, to June, 1883. We were running standard parallels, and moved camp every day. This necessitated the employment of fourteen horses, two buckboards, and twelve carts, the wheeled vehicles being replaced in winter by the same number of toboggans. Winter commenced on the 1st of November, when snow fell to the depth of two feet and remained. We then left the plains south of Battleford and made our way to Fort Pitt, near which our winter work started. Our outfit consisted of four ten-ounce duck tents, in three of which were small sheet-iron box stoves, and in the fourth, the cook's tent, a sheet-iron cook stove. Our winter food was composed of pork, beans, dried apples, and bread, with tea and sugar; to which may be added eight hundred pounds of fresh beef, and the flesh of one elk or wapiti and one jumping deer. When we could we shot prairie chickens, but this was not very often.

For clothing I wore woolen underclothing, such as I now wear in the city of Toronto, a flannel shirt, and over these caribou breeches with long woolen stockings drawn over them, a chamois-leather vest, and a small single-breasted tweed coat such as is worn in the city before overcoats become necessary in the fall. My feet were clothed with duffle and moccasins, and my head with a double, knitted, Hudson Bay tuque, which can be pulled right down over the ears. A pair of common woolen mits completed my outfit. At no time during the winter did I wear either overcoat or muffler. Indeed, neither the one nor the other was to be found in the camp. Mr. Abrey's dress was nearly the counterpart of mine, and the men wore woolen clothing altogether.

At night Mr. Abrey and I used two pairs of Hudson Bay blankets and two buffalo skins each. The blankets we sewed up into bags, and put one buffalo skin beneath and one over us. We slept on folding stretchers, which was, of course, not as warm as sleeping on the ground. Mr. Abrey, being slightly bald, wore a woolen nightcap, but I never covered my head the winter through. The men's sleeping outfits consisted of blankets only.

Our firewood was dry poplar sticks from one to two inches through. This makes a good hot fire, and *the colder the day the*

better it burns—that is our experience. But by no means can you make a fire of it burn more than half an hour without replenishing. In consequence of this, no attempt was made to keep fires burning at night. An hour after we were in bed the temperature inside the tent was the same as that outside. At no time was the temperature inside the tent raised high enough to thaw out the ground, which would only have given rise to wet feet without adding to our comfort.

A regular record of temperature was kept during the winter. Our thermometer was a standard spirit one graduated to -62° F., and had been tested at the Toronto Observatory. The record is on file in the Dominion Crown Lands Office. From the 1st of November the temperature fell in a series of remarkably regular jumps—that is, there would be three days of cold, then a few days of slightly higher temperature, then another three days of cold, and so on, each drop being colder than the last. This went on with unbroken regularity until the third week in January, when it began to rise again in the same way and with equal steadiness.

On Christmas day the weather was beautiful, still and cloudless, and the thermometer stood just at zero. I spent the day in making a pair of snowshoe frames, out of white birch, which was plentiful round the camp, my tools being an axe and an Indian crooked knife, which is nothing but a one-handed draw knife, shaped much like a farrier's knife. I worked all day with the door of the tent wide open, in my shirt sleeves, and bare-handed; and from 9 A. M. to 3 P. M. there was no fire in the stove. I slipped on my coat at noon when I was eating my dinner, but took it off again immediately after. The men spent most of the day lounging about the camp in their shirt sleeves, smoking and skylarking.

The second week in January we received word that Mrs. Abrey was in Battleford waiting to join us in camp. She had come from Toronto and had traveled across the open country in the mail sleigh from Qu'appelle to Battleford *via* Duck Lake and Carleton. Mr. Abrey immediately left with two horses and carioles (i. e., toboggans with raised sides of rawhide), and one half-breed. He carried no tent. The distance to Battleford from our camp was over a hundred miles, through an open country, with here and there clumps of small poplar and birch.

I went on with the line, and the third day after Mr. Abrey left us reached the shore of Frog Lake, a few years later the scene of a horrible massacre. The next morning the cook came bustling in with the breakfast, his shirt sleeves as usual rolled up above his elbows.

"The bottom's dropped out of the thermometer," he said with a laugh.

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I hurried outside, and, sure enough, the spirit had deserted the tube, and lay inclosed in the bulb—that is, it was lower than -62° F. It was startling, but there was no getting round the fact. The news spread through the camp, and the men came crowding round to see the unusual phenomenon. One man ventured the opinion that we had got to the north pole by mistake, but they looked upon it more as a joke than anything else, and were perfectly satisfied, because it meant a holiday. Mr. Abrey had made the rule that when the thermometer went below -30° F., we would not go on the line. We afterward came to the conclusion that there was nothing to prevent our working at much lower temperatures, but the rule once established it was impossible to alter it without creating discontent among the men. I went out that day two miles from camp on snowshoes, just to see how it would go, and, although it was cold at starting, I was warm enough before I got back.

The next night the thermometer went down to -58° F., and the third night to -61° F. Now, according to all precedent, we should have spent those three nights cowering with quaking hearts over the stoves, and using up the cook's fat to make the fires burn. As a matter of fact we went to bed as usual and slept without any fires at all. Not only that, but we suffered no discomfort. The only unpleasant thing about it was turning out of one's blankets in the morning to light the fire, and that I admit *was* cold, but still nothing that a strong man could not stand with equanimity.

But what will be thought when I state that during those three days of extreme cold Mr. and Mrs. Abrey were on their way from Battleford to Fort Pitt, *and slept out without any tent, and without keeping up a fire through the night?* If a Canadian surveyor's wife could do this, a Canadian surveyor can get to the north pole.

The next cold snap after this the thermometer reached -58° F., but it did not touch -60° again that winter. Not once during the winter did any of the party suffer from frostbite. I have repeatedly seen the men chopping bare-handed with the thermometer at -25° F.; and have myself taken observations of the North Star when it was -35° F. It was cold undoubtedly, but it was not as bad as taking the same observation in the mosquito season.

During the whole twelve months we were out we had not a day's sickness among us, but everybody was decidedly fatter and heartiest during the coldest weather. One fallacy we completely exploded—i. e., that extreme cold produces drowsiness. We never saw any indication of it, and since then I have traveled some thousands of miles across the ice of the Georgian Bay in temperatures varying from $+32^{\circ}$ to -30° F., and never experienced the slightest inclination to drowsiness. Only once in my life

have I felt it, and that was in the middle of summer, when as a very young man I was fool enough to try and walk fifty miles in a day without any previous training. During the last mile or two my companions had hard work to keep me on my feet, and at the end of the journey I subsided into a chair and went fast asleep, and in that condition was carried to bed, where I slept for twenty-four hours. I was simply "played out," and it is *that*—not cold—which produces the drowsiness so often referred to. More than once since then I have walked fifty miles on snowshoes and never felt anything of the kind, but I made it a rule to stop every four hours and brew some tea and eat a good square meal. When this practice is followed, it is astonishing how far a man can go without excessive fatigue. The "fatal drowsiness," as it is so often called (which is surely a near relation of "that tired feeling"), is nothing but Nature's final rebellion against a reckless overtaxing of the muscular power without renewing the waste, which of course goes on most quickly in cold weather.

A more recent example of the staying powers of Canadian surveyors is furnished by the exploration of the "Barren Lands" and Chesterfield Inlet just brought to a successful completion by the Tyrrell brothers for the Dominion Geological Survey. The party consisted of the two Tyrrells and six Indian canoeemen, a model party for exploring purposes. The total distance covered by them in canoes from Athabasca Landing to Fort Churchill on Hudson Bay was two thousand two hundred miles, and thence to Winnipeg on foot or by dog train one thousand miles. Of the two thousand two hundred miles, eight hundred and fifty was through an entirely new country never before traveled by white men, and five hundred miles was over the open sea of Hudson Bay at the very worst season of the year, between the middle of September and the middle of October. It was during this trip down Hudson Bay that they endured the greatest hardships. They ran out of provisions, there was no wood along the coast, and on one occasion they were unable to land for forty-eight hours on account of the heavy sea. None but Canadians would ever have ventured on such a trip in canoes; none but Indians could have carried it through successfully. All the stirring incidents of this daring journey have been fully published by the press throughout the continent, and need not be recapitulated here. They prove conclusively that the boast of the Ontario Land Surveyors is based on recorded facts, of which any nation might be proud.

In considering the record of past failures in the arctic regions—for, in spite of the magnificent heroism displayed, they were nothing but failures—two points stand out clear and distinct, viz., that the pole will never be reached in ships, and that it can

never be reached by any such parties as have hitherto been sent out. The men who so freely risked their lives were not to the manner born, and what they were called upon to endure was so violently opposed to all their ordinary experience that they were heavily handicapped at the very start. With the uneducated seamen the resulting mental depression must have been a most difficult thing to combat, thus creating a double tax on the already strained nervous courage of their more highly educated leaders. British seamen are fine fellows and possess in a high degree the courage of their race, but nothing would induce a Canadian surveyor to lead a gang of them into the arctic regions, or even take them out on an ordinary bush survey. They would simply be useless. What are wanted are trained *voyageurs* who are equally at home in canoes or on snowshoes; and not too many of them. With the exception of Dr. Kane's (by far the most successful), arctic exploring parties have been too unwieldy. The one hundred and five ill-fated souls who abandoned the Erebus and Terror starved to death where a party like the Tyrrells' would probably have won their way back to civilization. Had Kane been backed up as he should have been, he would most likely have reached the pole, and when that point is attained, as it certainly will be, it will be over the course followed by him, and by means of dog trains and canoes or boats.

In spite of probable criticism, I am going to sketch a plan for reaching the north pole, drawing on my own experience and that of Canadian surveyors and explorers. I assume at starting that expense is simply no consideration whatever. If a feasible scheme is put forward, I believe that there is enough enterprise, private and governmental, among Anglo-Saxons to carry it through, even if it cost a million.

The exploring party would be carried by steamer to the head of summer navigation on Baffin Bay, where a depot would be established as a base of operations. Here provisions, houses, steam launches, sailboats, canoes, dogs and sleighs, fuel, and all the other accessories, with the exploring party, would be landed, and the steamer could return to winter at Upernavik or Disco. The former place is only one thousand miles from the pole, the distance covered on foot by the Tyrrells, in the middle of winter, with the thermometer often at -40° F., and without tents. A point to be considered is, whether it would not be well to have a second steamer built on the principle of the St. Ignace, the steam ferry at the strait of Mackinac. This boat made an extraordinary record on her trial trip, shearing through ice three feet thick with the greatest ease. With such a vessel, it might be possible to push a long way up Smith's Sound. That point could be determined by a preliminary survey of the head of Baffin Bay.

The main exploring party should be composed of fifteen men—five white men and ten Indians. The white men would be made up of three Canadian surveyors, for the scientific purposes of the expedition; one doctor, as a concession to popular prejudice; and one journalist or reporter to work with pencil and camera. As a journalist myself, I claim the right of the fourth estate to be represented. The Indians should be picked *voyageurs* from the Georgian Bay. These men are good canoemen, first-class sailors, are used to ice traveling, and have walked on snowshoes since they could walk at all. Above all, they are faithful workers and reliable men.

The main depot or base would probably be situated at the mouth of Smith's Sound, in latitude 78°. That point has been reached more than once, and can be again. But it is not necessary or expedient to push it farther than the ordinary head of summer navigation, because it would become a permanent meteorological station, and would ultimately be connected with Newfoundland by cable, a distance of sixteen hundred and eighty geographical miles. The buildings would be ordinary American frame buildings, framed on two-by-six scantling, and sheeted with four layers of matched boards, two outside and two in, with heavy felt paper between the sheeting. With double windows and double doors, such a building properly heated will defy the cold of space. The heating would be accomplished with hard coal and base-burners. The buildings of course would be taken up all ready to put together, and, with the labor available from the ship, ought to be ready for occupation in a fortnight. This base would have a resident staff of officials, mechanics, and *voyageurs*, whose duty it would be to take care of the supplies, and back up the main exploring party by pushing forward provisions and other necessaries as they advanced farther north. Subsidiary depots should be established every hundred miles until the pole or an open polar sea is reached. These minor depots would be nothing but tents of stout duck, of the Northwest tepee pattern, raised on light but strong poles of cedar, and spiked to the ice with iron or copper spikes. They would contain provisions, blankets, stoves, and fuel, and, as long as the main party was out, would be connected with the head depot by regular dog service. Three or even four of these would probably be located the first fall.

About the middle of the following April (Kane abandoned his ship on the 20th of May) the real work of the expedition would commence. The problem presented to the surveyors would be to overcome the seven hundred and twenty miles separating the main depot from the pole. At the lowest estimate there would be five months in which to do this, necessitating an average daily

advance of nine miles on the straight line, to take them there and back. As an actual fact they could travel for six or seven months if necessary, and the going would probably be better in winter than in summer, for snow is the traveler's friend in high latitudes.

The main party, with an interpreter for communicating with the Eskimos, would start out with sixteen dog teams carrying tents, stoves, fuel, blankets, etc., and two big Peterboro canoes. The fuel would have to be specially constructed. Coal is unsuitable and wood is too bulky. I know from personal experience that an ordinary porous brick soaked in coal oil for twenty-four hours will burn for over two hours, and makes a first-class torch for spearing fish by; and I do not see why compressed bricks made of sawdust soaked in coal oil would not make a capital fuel. In a properly constructed sheet-iron stove it would throw an intense heat and could be lighted in an instant. In summer time, of course, very little fire would be needed except for cooking, but after the thermometer got below zero fires would be necessary night and morning. The best fuel for the purpose could easily be determined by experiment, but whatever its character it must be compact in form and must yield the greatest possible combustion for its bulk. All provisions should be packed in sealed tin cases of a convenient size and weight for handling. They would then suffer no injury from rain. The tents should be conical in shape, eleven feet in diameter at the bottom, and stretched on ten light cedar poles hinged to a ring at the top, and shod with iron at the bottom. This is the most convenient tent made. It can be set or struck in less than a minute, because it opens and shuts like an umbrella. It gives the greatest floor room for the amount of canvas. There is no large space overhead to absorb the heat. And it offers the least resistance to the wind, and if properly spiked can not blow down—a valuable property when the thermometer is away below zero. Four such tents would accommodate the exploring party. The character and quantity of food would be easily determined by the surveyors, but one article would have to be sternly eliminated, and that is alcohol. My allowance for sixteen men for five months would be two bottles of brandy, and I think they would come back unopened. The traveler's standby in cold weather is tea, and men will do more hard work on it than they ever could accomplish on any form of spirit. Of course, there are many minor details which need not be enumerated here.

What difficulties the party would have to contend with above the eighty-second parallel, of course, can not be known. Their motto at starting would be, "Get there somehow," and there is no doubt they would live up to it. If the theory of a Polynia or

open polar sea is correct, they would take to the canoes and follow along the west coast of Greenland as far as it may project northward. The Tyrrells made five hundred miles over the waters of Hudson Bay in this way, and others can do the same. In all they did, however, the surveyors would be guided by past practical experience. If they had their choice they would probably prefer ice to water, but whatever came they would meet it with the equanimity of brave and resourceful men. Above all others, their training in the field has qualified them to cope with the difficulties they are likely to encounter.

It is quite probable that the pole would not be reached the first summer. From Mount Parry to the pole is five hundred and fifty miles. If the most northerly point of Greenland does not reach within a hundred miles of the pole and there were no islands visible beyond, they would scarcely trust themselves on a trackless sea in canoes. They would then have to return and commence the arduous task of portaging a good-sized steam launch piecemeal from the head depot to the polar sea. The whole freighting force of the expedition would be laid under contribution, and the work pushed with unflagging vigor. The boat, of course, would be specially constructed beforehand for the purpose, and would go together and be ready for navigation in a week. Allowing the launch a speed of six miles an hour, the pole would be reached in four days.

The way to accomplish a task of this kind is to go at it quietly and systematically, and stay right there until it is done. Ship companies have always been confronted with the terrifying possibility of being cut off from all human succor. My plan renders such a contingency impossible. The steamer would visit the main depot every summer and then sail for Newfoundland, whence news of the expedition would be telegraphed over the world. The members of the expedition could thus communicate with their friends, and the depressing feeling of isolation would be obviated. There would be no danger of running out of supplies, and the expedition could go cheerfully ahead with the assurance that their retreat was provided for.

There are many reasons why Baffin Bay and Smith's Sound should be chosen as the route to the north pole. To put them shortly: 1. Greenland is the most northerly land known, and probably extends a good deal farther than at present explored. 2. Smith's Sound has been already traversed as far as the open sea. 3. Upernavik is the most northerly permanent abode of civilized man. The moral influence of this on the expedition would be great, because it would be but a short distance from the main depot. 4. A whisp of the Gulf Stream runs along the west coast of Greenland as far as the seventy-eighth degree of latitude, rais-

ing the average temperature 9° F. above that of the east coast, and rendering summer navigation certain. 5. According to Réclus, the January isothermal of Frog Lake, where I wintered in 1883, twists northward until it runs through upper Greenland, so that, although the winter might be longer, it would not be more rigorous. The same authority concludes, from various ascertained facts, that within the Arctic Circle the summer mean increases as you get nearer the pole, and favors the theory of an open polar sea. It is certain that the pole of greatest cold lies southwest from Greenland among the western islands of the polar archipelago. Lastly, Disco possesses coal, the most important item in steam navigation.

From a consideration of the foregoing points the situation resolves itself into a simple question of money. If the funds are provided, the men are here who are both willing and qualified to carry the work through, and this article has been written as an appeal to both governments and individuals to come forward and once for all settle the scientific questions involved in the location of the north pole. Canada will bear her share undoubtedly, and, what is more to the purpose, will find the men. One difficulty which will beset the organizers of the expedition will be the necessity of dealing with the hundreds of volunteers who, for sentimental reasons, will move heaven and earth to get themselves joined to it. Most of these men will possess absolutely no qualification for the work, and would prove nothing but so much useless lumber. They must all be met with the same unbending negation. Finding the north pole will be no summer picnic. The men to accomplish it must be experienced middle-aged men, whose muscles have been indurated and their minds fortified by a constant acquaintance with cold, hardship, and danger, and nowhere except among Canadian surveyors can you find men who combine these qualities with the necessary scientific attainments. Science knows no nationality, and in a matter of this kind there should be no international jealousy. Let Anglo-Saxons find the money, and those Anglo-Saxons best fitted for the work will undertake it and carry it through.

There is but one more point to be noted. The next five years will be particularly favorable for arctic exploration. We are now approaching a minimum sun-spot period, which experience proves is coincident with a period of mild winters. The last minimum was in 1888, a year of extreme heat and drought followed by a winter of unusual mildness. Going back eleven years, the winter of 1877-'78 was so mild that wild geese remained on the Georgian Bay throughout the winter, and the Collingwood steamers were plying the first week in April—a month earlier than usual. The winter of 1882-'83, which I spent with Mr.

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Abrey in the Northwest, was exceptionally severe and occurred during a maximum period. In our daily observation of the sun we watched the spots during the previous summer, and were astonished at their size and number.*

I can only add that when the expedition starts I hope to be one of the party. If it is organized on the lines I have laid down I should set out with an absolute assurance of getting there, and, what is of still greater importance, with an equal certainty of getting back again.

