
THE
EXCITING STORY
OF NICKEL
B. JOHNSON

THE INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED

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Published by The International Nickel Company of Canada, Limited, to help bring to the people of Canada, and particularly the youth of our nation, a better understanding of the nature and importance of Canada's vast stores of mineral wealth.

FRONT COVER:

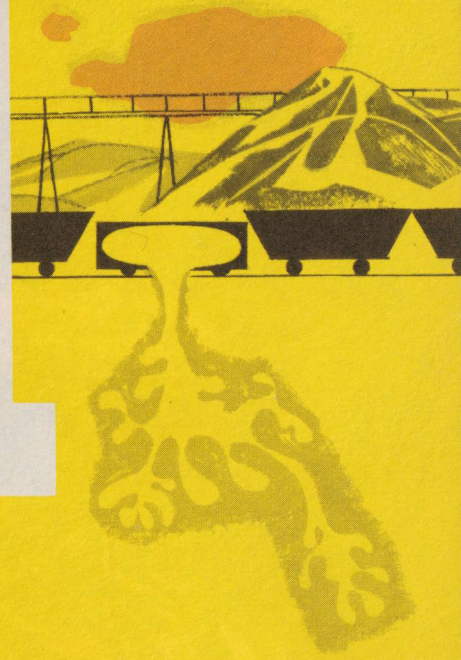
Converter aisle at Copper Cliff, Ontario.

BACK COVER:

Iron Ore Recovery Plant at Copper Cliff, Ontario, with Copper Refinery and Reduction Works in background.

THE EXCITING STORY OF NICKEL

BY ALAN KING

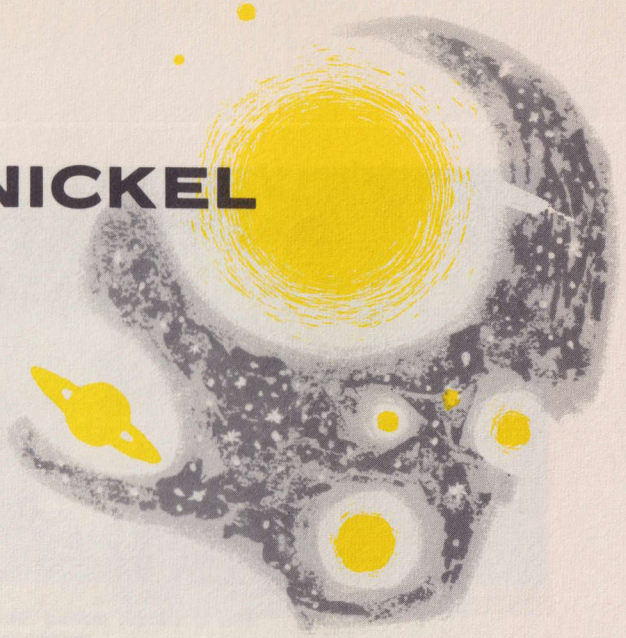


Spells! Magic! Secret formulae! These were the tools of the Alchemist, striving in his den to find the magical way to turn iron and lead into silver and gold. For centuries this was the dream of Man in his quest for the precious metals which Nature had hidden from his sight beneath the surface of the Earth.

Today Man has substituted science for magic and daring for spells, and with the tools of Knowledge has banished the Alchemist forever. Nature and her treasures are challenged today by the explorer, the prospector and the scientist.

This book is the story of the challenge for one of the most valuable treasures of all . . . NICKEL.

THE EXCITING STORY OF NICKEL

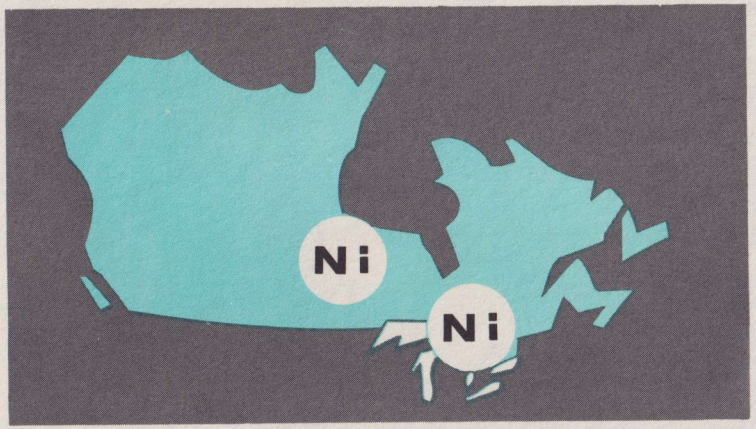


BY ALAN KING

Have you ever thought of the Earth as a great storehouse of hidden mineral treasure? Actually, it is a whole collection of storehouses, in which Nature has locked away most of the metals and other things that people for centuries have found useful, such as iron, coal, copper, lead, zinc and nickel. It is quite correct to call them treasures, because they play such an important part in our life today that we would not be able to get along without them.

The storing up of these valuable products began millions of years ago when most of the earth's interior was in a molten state. As the outside of the earth began to cool and harden, tremendous pressures were formed inside by the molten masses, and a great deal of buckling and twisting went on. Since there was often no escape for much of the molten material, it was pushed this way and that, finally settling in pockets and veins in different parts of the earth, well underneath the hard crust of the surface. Gradually these deposits solidified and for thousands of centuries just lay there, locked and hidden in the storehouses by vast layers of rock.

Canada is fortunate enough to possess more of these storehouses, and richer ones, than most other parts of the world. Because our country was settled centuries after Europe and Asia, only in recent years have men located these storehouses and the valuable minerals in them.



Map of Canada showing two of the most important storehouses of mineral treasures.

Nickel is a part of that heritage—one of the greatest treasures that lie beneath the surface of Canada. It has a very exciting history, which is what we are going to tell you about in this book.

Like many other metals, nickel looks very unlike itself when it comes out of the mine. In fact, nickel ore and copper ore often look very similar, which is why nickel got its name. It happened like this: more than two hundred years ago some miners in Saxony were mining for copper, and they brought to the surface of their mine something which looked just like copper ore. Copper is a soft metal, easy to work with, and men had been using it for many, many years. But when they smelted down this ore to get the metal out, they got a white metal that they didn't recognize. It certainly wasn't copper, and it was so hard they couldn't do anything with it. In those days, if a metal was not soft enough to hammer into the shape you wanted, it was not of much use.

Nickel ore as it looks in the mine.

Also, in those far-off days, people were very superstitious, and believed in spells and witchcraft. The Saxon miners thought that Satan—or Old Nick, as they called him—had cast a spell over their mine, and so they named this new metal "Old Nick's Copper" or, in their language, "Kupfer-Nickel".

Many years later, in 1751, a Swedish scientist named Cronstedt, after much research on this hard, white metal, found that it contained not only copper but a new metal altogether. So he dropped the "Kupfer" and called the new metal "Nickel".

The next great problem was to find out how nickel could be used and from China came the first important clue. Since very ancient times the Chinese had been making lovely boxes and candlesticks from a white metal called "paitung". Now "paitung" was made by adding zinc to the metal obtained from nickel-copper ores similar to that which in Europe was called "Old Nick's Copper". When trade routes were opened with China in the seventeenth century, the East India Company brought back articles made of "paitung".

Soon, vases and decorative pieces were being made in Europe by adding zinc to "Old Nick's Copper", which they then called German silver. Later, they found that other metals could be plated with nickel to give them a hard, bright surface. Then, in 1881, the first nickel coins were issued in Switzerland.

Now all this time men were getting nickel ore mostly from mines in Norway and in the South Seas. They had no idea that in the New World, in Canada, huge deposits of nickel ore were lying there unsuspected. There lay these great storehouses of treasure, some of the most valuable and useful in the world, hidden beneath the feet of roaming Indians and adventurous coureurs-de-bois. Certainly Europeans were beginning to notice Canada and to settle here, but for the first two hundred years Canada's wealth was thought to be mostly on the surface, in the shape of furs and timber and the soil of the vast farm lands.

But many of those who came to Canada in the eighteen-hundreds were men of tremendous curiosity; they wanted to go where nobody had gone before and, when they got there, they wanted to see what there was of value. And they had a good reason: the Machine Age was getting into its stride, and more and more new materials *had* to be found. So men began probing, scratching and digging into the surface in many parts of Canada, looking for minerals . . . and then, as so often happens, one of the most important storehouses to Canada's future was unlocked by accident.

It took place at the time when Canada was becoming a nation. Sir John A. Macdonald was doing all he could to bring the western part of Canada into Confederation. He had promised to build a railway which would reach right out to British Columbia, and the only way to get it through much of the rocky wilderness in Northern Ontario was to blast a way with dynamite. It was this blasting that uncovered a deposit of what appeared to be copper ore at a place

near Sudbury.

Immediately prospectors rushed into the area to stake claims, and several mines were started. Sir John A. Macdonald, one of the Fathers of Confederation, Sir Charles Tupper, and two of the men who helped build the C.P.R.—Lord Mount-Stephen and Sir William Van Horne—paid a visit to the new mining settlement at Sudbury, and because they could see how operations like this would help in the development of Canada's underground riches, they gave all the help and encouragement they could.

Even so, it looked at first as if the Sudbury District mines would have to close down right after they opened. The first batch of ore that was smelted down didn't produce pure copper at all; instead, it contained a large quantity of nickel. And in spite of the few uses that had been found for it, nickel was not in big demand and was thought of chiefly as a trouble-maker instead of a valuable metal, because it was difficult to separate from the copper. But, unlike the miners of Saxony a hundred years before, the owners of the Sudbury District mines said to themselves: "Why don't we find a new way to separate the nickel and develop new uses for it and therefore *make* it valuable?"

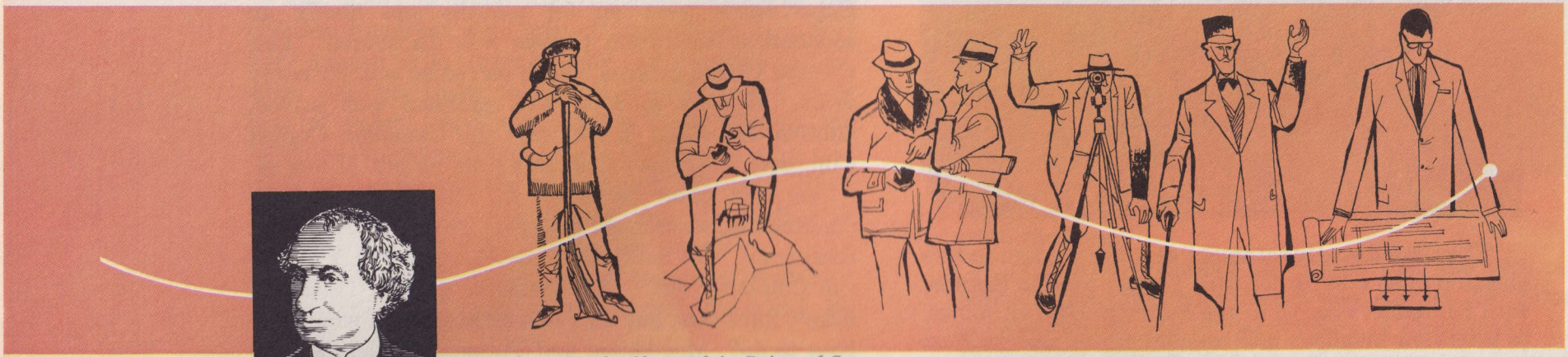
Sir Charles Tupper and Samuel Ritchie arrive in Europe.

The Canadian Government saw the wisdom in this idea and even sent Sir Charles Tupper over to Europe, with Samuel J. Ritchie of the Sudbury District mines, to interview chemists and manufacturers and interest them in finding uses for the new metal. They learned that a Scotsman had discovered that by mixing nickel with iron in the making of steel, the steel became much tougher than any steel produced before. Immediately manufacturers found uses for this new, tough steel—and then came new problems for the Sudbury District mines.

It was found that to separate the nickel from the copper was so expensive that it cost more to produce the nickel than people were willing to pay for it. Experiments went on for months and finally an economical separation process was discovered. This was the Orford process, which served so well for many years. But as soon as this problem was solved, another one stood in the way: the Canadian Copper Company at Copper Cliff was running out of money.

At this point Sir John A. Macdonald and Sir Charles Tupper stepped in again. Two great European companies, with millions to spend, made offers to buy the Company out. The Canadian Copper Company didn't want this, but they had no money, so what were they to do? Macdonald and Tupper, who had a great deal of influence in Canada in those days, gave them so much encouragement and support that they were finally able to borrow from the banks the money they needed to make the Company independent of outside help. They put in the equipment they needed, produced more and more nickel, and as the demand for it was developed all over the world they were able to sell larger and larger quantities at a profitable price. The nickel industry was saved for Canada.

The smelter at Copper Cliff as it appeared in 1889.



Sir John A. Macdonald, one of the Fathers of Confederation, gave encouragement and support to the men who helped build the Canadian nickel industry.

By 1902 the Canadian mines were producing five thousand tons of nickel annually. The industry was growing at such a rate that finally the Canadian Copper Company at Copper Cliff, and the refinery in the United States, where the Canadian ore was refined, decided to amalgamate, and that was the beginning of The International Nickel Company, which today produces more nickel than any other company in the world.

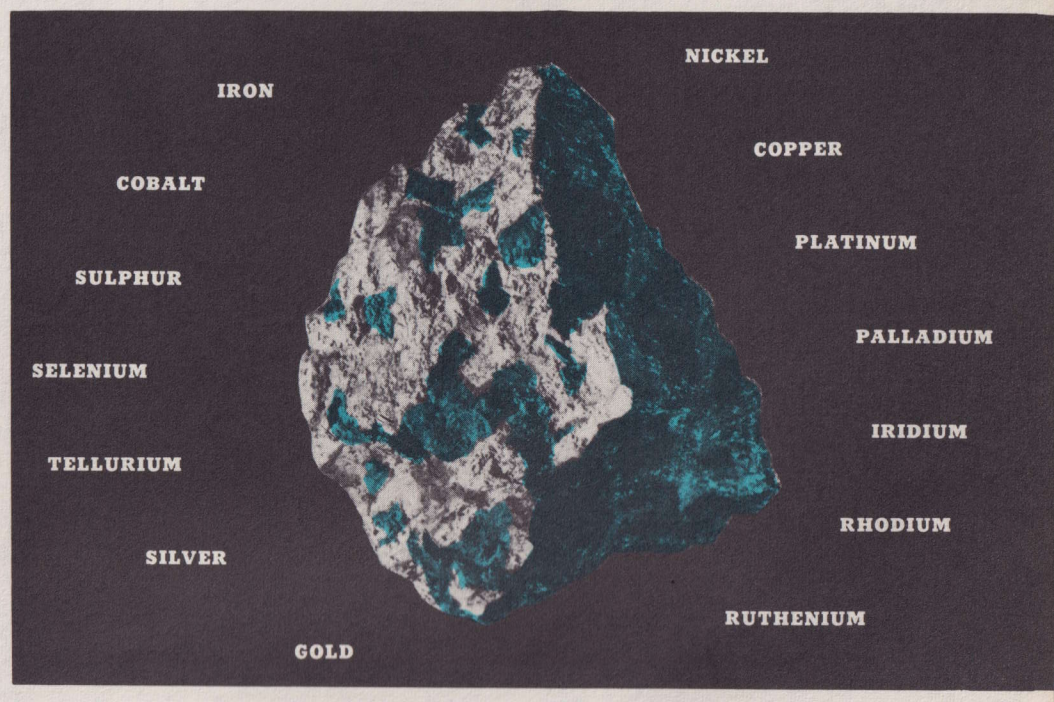
Now you can see in this short history of nickel how many different kinds of men have played their part in unlocking this great storehouse which lies beneath the surface of Canada. The explorer went out into the northern wilderness to see what was there; the prospector followed him to find out how much was stored away; then came the mining and metallurgical engineers to show others how to get the ore out and how to refine it. Next came the statesman to give support and encouragement, the investor to provide the money, the research man to develop new uses for the nickel, and the businessman to provide the organization. Thus you see that in order for any business venture to grow and prosper, it takes the combined efforts of many men of different skills working in an atmosphere of friendly cooperation with the government. Back of them all stands the investor who risks his savings to help build the business; and for this risk is entitled to a fair return on the money he invests. In the operations of The International Nickel Company today, all these men still play their part, not only for the benefit of the Company but for the benefit of Canadians throughout the land.

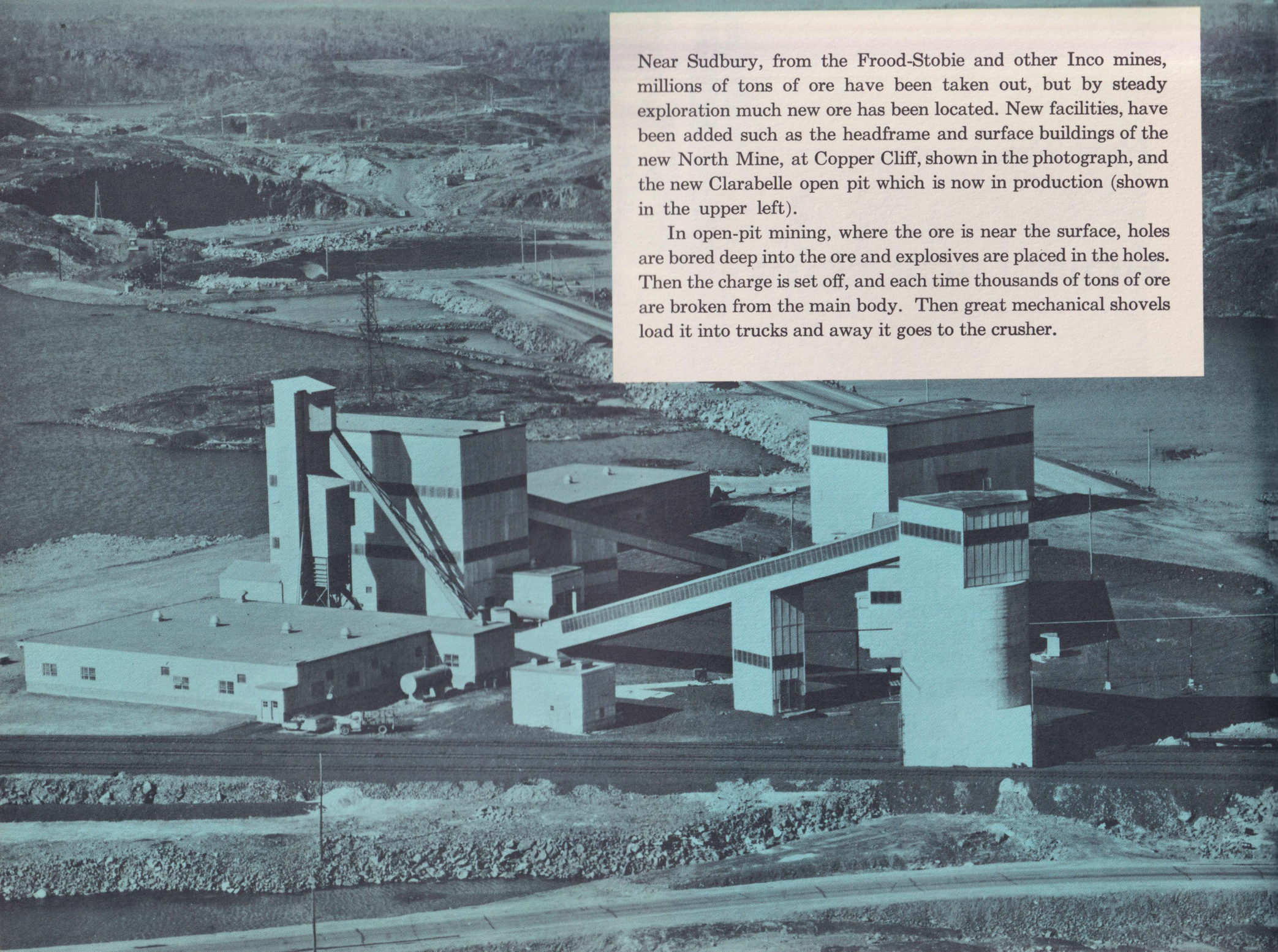
Part Two

HOW NICKEL IS PRODUCED

Here you see a lump of the ore from which nickel is obtained. Along with the nickel in the ore are thirteen other elements, some with strange-sounding names like selenium, tellurium and ruthenium, with uses ranging all the way from electric eyes to precious jewellery. Inco (the short name for The International Nickel Company) has developed ways of recovering all these elements, as well as the nickel and the copper, so that during the years the ore has been made more and more valuable.

Now we have said that the nickel ore has been locked up by Nature in her great storehouses under the earth. Like anything else that is locked up—such as money in a safe—the ore is difficult to get at, and then when it *has* been taken out of the ground, it is another difficult job to extract the nickel from it.





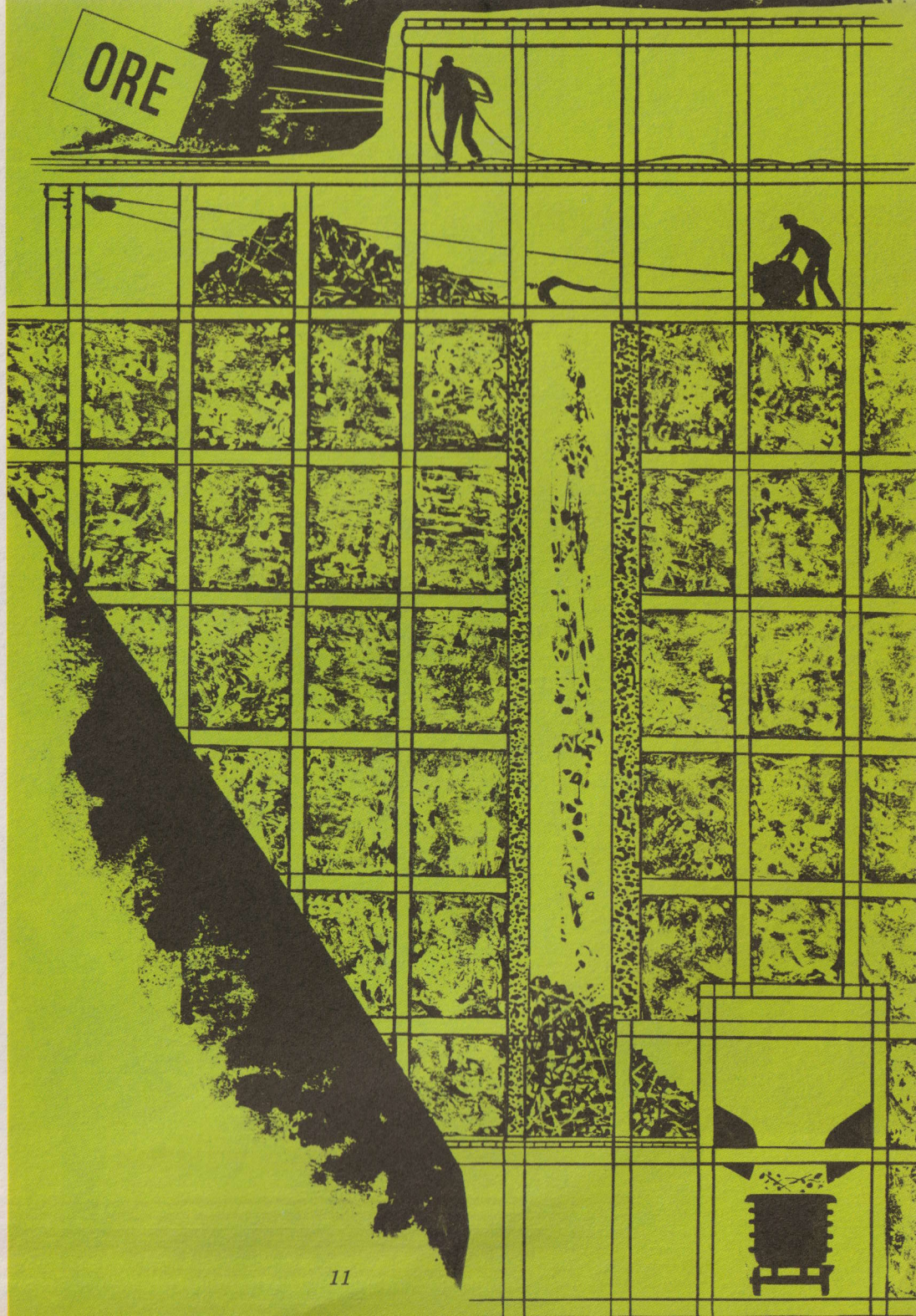
Near Sudbury, from the Frood-Stobie and other Inco mines, millions of tons of ore have been taken out, but by steady exploration much new ore has been located. New facilities, have been added such as the headframe and surface buildings of the new North Mine, at Copper Cliff, shown in the photograph, and the new Clarabelle open pit which is now in production (shown in the upper left).

In open-pit mining, where the ore is near the surface, holes are bored deep into the ore and explosives are placed in the holes. Then the charge is set off, and each time thousands of tons of ore are broken from the main body. Then great mechanical shovels load it into trucks and away it goes to the crusher.

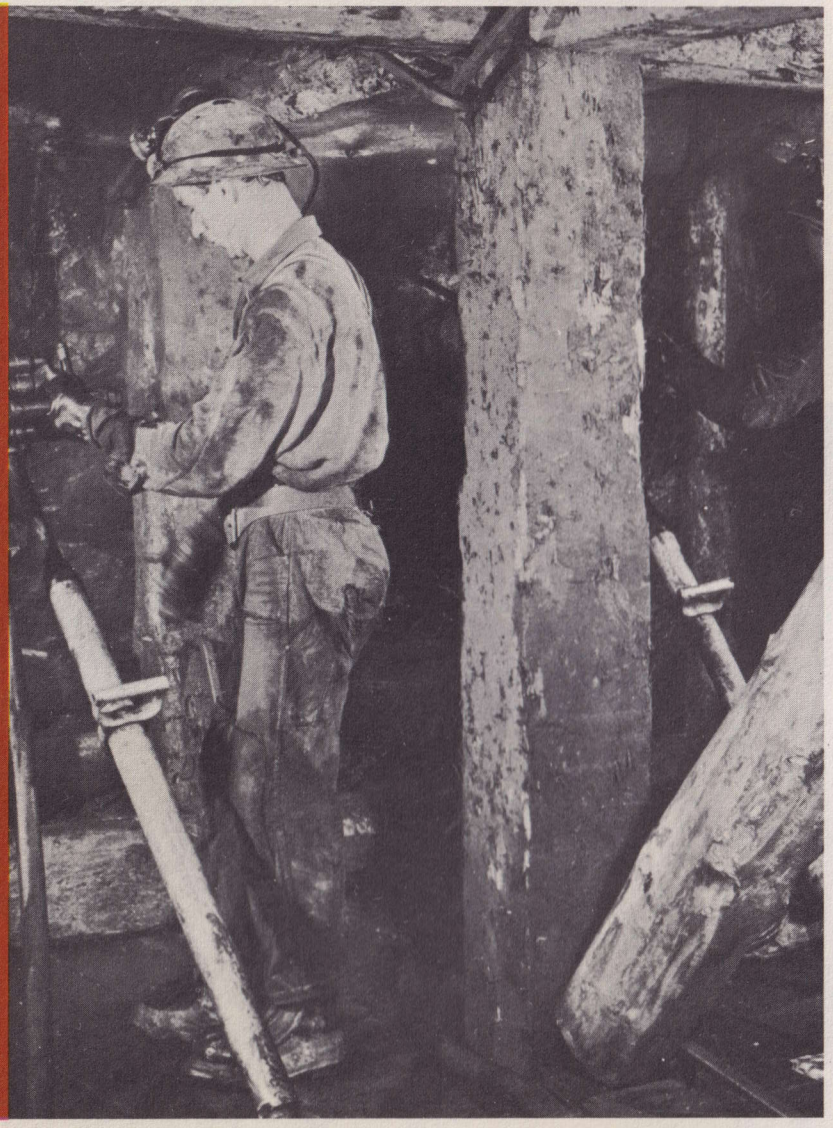
Underground mining is a much more complicated business. There is an elevator, or cage which takes the miners up and down. At different levels you will see tunnels running horizontally, driven right into the ore-body. All through those tunnels clean, cool air is circulating, driven down by giant fans from the surface. At the end of each tunnel is what is called a stope, which is like a small room with a plank floor, a timbered ceiling supported by posts, and walls of rock.

In these stopes, the miners work in shifts. In one shift they bore holes into the ore-bearing rock with roaring compressed air drills, and then into the holes they pack the explosive, with fuses set for ignition. At the end of the shift the fuses are lighted and as soon as the men are safely away the powder is exploded and the whole section of the wall crumbles to the floor of the level below.

The men in the next shift then come in and place square sets of timbers in the section which has just been blasted, after which they drill another group of holes to get ready for the next blast. Underneath them, where the broken ore has fallen, a man operates a machine like an enormous mechanical hoe, known as a "slusher", which drags the ore over to a chute. Down the chute it goes, and is fed into the ore cars. The cars run on rails, on one of the lower levels, over to the crusher where the large lumps of ore are broken



Cross section diagram of a square-set stope showing driller at work at top. Below him, the slusherman scrapes ore into a chute. Down below it falls into ore cars.



Drilling operations in a square-set stope.

into smaller pieces to make it easier to haul to the surface.

This process is known as square-set mining. Another method of getting out the ore is known as "caving", and then there is "blasthole" mining, which loosens some 30,000 tons of ore at a time, enough to keep several slushers busy two shifts a day for two months.

Now whichever of these mining methods is used, the next place the ore goes is to large automatic hoists which haul it to the surface. There it is loaded on the trains of cars which carry it from the mine to the reduction plants at Copper Cliff. At this stage the ore looks like chunks of rock. Hidden in those chunks is the nickel and other valuable metals, and now begins the long process to produce the shiny, white metal which plays such an important part in our daily lives.

First, those chunks of rock are emptied into other giant crushers, which crush them down to small pieces a quarter of an inch or less. On, then, goes the ore into the grinding mills, set in rows in a building several times as big as a hockey arena. Water goes into the mills at the same time, and the ore comes out as finely ground as fine sand.

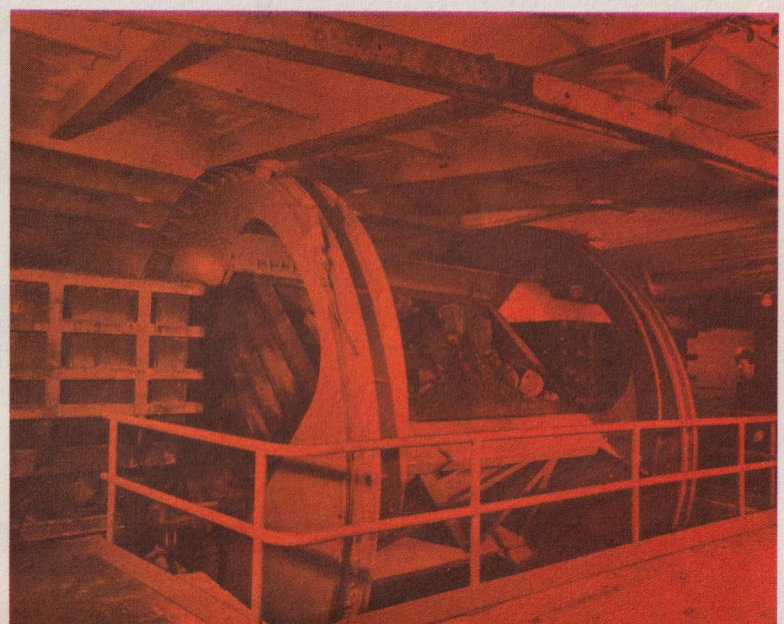
From the grinding mills the crushed and ground ore goes into a long row of tanks, and now begins the process of separating some of those fourteen different elements. In the tanks, the valuable mineral particles are floated away from the useless rock by adding various chemicals and blowing in air. This is called "flotation". First iron sulphide is separated, and from

Slusher operations in a nickel mine.

this material iron ore is recovered by a new method developed by Inco research. The other mineral particles are also separated by flotation. These separated parts are called concentrates—one containing most of the copper, another most of the nickel. The separated concentrates then go to the smelter.

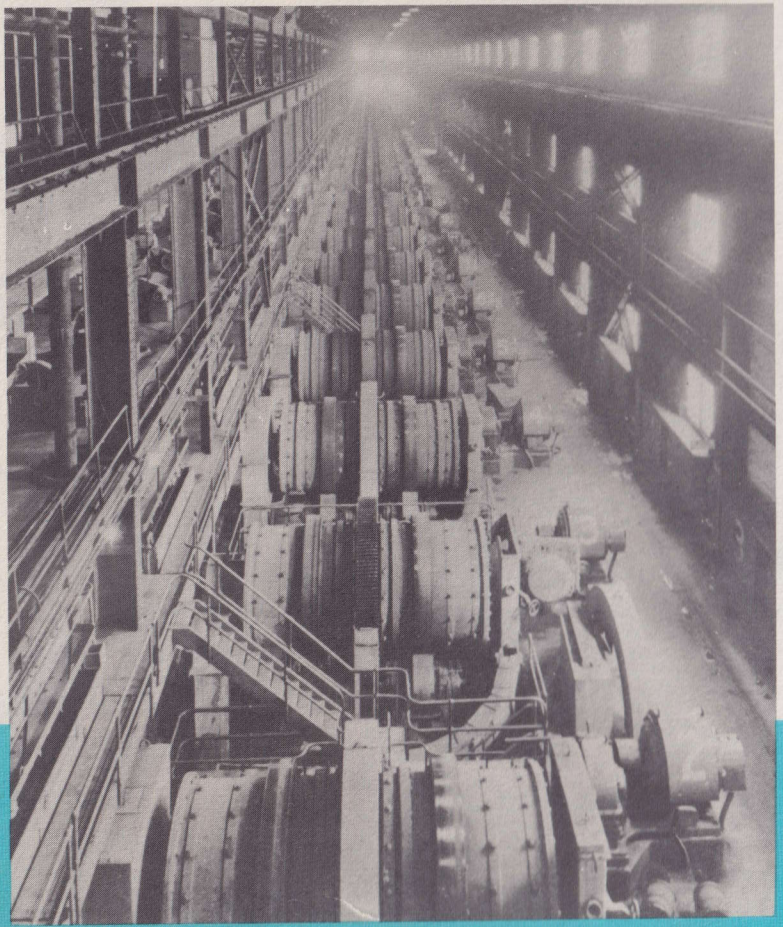
This is the plant with the three great chimneys, two of them over five hundred feet high, which carry tremendous volumes of smoke harmlessly away into the upper air. Once upon a time this smoke escaped close to the ground, and nobody around Copper Cliff could grow anything in their gardens. Since those days Inco has built these tremendous chimneys and developed new recovery processes which do their job so well that now you can see trees and lawns and flowers and vegetables flourishing all through the Sudbury District.

The nickel concentrate, when it arrives in the smelter, contains sulphur, and to get rid of some of this sulphur the concentrate is roasted in enormous furnaces which are several stories high. The material gets hotter and hotter as it flows from the top to the bottom of these furnaces. Then it is melted in a different kind of furnace and some of the impurities in it rise to the surface in the form of slag, which is skimmed off and thrown away, just as your mother



Nickel ore being emptied into giant crushers.

Battery of grinding mills at Inco's Copper Cliff plant.



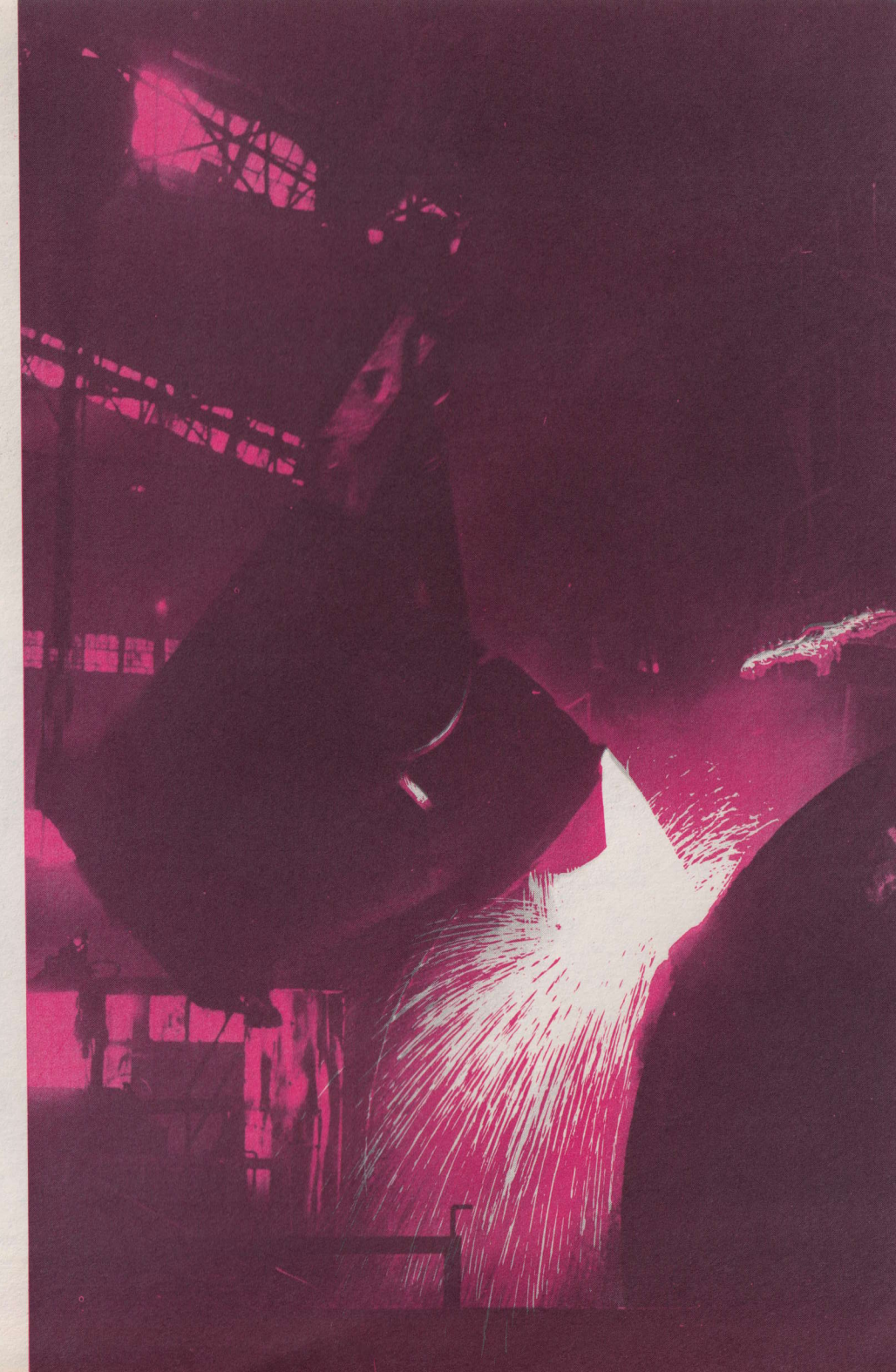
skims the top off a big kettle of jam. But this nickel "jam" is not by any means pure yet. Molten and glowing hot it is poured by giant ladles into what are known as converters, where sand or quartz is added and air blown into it. This burns off still more sulphur and forms more slag, which is skimmed off as before.

The flotation process is used to separate the ore concentrates.

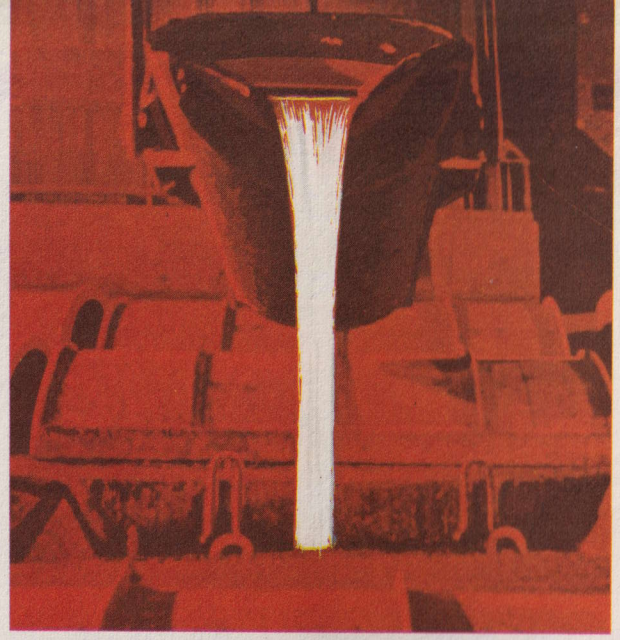
At this point, there is still some copper mixed in with the nickel. And here is where the Orford process for separating nickel and copper served the Canadian nickel industry so well for so many years. But Inco scientists never gave up the search for a new and better process to replace the Orford method. Their years of research were successful. Now Inco uses a process called "controlled cooling". What happens is that the molten matte, which we likened to jam, is poured from great 14-ton ladles into special cooling moulds and covered with insulated steel hoods. As the matte cools in these moulds, nature works a wonderful miracle of her own. When the cooling process is over, the nickel crystals and the copper crystals in the matte have formed independently of each other. The nickel and copper are now separated by another flotation process and each goes its separate way. This new matte separation process is another triumph of Inco research.

Even now, the nickel is not yet pure. It is in the form of nickel sulphide (with a little copper and iron still mixed in) and by a process known as fluid bed roasting the last remnants of sulphur are driven off and what is left is shipped to Port Colborne, close to Niagara Falls, where it enters Inco's great refinery. There it is reduced to metallic nickel of almost perfect purity—as pure as the nickel coin in your pocket.

First, it goes into furnaces where it is melted and poured into moulds. Here it is allowed to cool in the form of anodes weighing 490 pounds each . . . and this



A huge ladle pours molten matte into a converter at Copper Cliff.



In 1958, Inco developed a new refining method, after seven years of continuous study, whereby nickel sulphide is cast into anodes and electrolyzed for the production of high quality nickel. This, for the first time in nickel refining, reclaimed elemental sulphur as a by-product, in addition to cobalt and precious metals recovered by the previous process.

Electrolytic tanks at Inco's Port Colborne nickel refinery.

is where the real magic begins. An anode is just another name for a slab of nearly pure nickel which acts as a conductor and is connected to a source of electric power while a cathode is a thin sheet of pure nickel which completes the electrical circuit through an electrolyte. So these impure nickel anodes, along with the cathodes, are lowered into special tanks containing a nickel sulphate-chloride solution and an electric current is turned on. Immediately, the electric current and the solution in the tank get together and start eating away the impure nickel anodes. And where does the pure nickel go? Right through the solution and on to the cathodes, where it builds up and up until large plates of pure nickel are formed, which are then lifted out of the tanks, ready to be cut into sizes convenient for use by various industries, particularly steel plants.

If you are wondering about the rest of those fourteen elements which we told you came out of a lump of ore, some of them are now sludge lying on the bottom of the tank—the ones with the strange-sounding names: palladium, rhodium, ruthenium and iridium, along with platinum, and some gold and silver. They are collected, too, and shipped to other Inco refineries where they are produced in very pure form, so you see there isn't much left of value in that lump of ore that isn't used. But we are concerned here with nickel—that clean, hard, shiny metal which came out of the tank and is ready now to enter our daily lives in a thousand different ways.

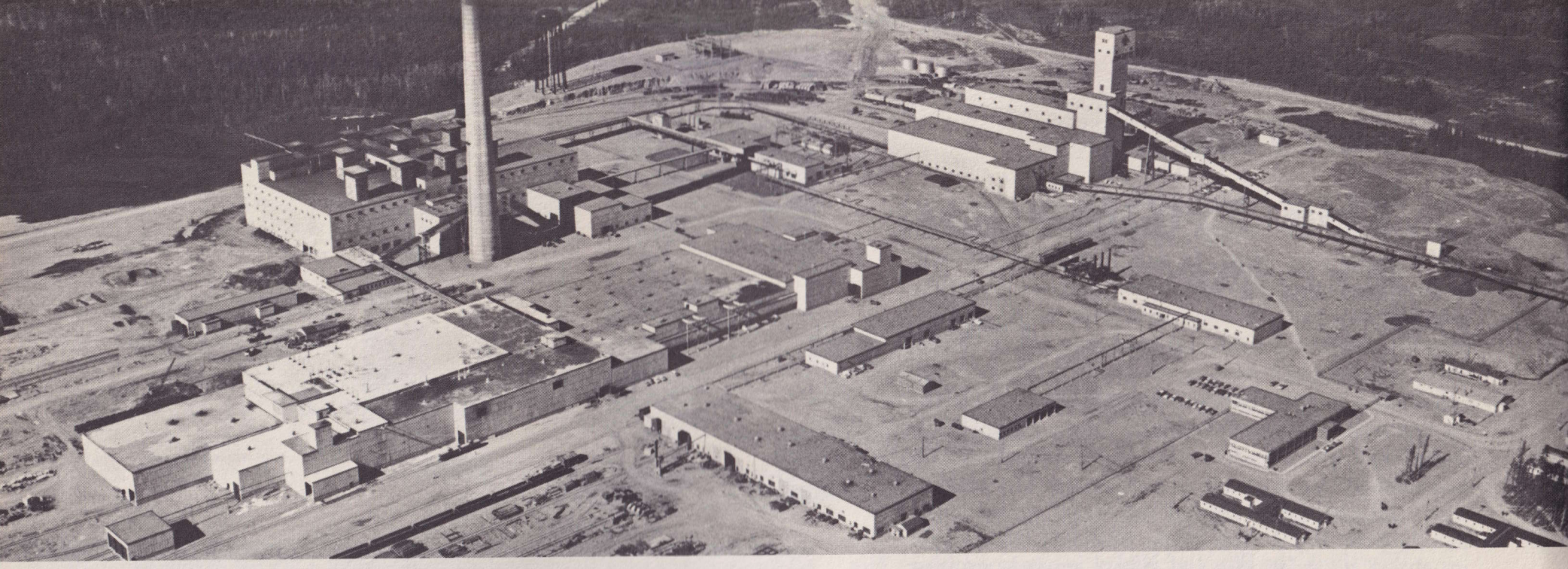
Part Three

THE THOMPSON STORY

We think the Story of Nickel is pretty exciting. But then the whole story of Canada is exciting, and nickel fits right into the picture. Think of some of the chapters of Canadian history: the early explorers, pushing out into the unknown wilds, not knowing what they would find; the fur traders, travelling overland and by canoe as far north as the Arctic Circle, and right over the Rockies to establish their trading posts; the Mounties, who brought law and order to the western plains; the prospectors, who sought gold and other metals locked away in the rocks; the bush pilots, who extended the fields of discovery ten or twenty times farther in just a few years. All these people belong to Canadian history. But history isn't simply what you read in books about past days; history is Now. We in Canada are part of it, and to show you more of the part that The International Nickel Company is playing in it we want to tell you The Thompson Story.

Knowing that no mine lasts forever, Inco started searching for new orebodies in Canada, long before World War II. Much of the hunting for nickel went on in Northern Manitoba. Because the wildness of the country made exploration on the ground too difficult and slow, the company's scientists took to the air. They used all the new tools that science had given them, including flying magnetometers, like the one pictured on page 26. After many millions of dollars had been spent over ten hard years, they made their strike. The place was 400 air miles north of Winnipeg, and south-west of Churchill: the year was 1955.

Diamond drilling, to check the size and mineral content of the orebody, went on for a year, and in

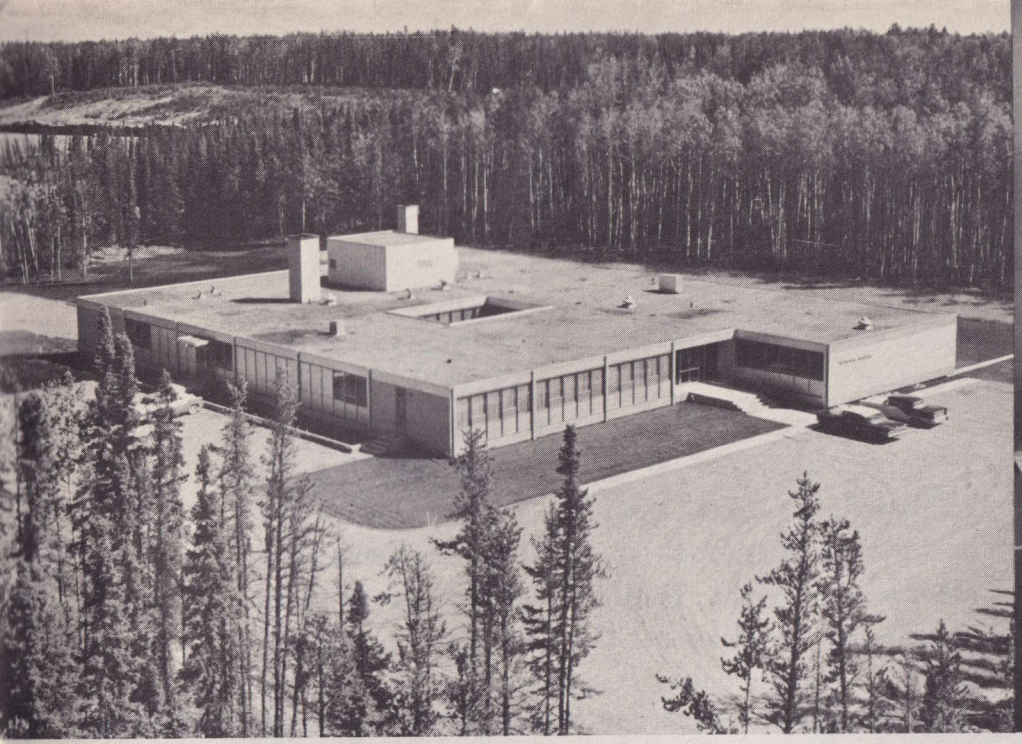


The $200,000,000 Thompson project is the largest single investment in Manitoba's history.

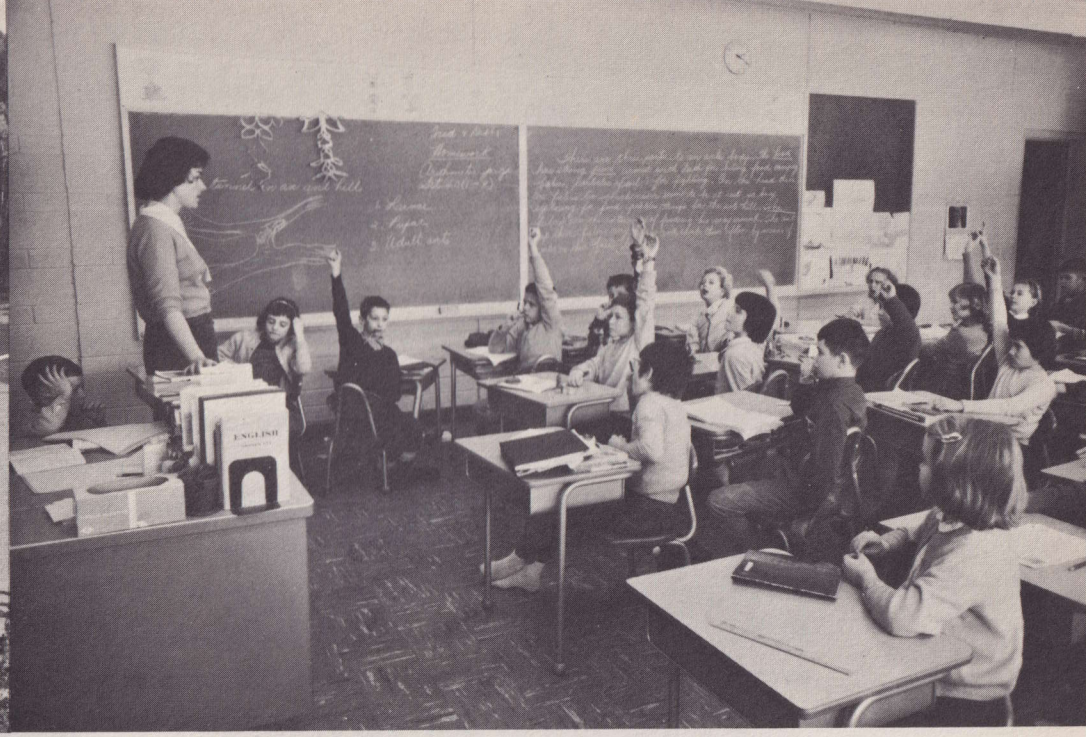
December, 1956, Inco decided to go ahead with development.

There were many problems and hazards! There were no roads, no trails; only vast areas of forest and muskeg. Every single thing, from nails to bulldozers, had to be taken in that winter over the frozen ground by tractor trains. The "Snowball Express", as it was called, ran 24 hours a day, seven days a week, on the 70-mile round trip from the nearest point on the C.N. R.'s Hudson's Bay Line, and all that summer of 1957 other crews rushed to complete a railway spur to the new mining development. On October 20 the last spike was driven, and men and materials began to pour in.

Remember, Inco had to build more than a plant: it had to build a town as well. Wisely, before a single house was built, the company invited the Metropolitan Planning Commission of Winnipeg to plan the town. This was to be no disorderly collection of shacks rushed up to house the workers and their families: this was to be a carefully thought out community, planned for orderly expansion, in which men, women and children could live happily and healthfully close to their work. Here is an air view of the Inco plant at Thompson, named in honour of Dr. John F. Thompson, then Chairman of the Board of Inco, and in his 50th year of service with the company.



The ultra-modern hospital includes operating rooms and a permanent staff of thirty-two, including ten nurses.



Thompson has elementary schools as well as a high school to service the educational needs of the community.

Commercial production of nickel began in mid-1961—four and one-half years after the decision was made to develop the mine. In size it is second only to Inco's Sudbury District operations, but in one way it ranks first: not only is the ore mined, the nickel concentrate extracted and smelted, as we described in Part Two, but it is also refined at Thompson, instead of being sent to the Port Colborne Refinery, so that the finished product can be shipped directly from Thompson to markets all over the world.

Thanks to Inco's continuing process research, the Thompson operation is not only the most modern, but also the first fully integrated refined nickel plant in the world today.

What makes the Thompson refining method different from older procedures is that it employs direct electrorefining of nickel matte, a process developed and patented by Inco metallurgists.

In the town of Thompson, Inco's expenditures are estimated at $8,500,000, the major portion of which has already been spent for such facilities as roads and sidewalks, elementary schools, a high school, an administration building and fire station, sewers, a sewage disposal plant and water mains, all of which it has given to the town. In addition a modern hospital is

operated by the company primarily for its employees and their families.

Already the men and women who live in Thompson have organized many things for themselves, such as a community club, a camera club, several churches, Boy Scout and Girl Guide troops and a dance orchestra. There is a curling rink, a hockey league and a full summer's baseball schedule, and on the nearby lakes everyone can enjoy boating, fishing and swimming. And just like in any other go-ahead town in Canada, there are department stores, supermarkets and a big shopping plaza.

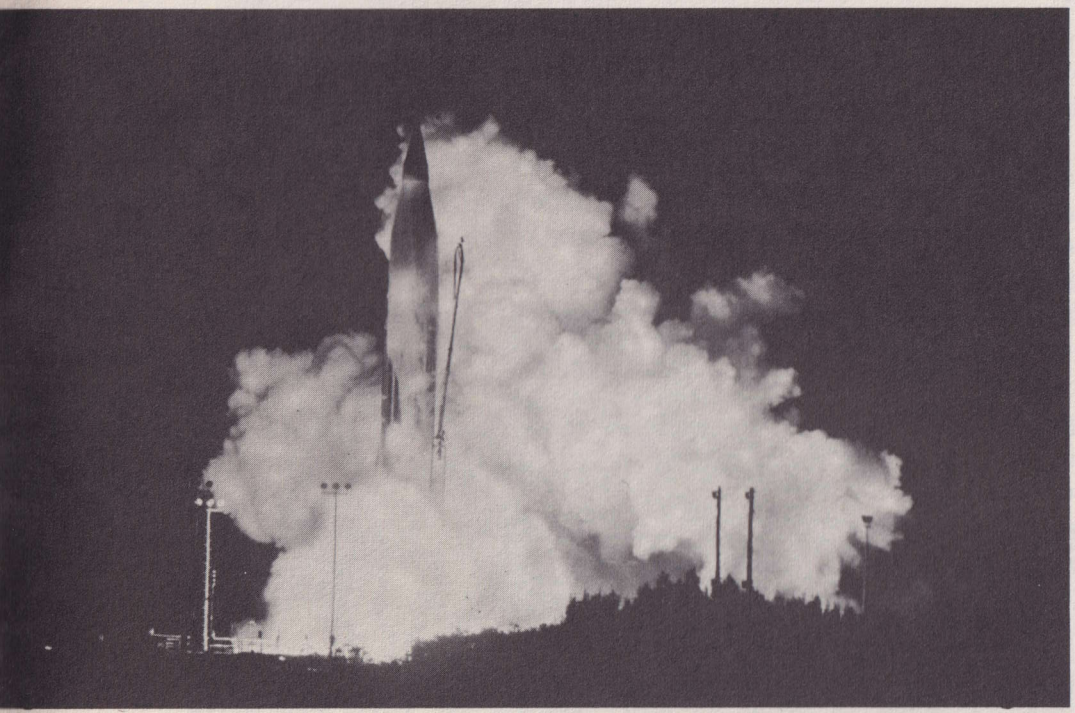
All these things are just a beginning. As one resident said: "We're growing with a young community and becoming part of it. This is a new frontier of Canada, and this is where I want to be." Doesn't that make you think of earlier days in Canada, when men and women set out from the first settled districts to find what lay beyond the lakes and the forests and build new towns and cities for themselves and for those to come after them? It's history being made over again, with parts to be played in it by boys and girls of today.

And though the huge plant, and the Town of Thompson, have been financed and built by The International Nickel Company, further developments in Northern Manitoba will probably be undertaken by other organizations. To provide electric power for the Thompson development, the Manitoba government has built a great power station on the Nelson River, 53 miles to the northeast. They have named it the Kelsey Generating Station, after the first white man to explore that section in the years 1690-92. With electrical power now available, other industries may find it profitable to venture into this large previously undeveloped country.

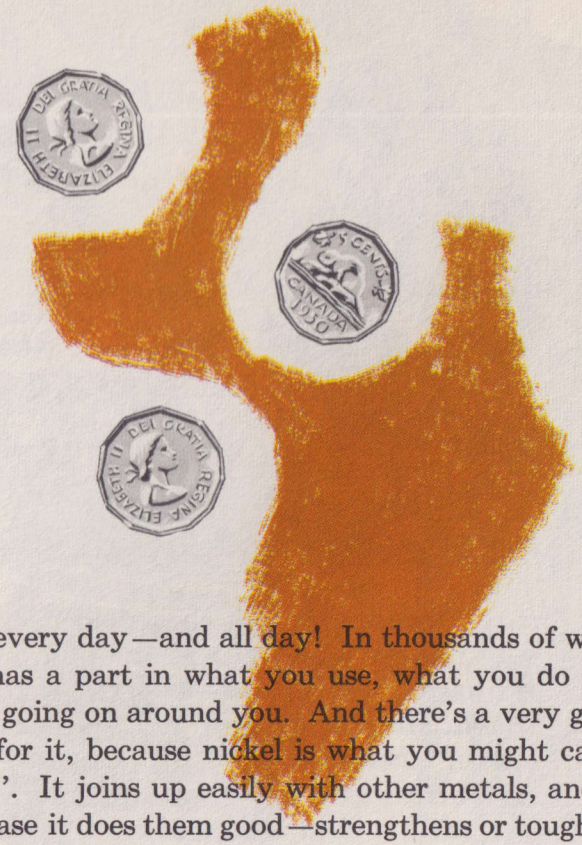
So there is the first part of the Thompson Story: a new industry and a new town which, in four years, men with imagination, faith and money have truly "put on the map". The rest of the story will be written in the years ahead, perhaps by some of you who are reading this now.

Part Four

NICKEL EVERY DAY



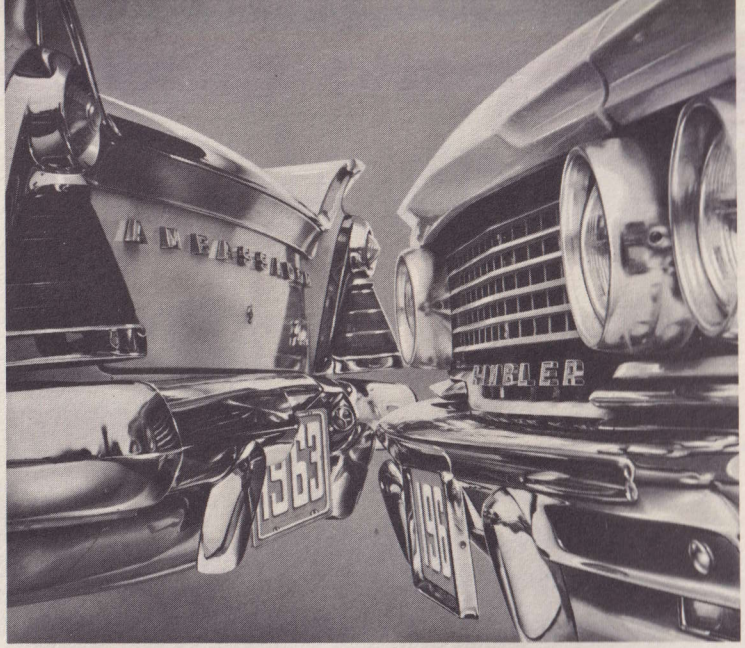
Nickel is in many of the metals that are playing an important part in space exploration.



Nickel every day—and all day! In thousands of ways nickel has a part in what you use, what you do and what is going on around you. And there's a very good reason for it, because nickel is what you might call a "joiner". It joins up easily with other metals, and in every case it does them good—strengthens or toughens them—protects them against heat and corrosion.

Did you know that nickel helps the astronauts make their orbits of the earth? The skin of the Atlas booster rocket is made of stainless steel with nickel in it; and the shingles on the outside of the space capsules are often made of a nickel-base alloy. The boosters have to stand-up to temperatures of –297°F to 1200°F. The capsules must withstand speeds of 17,500 mph!

And if nickel will help other metals to stand-up to that kind of torture, imagine how easily it will help them to do ordinary, everyday jobs. Watch your father polishing the shining grille on that new car of his: it wouldn't be so easy for him to keep it gleaming



Nickel plating over the steel and under the chromium plating on a car helps prevent rust and keeps the metal looking bright and shiny.

if the steel under that chromium hadn't been coated with nickel. And in trucks and buses, where the duty is rugged, the important parts of the engine and chassis are strengthened and toughened by the addition of nickel.

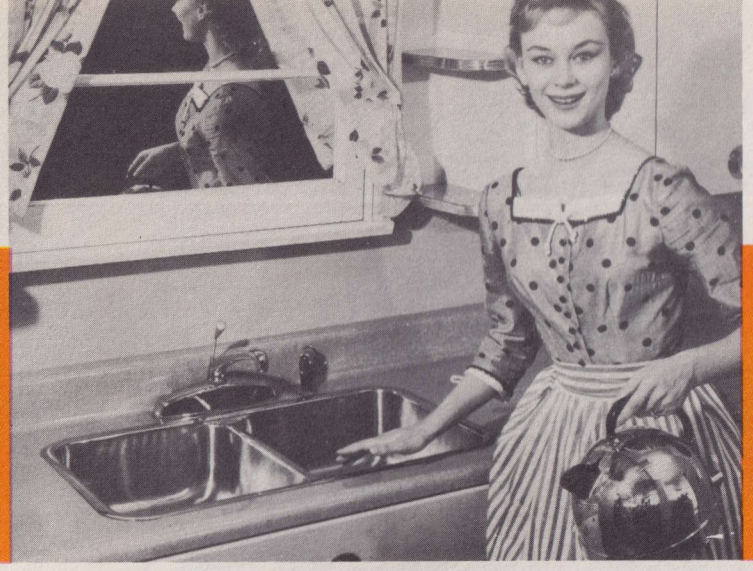
There was a time, not long ago, when tableware had to be rubbed and polished with special powder to take off the stains. But that was before someone discovered that combining nickel and chromium with iron produced a metal called stainless steel which could be made into knives, forks and spoons that wouldn't stain or rust.

All through your home, too, nickel goes on working for you out of sight: in your radio, in your television set and in your telephone. Even more imaginative applications where nickel makes its contribution to modern living, include the new life-time rechargeable nickel-cadmium batteries. They are doing away with plug-in cords in a myriad of household items. Take for example your Dad's new electric shaver, his flashlight, his drill, and other power tools. Now he can use them in his car, cottage and boat without worrying about generators, cords or power lines to conventional outlets. With cordless packaged power at her fingertips, your mother will also be able to use the vacuum cleaner and other household and kitchen appliances with greater ease; she will not have to worry about extension cords or tripping over loose wires when working in the house. To give a life-time of service and many hours of use, these tiny nickel-based power packs need only be plugged for a recharge into conventional electricity outlets for short periods when not in use.

That gleaming coffee pot your Dad gave Mother for Christmas is probably made of stainless steel, while its heating element, like those on your stove, is no doubt sheathed in Incoloy* alloy 800 produced by Inco specially for that kind of heating job. And have you in your home one of those fancy can-openers with a magnet to hold the lid of the can after it's been cut off? There's nickel in that magnet—alloyed with aluminum, cobalt and iron.

*Trademark

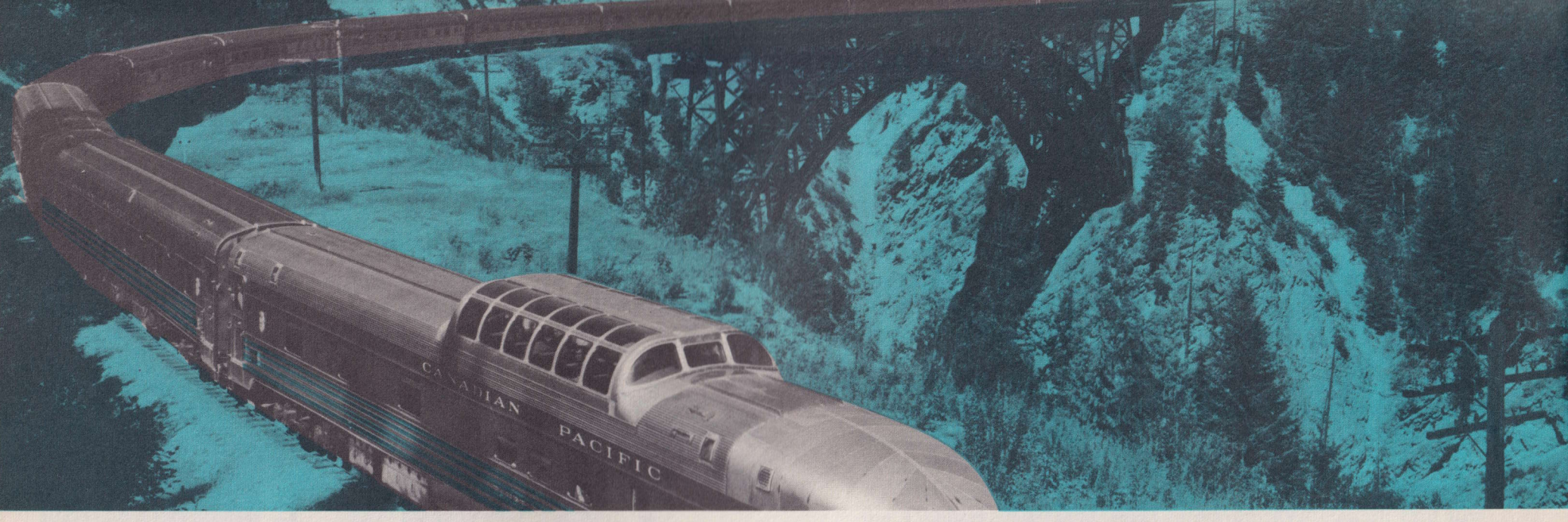
There's Inco nickel in lovely modern stainless steel tableware.



Stainless steel made with Inco Nickel is now being used for sinks in many modern homes and apartments.

And then, all the way from the hairspring of your watch to the largest steel jobs you can imagine, you will find nickel. Watch one of those great new buildings going up in the city—huge steel girders being lifted and swung into place ten or twenty stories above the street. The crane that's lifting them looks spidery, as if it might bend under the tremendous weight, but the nickel steel it's made of gives it a strength away beyond its appearance. And if you had watched them digging the foundations for that building, you would have marvelled how the bulldozers and power shovels down in the hole could stand up to the awful shocks they were taking as they bit into the rock and clay. Nickel again—for steel with added nickel can take it!

Nickel stainless steel is used in the window frames and doors of Toronto's modern new City Hall.



Over half a million pounds of nickel were used in the 173 stainless steel passenger cars now in service on the CPR's continental route.

Now imagine you're clambering up on the fence to watch the Trans-Continental flash by on its way to Vancouver or Montreal. There's the hooter for the crossing—two longs, a short and a long—and here's the train itself, as clean and shiny and beautiful as the day it made its proud first run . . . stainless steel or nickel on the job again. Look—there's the dining-car! See the waiters in their white coats setting the tables with knives and forks and spoons and sugar bowls and cream jugs all made of stainless steel or nickel silver, while in the kitchen the food is prepared, cooked and kept hot on tables or in pots of nickel or stainless steel.

Back home again it's time for bed, and there we have nickel again, in the heating element of the electric blanket and the works of the electric clock.

So there is nickel—around you and with you all day and every day. Did we say in thousands of ways? True—but we can't list them all here . . . so begin asking around and you'll be surprised how often you find nickel working for you—from the tiny pins in the frame of Dad's glasses to the propeller shaft on Uncle Joe's outboard to the massive girders on a great new bridge . . .

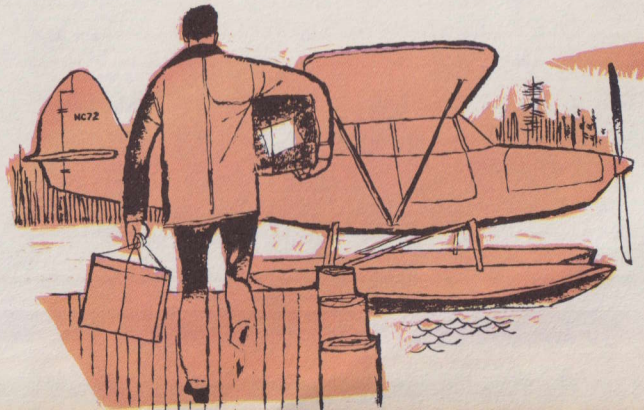
Besides these common uses which are familiar to all of us, nickel and alloys containing nickel have hundreds and hundreds of special uses in industry—to help make paper for the newspapers, books and magazines you read; on farms and in dairies to help keep the milk you drink pure; in big canning factories where the tinned foods you eat are processed; in oil refineries and chemical plants. In practically every industry you can name, nickel and nickel alloys are used to manufacture products you use nearly every day.

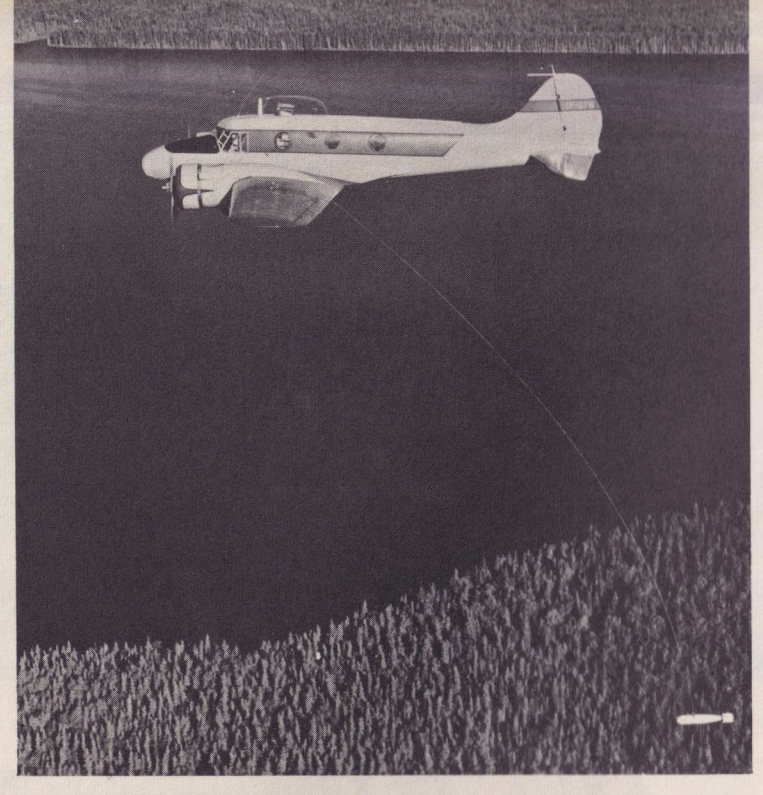
Nickel? It contributes to the quality of the products in our everyday life.

Part Five

WHAT NICKEL MEANS TO CANADA AND TO YOU

Conscious that every ton of ore mined from the Sudbury District and Thompson, Manitoba, must be replaced by new finds, Inco is continuing its relentless search for new nickel deposits. To find them, the company works in many parts of Canada. A large portion of this search is concentrated in the far northern and Arctic regions. The modern pioneers, who work there, are every bit as venturesome as any explorers of old. But unlike the mine seekers of yesteryear, who were handicapped by weather, ground conditions and distances, Inco exploration crews today are moving swiftly in planes and helicopters, peeking under the surface of the earth with the most modern scientific instruments, many of which were developed by the company. They are methodically and scientifically combing many areas of the country and examining spots where nickel is thought likely to be found. Like Mounties on the trail of a wanted man, they persistently follow every clue. Sometimes, it takes months, sometimes it takes years of hard work to find a worth-while deposit, because to make mining economical it is not enough to find some nickel. The





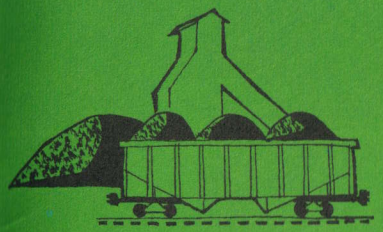
Inco's aerial prospectors explore the Northern Manitoba region in search of new sources of nickel. As a result of these explorations new mines are being opened in this area.

deposits must be substantial enough to warrant their development or otherwise it may cost more to build a plant, extract the ore from the ground, treat it and ship the nickel to markets, than can be realized for it.

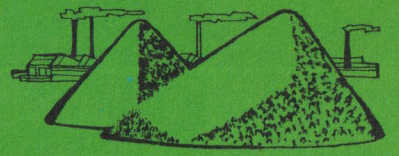
But when the earth finally yields such a hidden treasure, as it happened recently at Thompson, new jobs are created for thousands of people. They built towns and railways in the wilderness and now they are working in the mines and plants to extract and refine the ores. Others develop markets for the nickel in Canada and abroad. Others yet, are seeking new ways of adding nickel to other materials to make better and stronger products, needed by industry to cope with the developments of modern technology. By searching for nickel, mining it, refining it, selling it, and finding new uses, Inco's operations in Canada provide jobs for many thousands. Together with their families and dependents, this makes for some 75,000 to 80,000 people who derive their livelihood directly from the company's operations. Inco pays its employees more than $100,000,000 a year in salaries and wages. But that is not all. Thousands more are engaged in making and supplying other products which Inco needs: timber for props in the mines, railway cars for carrying the ore, furnaces for smelting it, machinery and equipment for all stages of refining, chemicals for purifying it, explosives for the mines, boots and helmets for miners, paint, bolts, etc. Altogether, goods and services purchased by the company amount to over $132,000,000 annually. Another $12,000,000 a year is spent on railway transportation. The company itself, pays more than 46 million dollars a year in taxes to federal, provincial and municipal governments, while its employees add another $12,000,000 to the federal treasury through payroll tax deductions.

On top of all that, still more thousands of people are employed as grocers, doctors, electricians, bus drivers, nurses, and in many other ways, all providing goods and services to the company and its employees. When you think of all these people, directly or indirectly obtaining their livelihood from Inco operations you can visualize the impact the company is making on the Canadian economy, and the country as a whole.

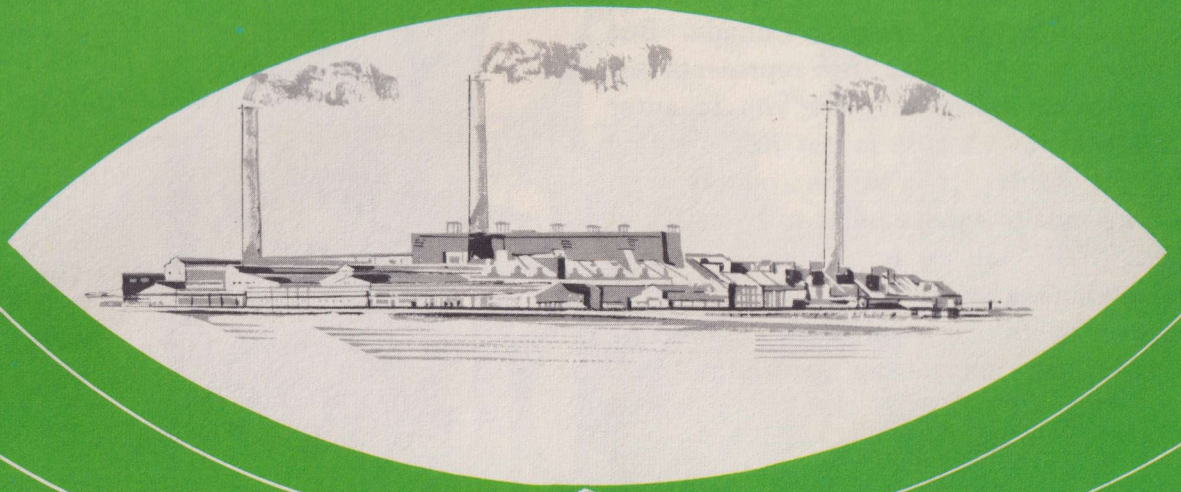
SOME OF THE MANY DIFFERENT TYPES OF PRODUCTS USED BY INCO IN ITS MINING, MILLING, SMELTING AND REFINING OPERATIONS.



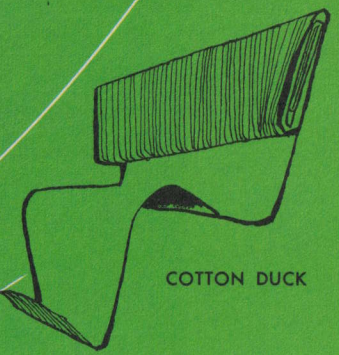
COAL, COKE AND NATURAL GAS



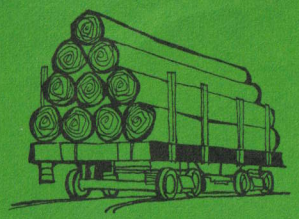
SALT AND SODA ASH



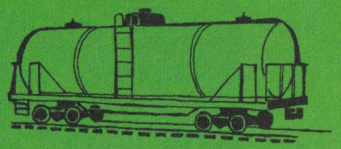
FUEL OIL, LUBRICATING OIL AND GREASE



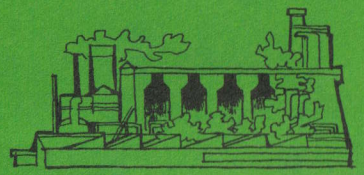
COTTON DUCK



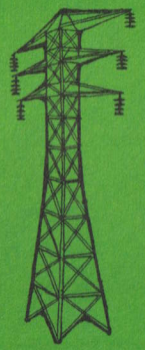
LUMBER AND TIMBER



SULPHURIC AND COMMERCIAL MURIATIC ACIDS

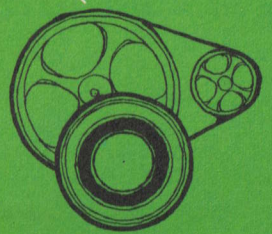


STEEL PLATES AND BARS, STEEL PIPE, WELDING RODS, IRON AND STEEL CASTINGS

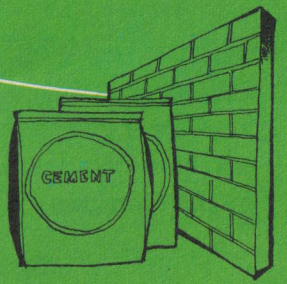


ELECTRICAL SUPPLIES

EXPLOSIVES



MECHANICAL RUBBER GOODS



PORTLAND CEMENT, BRICK AND SPECIAL CEMENTS

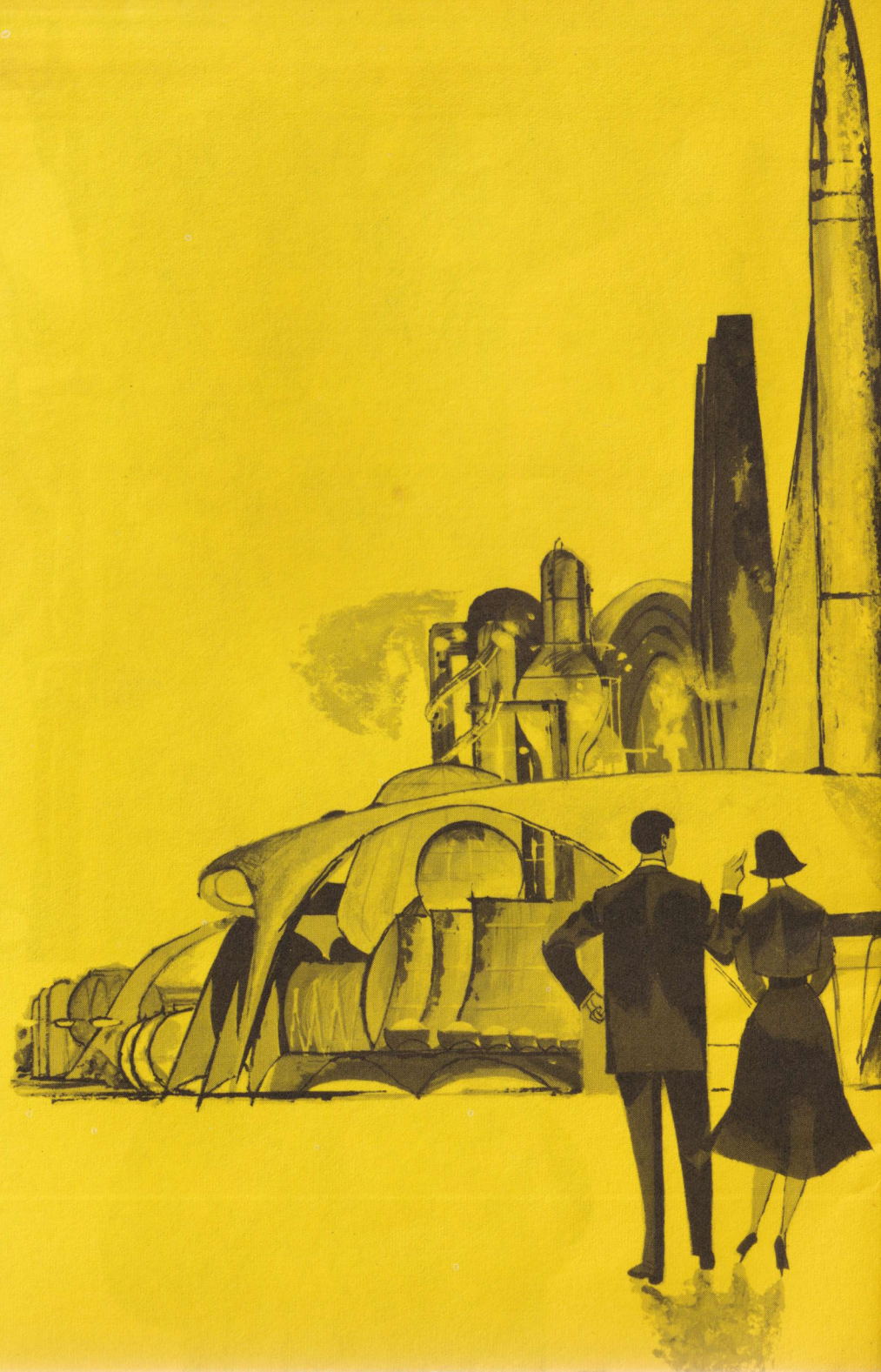
It is easy to see what this means to Canada. But what does it mean to you? Well, Inco represents one of the great fields of opportunity for you to enter when you leave school. Canada is not just a string of cities along the border; it is still a country with hundreds of thousands of square miles to be explored and developed. Who knows how many more of Nature's treasure-houses await the coming of adventurous young men to unlock them? And if someone does find a great new deposit up near the Arctic Circle, for instance, it will take the strength and courage and scientific skill of hundreds of young Canadians to get the treasure out and to make it possible to live and work in that far northern country.

Maybe such a job is for you. Or maybe you see yourself quietly at work in a modern, well-fitted laboratory on the trail of new techniques to improve the mining or the refining or the use of nickel. If you are strong and rugged, and like to work with machinery, perhaps you can see yourself down there on the two-thousand foot level, in at the start of the whole operation—the man who actually wrests the treasure from the storehouse where Nature locked it. Or, if you are a girl, you may see yourself as a secretary in one of Inco's large modern office buildings or at work in the Company's library.

To help play your part in Canada's future development, and to help equip you to seize the opportunities as they occur, Inco has set up scholarships* at Canadian universities, available to high school graduates. This is Inco's way of helping deserving boys and girls to obtain a university education, and at the same time to help provide a continuing supply of trained and educated men and women for the future of Canada and Canadian industry.

In other lands they say that today the spotlight is on Canada. We at Inco believe that to be true. Shining in that spotlight are Canada's great mineral treasures, of which nickel is one of the greatest. Canada is called the Country of Tomorrow, and we know that no matter how bright that tomorrow is nickel will play a tremendous part in it. Nickel has an exciting past, but its future will be even more exciting . . . for Canada and for you.

**Information on the current Inco scholarship programme may be obtained by writing The International Nickel Company of Canada, Limited, 55 Yonge Street, Toronto, Ontario.*



Part Six

NICKEL GOES TO MARKET

In olden times, when a man had something to sell . . . whether it was something he grew on his land or made with his hands . . . he usually took it to market in a nearby village.

But in the nickel industry today, the whole free world is the marketplace. In cities and towns and villages the world over, people need strong, tough nickel steels and other special nickel alloys to withstand extreme heat and cold or resist rust and corrosion.

Since almost every industry in the world uses nickel and nickel containing alloys, Inco has trained men in all the world's major industrial centres. These men are specialists who can explain the advantages of nickel and nickel alloys to industrial customers. When new alloys are developed, they must be able to show customers—old and new alike—how and why they should use these alloys. In this way, they help industry to turn out better products, while at the same time helping increase the demand for nickel and ensuring jobs for many Canadians in all walks of life.

Trained metallurgists, scientists and technicians, working in Inco's laboratories or under operating conditions in customer's plants, carry on special tests and experiments to learn everything they can about nickel and nickel containing alloys. For instance, how certain alloys react to salt water, sulphuric acid, or the many other industrial environments; how best to weld and fabricate these alloys.

Inco scientists also carry on research to develop new or improved alloys for longer life, higher temperature or extreme cold, increased resistance to corrosion and wear. Through constant research, Inco has accumulated a vast fund of information which has been indexed and carefully filed for ready reference. Some of the information is published in the form of technical data, bulletins and special papers—all for the purpose of helping Inco's customers produce better products at lower cost through the use of nickel and nickel alloys.

Up-to-date information on nickel and its applications is made available to customers through the company's sales and research facilities in key industrial centres in Canada, the United Kingdom and the United States. This information is also made available through offices in Paris, Milan, Brussels, Dusseldorf, Zurich, Madrid, Bombay, Johannesburg, Tokyo, Buenos Aires, Sao Paulo and Melbourne.

So you can see what an enormous task is involved today in marketing something as important as nickel.

Spells! Magic! Secret formulae! Not any longer. The alchemy of the past has given way to the science of the present. And Inco scientists look to the future. They know the need for newer and better alloys is a never-ending one. And they carry on never-ending research to provide new alloys to meet the ever-expanding needs of industry.

In times to come your lives will be enriched by the discoveries of Inco's development and research facilities. Many physical and chemical secrets of metals and alloys remain unsolved and these facilities of Inco —which have already solved many of them—will go on to discover many more. For such are the ways of progress . . . and such are the needs of the future. With man-made satellites circling the earth . . . with the promise of rockets to the moon in the near future . . . the world will require remarkable new materials and men of great genius in the years to come.

But nickel still has to be distributed quickly and efficiently to customers even in remotest parts of the free world.

When large quantities of nickel are ordered by steel mills and other regular customers, they are shipped directly by the company. When smaller quantities are needed on short notice, Inco relies on a large number of distributors for nickel and nickel alloys throughout the world. The various brass and steel mills which produce nickel containing alloys also have many hundreds of distributors with large warehouses who stock and service the various nickel alloy steels or bronzes, as do the plating distributors who produce nickel anodes used by the plating industry.

So when a customer in Texas or Bombay wants a nickel product, he doesn't have to wait for it to come from Canada. He can get it from a nearby distributor.

Inco's marketing activities are supported by a carefully integrated advertising and publicity programme using newspapers, magazines, radio, trade and industrial exhibits, special company publications and motion pictures. Some of this material is produced in French, Italian, Dutch, German, Swedish, Spanish, Portuguese and Japanese as well as English. In this way, industries at home and in foreign countries are kept informed about Inco products.

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