Within The

INCO TRIANGLE

VOLUME 3 FEBRUARY, 1939 NUMBER 2

HORNE SHIFT SETS RECORD

Frood Mine's safety record shot to a new high this month with the completion, on February 2 by the Martin Horne shift, of 119 operating days or 97,211 man shifts without a lost-time accident.

This splendid mark totally eclipsed the previous Frood record of 59 operating days, and established a precedent that will probably be exceptionally difficult to beat.

An ironical twist of fate characterized the mishap which nipped the Horne crew's no-accident stretch in the bud just as the men thought 100,000 a cinch and were adjusting their sights to aim at the 200,000 mark. The accident which finally ended the record occurred under a shift boss whose group had just completed a full year without a lost-time accident!

CLOSELY WATCHED

Keen interest and enthusiasm infected the entire Frood force as the 900-odd men on the Horne shift piled up day after day of their imposing safety total. When the break came condolences were freely expressed, although naturally these were more than offset by hearty congratulations all around on the great achievement.

When December brought in a figure of .058 accidents-per-1,000-shifts worked for the entire Mining and Smelting Division, it was definitely established that 1938 was the best safety year on record in INCO's history. The figure for the whole year was .065, which bettered by a substantial margin the previous best mark of .099 in 1937. It was no surprise to General Safety Engineer G. S. Jarrett, however, when he finally computed the year's average, to find that it was an improvement even over 1937's, because in only one month of 1938 (February) did the Division fail to return a better figure than that for the same month of the previous year!

Corresponding improvements were noted in other features of the 1938 safety experience. Lost-time-per-1,000-shifts dropped from 3.85 days in 1937 to 3.12 days last year, despite some decrease in the total working force of the Division. Compensable accidents dropped from 1937's 264 to 1938's 163, and of the latter no less than 23 were classed as no-lost-time accidents, most of them being minor mishaps such as injuries to teeth.

Every plant did its bit to bring about these excellent results. In Copper Cliff smelter, for example, three shifts on December 21 had more than 50,000 safe days to their credit, although the previous best mark was 46,000. At Coniston the previous record in the operating section was Blake's 24,655, but last year six shifts did better than that. At Frood only one shift boss had previously run a complete calendar year without a lost-time accident being charged against his men. This was in 1937, and the shift boss was Jack McAndrew, now safety engineer. But last year an even 10 shift bosses had this distinction to their credit.

Most recent safety record of the season was that established by Copper Cliff smelter. Previous best stretch in this plant without a lost-time accident was 33 days, but the men finally succeeded February 10 in pushing the "mercury" out the top of the changehouse thermometer with 35 safe days.

All of which would indicate that safety records, no matter how imposing they may seem, are like almost any other kind of record—made to be broken. And so the safety job in hand, in which every employee is expected to do his part, is to make 1939 better than 1938. It can be done.

Besides the recently acquired all-time safety record for the mine, Underground Superintendent Martin Horne's shift at the Frood boasts a full-fledged artist. Martin is here proudly displaying to Harry Smith, his foreman, an oil painting presented to him by Hannis Taskela, one of his timbermen, whose original work it was.

ENTER TWO TEAMS

With teams in both A and B groups of the Niagara District Badminton League, and both teams acquitting themselves very well in tough competition, INCO Club at Port Colborne is well represented this season. The finals of the Intermediate District are to be held in the Club this year, the first or second week of March, and Refinery boosters are looking to some of their hopefuls to pick off at least a couple of titles.

Cliff Rinks Win Curling Recognition

High class entries from Copper Cliff distinguished themselves in the recent N.O.C.A. Bonspiel at Sudbury and Copper Cliff.

The W. T. Waterbury quartet, of which the other three members were J. O. Walberg, R. Lepage, and J. Thomson, won the McKellar trophy and the handsome prizes that went with it.

Also in the prize class were Jim Hudson and his rink, who reached the finals of the British Consols event, and the semi-final of the Sudbury Brewery event. Members of the Hudson clan: V. M. Burns, K. Madill, J. L. Spalding.

Distinction of being the largest trailer in the world is claimed for a unit developed by the Austin-Western Machinery Company, Aurora, Ill., for hauling coal from open-pit strip mines. It has a capacity of 25 to 28 tons. To reduce dead weight and provide the required strength nickel alloy steels were used for stressed parts.

Shift Curlers Get the Broom

With the inauguration of special schedules for men on shift, Copper Cliff is experiencing this winter a real boom in curling. Membership is almost three times what it was last season, and enthusiasm runs high. First competition for the new Waterbury trophy, put up for competition among the shifters, was won by a rink skipped by Harold Hudson and composed of McLaughlin, lead; Young, second; Bothwell, third. Ten rinks took part in the schedule, which was a big success.

Camera coverage of a regular morning's play among the shifters produced these shots:

1 George Ferguson, veteran besom an' stane devotee, gives the broom to his third, while these members of the two rinks await the result, some with fear, some with hope: Left to right, Alex McGhee, Joe Holler, Alf Mash, Edward Miller and Harold Hudson.

2 "Looks like she's light! Bring 'er! Bring 'er hard!" booms the voice of J. R. Rae down the rink, and he starts forward to give his sweepers a hand while Jesse Morrison watches anxiously and Lorne Hudson, in the background, squints to see if the rock is on the broom. In a moment like that, nobody pays much attention to a camera.

3 Much interested in a scheduled match going on outside the glass, Alf Wulff was one of the "armchair skips" on the job when The Triangle visited the Copper Cliff rink. The way he's frowning, his favorite rink must be on the short end of a long score.

4 "Alright now, Romeo, I want a guard just about there. Get the broom now, give me your in-turn, and if you're a bit heavy it'll still be okay," hollers the skip from the other end, and Romeo Rose takes a deep breath, prays for Divine guidance in this moment of great trial, and prepares to ease one away.

5 Lorne Hudson and Ken Madill are putting a little heavy thought on how best to build up a fat end against the opposition. Looks like someone is going to be asked to come through a narrow port, get a nice wick and roll, raise a guard, lie shot, and swallow the broom.

6 Sure enough, our guess was right on No. 2. That rock was light, and J. P. Rae hustled down to give the boys with the brooms a hand. Not that Pat McLaughlin and Jim Brownlee aren't doing a real job of dusting off the ice, but you never can tell what a few extra licks will accomplish in coaxing a lazy stone into the house.

$5,000,000 IN JEWELS

Most closely guarded building in the 1939 World's Fair will be its smallest exhibition hall, the House of Jewels, which will display precious stones and their use in the jeweler's art. A special feature of the exhibit will be a display of the British diamond interests, showing both rough, uncut stones and diamonds of exquisite cut set in platinum. The building will be protected by special safety devices as its exhibits of gems, platinum and other precious metals will have a value of more than $5,000,000.

SWEET SPOT FOR MONEL

In pressing out bars from which rock-hard sugar loaves are made, a Canadian company used metal plates which roughened in service and resulted in rough sugar. Monel plates were substituted and now smooth loaves are obtained. Monel has the hardness, strength, stiffness and wear resistance required for this purpose.

Within The INCO TRIANGLE

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EDITORIAL OFFICE COPPER CLIFF, ONT.

Don M. Dunbar, Editor

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Alloys, Why and How

INCO's dependence for the major share of its market for nickel on the use of this metal as an alloying element, and the part which the Company's research and development activities have played in creating The Age of Alloys, make appropriate a brief explanation of what alloys are and why they are used.

An alloy is a combination of two or more metals, which is made either to accentuate specific chemical or mechanical properties or, in certain instances, to create properties not possessed by any of the constituent metals. In common practice this combination or alloying is effected by melting the metals together.

Steel is iron alloyed with carbon. Brass is essentially a combination of copper and zinc, and bronze is one of copper, zinc and tin. Nickel silver is basically an alloy of copper, nickel and zinc. Stainless steel is steel to which chromium and nickel, or for certain uses chromium only, have been added. By varying the percentages of the constituent metals, the number of possible alloys, each with its own special properties, becomes almost limitless. At present there are more than 8,000 standard alloys of which some 2,300 contain nickel.

Such is the broad field in which the Company marketed last year approximately 75 per cent. of the 200,000,000 pounds of nickel it produced.

Modern industry demands of a single material a combination of properties not available in any one metal. For example, the heavy chemical and the food processing industries require equipment with both high corrosion resistance and high strength. They can get this combination in either the nickel-copper alloy, "Monel," the iron-chromium-nickel alloy, stainless steel, or the nickel-chromium alloy "Inconel."

Again, the mining, ceramic and cement industries, among others, subject their equipment to severe abrasive wear and to sudden impacts. They accordingly select certain nickel alloy cast irons and nickel - chromium-molybdenum steels to meet these exacting conditions.

In the electrical industries and associated field of communications there are countless problems of electrical resistance, magnetism and non-magnetism. For their solution there have been developed nickel-chromium and nickel-iron alloys which have made possible both household conveniences and great industrial installations and which play their part in radios, long distance telephones and transmission cables.

Illustrative of an alloy which creates a new property not possessed by either of its component metals is "Invar," a nickel-iron combination containing 36 per cent. of nickel, which neither expands nor contracts over a considerable range in temperature; although either nickel or iron will react to temperature changes.

Saga of the Sea

Up and down the Atlantic Coast, boats small and large scurried for wherever they thought they might find safety. Even the great "Queen Mary" postponed sailing while she cuddled in her berth, lashed to pier and shore with a network of hausers as thick as a man's leg.

Then the storm struck, the now-famous hurricane of September, 1938. Caught directly in its path off Fire Island, was the 42-foot, Christensen-built cruiser "Stephen-Joan." She had two anchors on board. One was a 45-pound iron service anchor. The other was a newly-developed Monel anchor, weighing only 12 pounds, which The Youngstown Welding & Engineering Company had furnished for testing.

The 45-pound iron anchor failed completely shortly after the blow started. Now the new Monel anchor had to hold. And for more than 45 minutes, while the hurricane was blasting destruction on hundreds of square miles around, lifting up great waves that washed whole colonies into the sea, and littering the shore with shattered boats, the little Youngstown anchor did hold.

Of all the tests made on the new Monel anchors before they were formally introduced at the recent Motor Boat Show in New York, this unplanned one best proves how the Youngstown anchor surpasses the heavy iron anchor in holding power. Yet it weighs so little that, except for the large size made for 90-foot boats, anyone can pick it up with one hand. There is no danger of rust or corrosion because the entire anchor is fabricated from Monel sheet, electric welded.

—Which all illustrates how even so traditional and conservative a form as an anchor may be redesigned and improved by taking advantage of modern, quality materials like Monel.

Close Contest In Club Basketball

Final humbling of the mighty Frood machine was the feature of the last month's basketball at INCO Employees Club. After a run of 10 straight victories, which had the five other clubs in the league in despair, the Froodians fell before a determined offensive by the loop's cellar-position team, Copper Cliff Town. The score was 31-30 in a great match which saw "Moe" Mitchell, coach and key-man on the Town lineup, run amok for a total of 17 of his team's 31 points.

Perhaps shaken by the defeat, Frood went on to lose two more consecutive matches, to Refinery Blues and Copper Cliff Smelter.

The Town team, on the other hand, started playing inspired basketball in the scheduled matches, and although to that date they hadn't won a game, they now have four in a row to their credit. So goes basketball.

The league matches are drawing good turnouts of fans, and it's the consensus of opinion that the brand of play is one of the most surprising Nickel Belt sport features in many a year, because, although there has been little or no senior basketball played in the district for several years, nevertheless this league's engagements are fully as smart and fast as those played in the city loops.

Standing of the teams:

	W	L
Frood	10	3
Refinery Blues	9	4
Refinery Whites	6	7
Creighton	6	7
Copper Cliff Town	4	9
Copper Cliff Smelter	4	9

'Tis the night before pay-day, and all through my jeans
I've hunted in vain for the ways and the means;
Not a quarter is stirring, not even a jit;
The kale is off duty; the greenbacks have quit;
Forward, turn forward, O Time in thy flight,
And make it tomorrow, just for tonight!

—Felix the Froodian.

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Oscar: "Wish I knew where I could get a job. I lost mine at the store, you know."

Joe: "You did? Why I thought you had been there so long you were a permanent fixture. How did it happen?"

Oscar: "Oh, it was accidental. I simply moved a sign from a lady's lace dress to a bathtub without paying any attention to what I was doing."

Joe: "But that's nothing to get fired for. What did the sign say?"

Oscar: "It said: 'How would you like to see your best girl in this for $5.95?'"

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"What of all things in the world is the longest and shortest?" Zadig was asked by the great Magi.

"Time," answered Zadig. "Nothing is longer, since time is a measure of eternity; and nothing is shorter, since our time is insufficient for the accomplishment of our projects."

"What of all things is the swiftest and the slowest?" next asked his interlocutor.

"Time," answered Zadig. "Nothing is more slow to him who expects, and nothing more swift to him who enjoys."

"And what is of all things neglected and most regretted?"

"Time," answered Zadig. "All men neglect it, and all men regret the loss of it, and nothing can be done without it." —Voltaire.

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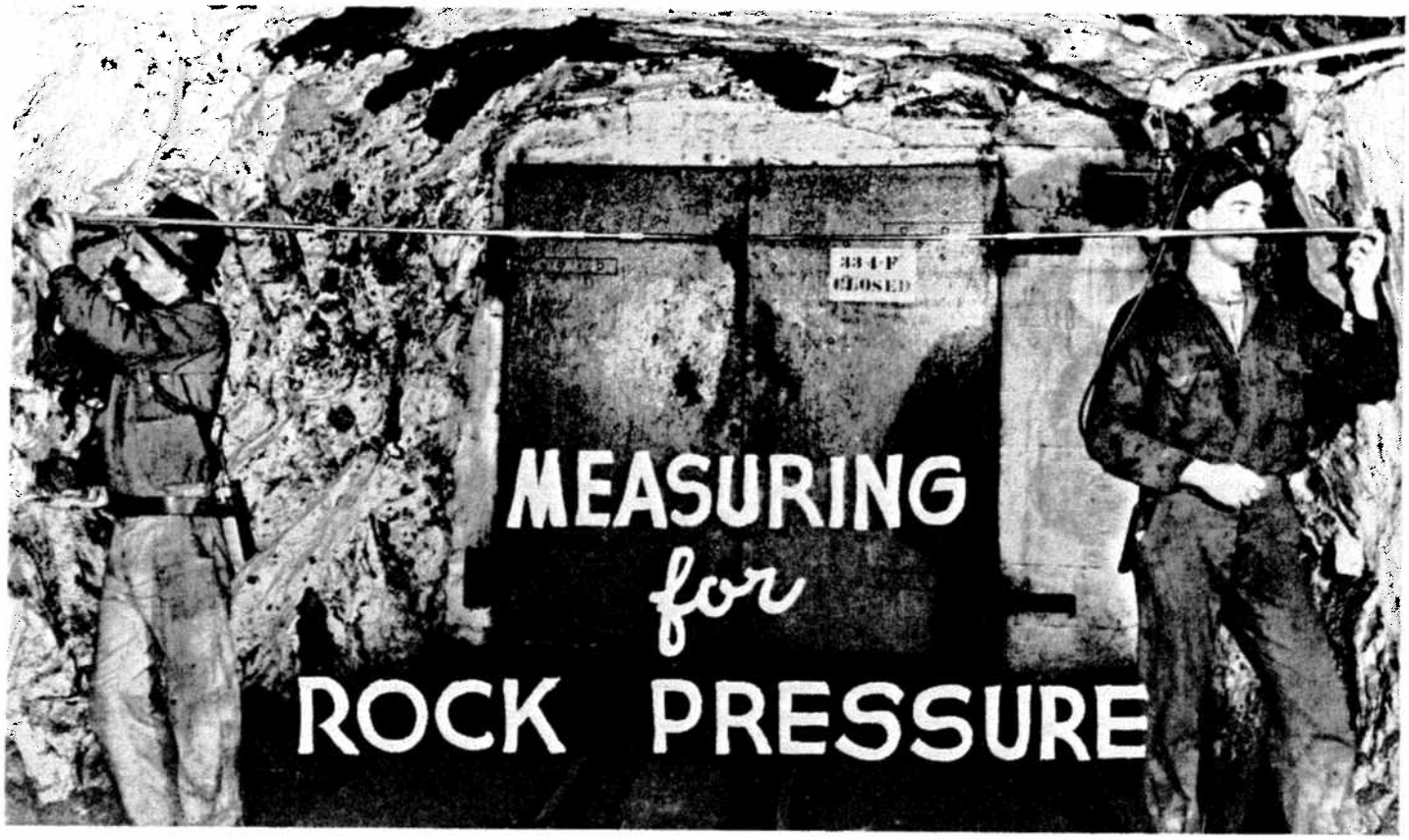
"You admit you drove over this man with a loaded truck?"

"Yes, your honor."

"And what have you to say in your defence?"

"I didn't know it was loaded."



MEASURING for ROCK PRESSURE

George "Frosty" Ennis and Joe Kerr, of the geological department staff, employ the precision instrument by which measurements are taken for rock pressure in INCO mines. They are in one of the shaft stations underground at Creighton. The work is described in the accompanying article.

Although the mines of the Sudbury District have been free from serious rock bursts, and relatively free from minor disturbances, no false sense of security is to be found in the attitude of the industry toward this problem.

To guard against the possibility of encountering these conditions in its operations, INCO has for some years been making a comprehensive study of subsidence, rock bursts, and so-called "air blasts." A serious effort is being made to collect sufficient information and to correlate it in order that subsidence, which is inevitable wherever mining operations are carried on, can be controlled by mining methods so as to eliminate rock bursts or at least reduce them to the point where they will not endanger life or property.

COMMON WORLD OVER

Common in deep mining the world over, rock bursts and their accompanying air blasts depend upon the nature of the rock, the way it behaves under stress or pressure, and the control that may be employed in mining operations. These blasts may or may not be hazardous. In most of the deep mines of the world—those of the Rand in South Africa, of the Kola gold fields in India, of the copper districts in Michigan, and many other districts where there is deep mining—rock bursts are a constant source of trouble, but it has been possible by a systematic study of these conditions to predict and control them to some degree, thus lessening the danger from them. Only in a broad sense can these findings be applied locally, however, since every mining district has its own peculiar problems, and there is much to be learned in regard to the behavior of any particular rocks under stress.

'QUAKES INDICATION

The rocks that make up the crust of the earth are under stresses of various kinds. Continuous slow adjustments in the earth's crust result in enormous stresses being localized along certain zones, and when rupture or fracture occurs an earthquake results. The disastrous consequences of some of the major earthquakes are well known, but the many hundreds of minor earth tremors that are going on all the time result in no catastrophies and, although recorded on instruments set up for these purposes in many parts of the world and known to scientists, particularly seismologists, the world at large knows little of these disturbances. They are, however, an indication of the stresses constantly being accumulated and relieved within the rocks.

The old rocks within the great areas of the Pre-Cambrian, such as the so-called "shield" of Canada within which the mines of the Sudbury District lie, for the most part have undergone so much distortion that they have fairly well adjusted themselves to these stresses by recrystallization and movements along numerous slip planes or faults. Hence further stresses within these old rocks are less apt to be relieved by explosive bursts than in compact younger rocks which have not undergone so much distortion.

FLOW LIKE MOLASSES

Besides the inherent stress of crystallization and the accumulated stress of crustal adjustments, there is ever present in all mines the stress in the rock induced merely by the weight of the overlying rock, and obviously this stress is directly proportionate to the depth below surface. At great depths within the earth where they are completely confined, rocks actually flow more or less like sticky molasses or some other plastic material, and in some of the deeper mines in the world, where the softer rocks are found, these conditions are already being encountered.

Between the depth at which rocks actually flow and the surface, there is a great vertical range throughout which rocks are apt to fracture whenever an opening of any kind is made within them to provide the relief of the accumulated stress. Some rocks can adjust themselves to these conditions by quiet spalling, which can be controlled by protective timbering. Other rocks, particularly the brittle strong rocks, tend to build up these stresses and, although they appear to be strong, the stresses finally exceed the breaking strength of the rock and it lets go violently, causing what is commonly known as a "rock burst." The concussion or vibration set up in the air near such a burst will be transmitted through the available openings for considerable distances, and such concussion is commonly called an "air blast." It is these brittle rocks that are being studied particularly.

Every experienced miner and engineer knows that, sooner or later, as greater depths are attained in mining, these conditions are bound by the nature of things to exist. It is, therefore, one of the fundamental and important duties of his calling to anticipate these conditions and to lay out and plan a long time in advance so that the method of mining employed will not permit the building up of dangerous stresses at any point in the mine.

Obviously this entails the accumulation of an enormous amount of data, and the rock structures are so complex that it is almost beyond human ingenuity to study in detail all the possible conditions that might exist or to predict all the possible results of mining.

Each mine, even in the same district, presents its own peculiar problems, and it is therefore necessary to study the behavior of the rocks at various depths in all the mines. The many factors involved are the attitude of the ore body to be mined, that is, the angle of the dip, the relation of the ore to the wall rocks, the size and shape of the ore body, the character of both hangingwall and footwall rocks, the method of mining, and particularly the length of mine opening. All of these, except the last two, are factors that cannot be changed, so that the mining method, the sequence of mining, and the location of development work are the factors that must be adjusted to meet the conditions imposed by the characteristics of the ore body and its enclosing wall rocks.

The first step taken by INCO several

years ago in its attack upon these problems was the inauguration of a systematic study of all occurrences of minor rock disturbances in all the mines. A map is made of each disturbance, showing the distribution and character of all cracks and slips and their relations to mine openings or pillars. An attempt has been made in each case to determine the exact cause of failure and the reasons for the localization of stress at this particular point, so that such conditions may be avoided in the future. From this work it has become apparent that precise measurements of rock movements would have to be made before actual failure can be predicted. In line with this, a series of stations have been set up in the deeper mines at which precise measurements to as close as 1-1,000 of a centimeter are made at regular intervals. The instrument used to make the measurements is an alloy-steel micrometer bar, and consists of sections of several lengths so that readings may be taken across mine openings of variable widths up to 13 feet. Each section has a screw for adjusting to an accuracy of one millimeter. The micrometer adjustment is on the end of the section that is placed against one of the measuring plugs, of which there are two in each measuring station. Made of brass with supporting shoulders, the measuring plugs are set in concrete within accurately-located drill holes. In each reading of the bar allowance is made for temperature changes. Measurements from time to time are plotted on graphs, showing the progressive changes going on at places apt to be affected by localized stress. It is hoped, by such measurements, that these conditions can be predicted before failure occurs, and thereby either controlled or prevented. Measurements are being made of the different kinds of rock, both in the footwall and in the hangingwall, opposite both pillars and stopes, to ascertain where stresses are being accumulated, and, if possible, to determine just how much movement these rocks can stand without breaking. When enough such measurements have been taken to indicate where stresses are being localized, immediate steps can be taken to relieve the situation

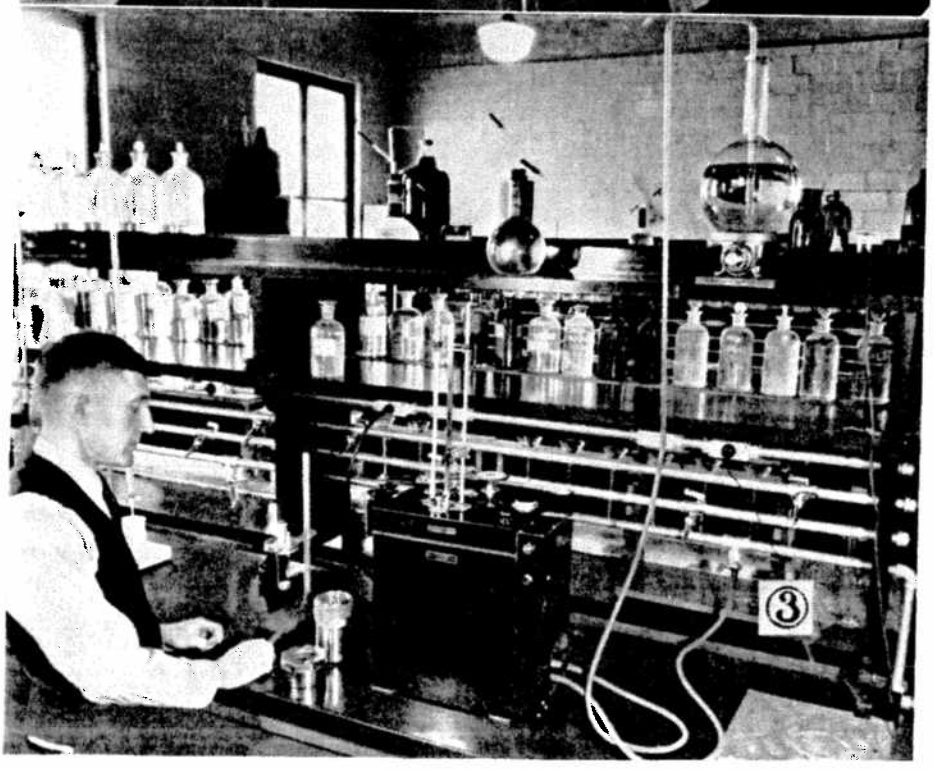
150 Women Study Sewing

Approximately 150 INCO women are taking advantage of the sewing classes being conducted by Canadian Legion at Copper Cliff and INCO Employees Club in Sudbury. Through the co-operation of the Singer Sewing Machine Co., which furnishes machines and instructress, the classes are proving a decided success. And Arthur Brown, Singer's Sudbury manager, joins with Miss Alice Fisher, the instructress, in high praise of the ability of their "pupils."

How to handle various sewing machine attachments, dressmaking, altering patterns, measuring, fitting, home decoration, making chesterfield covers and drapes—these are some of the subjects taught in the course.

Copper Cliff classes are held in the Legion rooms, and are open to all ladies of INCO towns. Thursday's the day, and hours are: 9.30-11.30 a.m.; 2.30-4.30; 7.30-9.30. In the INCO Club four classes each Wednesday are necessary to handle the large number of entrants. Hours are 9.30-11.30 a.m.; 1.30-3.30; 4.30-6.00; 7.30-9.30.

Top photo in the layout shows Miss Fisher registering a group of ladies at the Employees Club the night the classes opened. Below are candid studies of some of the "students" in the Legion class at Copper Cliff, hard at work.



The Big-Leaguers

It may be news to Toronto Maple Leafs that they're leading the National Hockey League, and we imagine Conn Smythe will be very glad to hear about it. Only this is the Midget National Hockey League, and it's being played in Copper Cliff. What's more, there are just three other teams in the loop—Canadiens, Rangers, and Boston. The schedule winds up at the end of February, and after that there will be playoffs for the championship. Of all the things for which these Copper Cliff kids may feel grateful to INCO's President R. C. Stanley, none at the present time is more important to them than his name, because when he donated a handsome trophy to them for their league winners they were able to name it Stanley Cup and thus add one more big-league touch to their setup. They sport regulation N.H.L. uniforms, and each player wears on his back the name of a big league star. In the organization too are four "farm" teams, Syracuse, Providence, Philadelphia, and New Haven. More than 120 boys take part in the Saturday morning matches at Stanley Stadium, and every one of them has signed a Good Behavior contract. Some time in March a midget team representing Southern Ontario will come to Copper Cliff to play a local all-star team a two-game series for the provincial midget N.H.L. title. Gordie Drillon and Syl Apps of the Leafs will likely appear in person to officiate. The league is the pride and joy of Gordon Alcott, its organizing genius, and is sponsored by Copper Cliff Athletic Association.

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Shops Challenge

Copper Cliff converter building's First Aid team last spring won the P. F. McDonald Shield for inter-dept. competition, and represented the plant in the annual contest for the coveted Parker Shield. Any holder of the McDonald Shield may be challenged during the year by another team, according to the regulations, so the crack shops First Aid squad made a bid, coached by First Aid man Ivan Fraser. Shops proved their challenge no mere gesture by defeating converter building when the test was held. They hold the Shield until the annual competition next month. Left to right, D. Hadcock, A. Didone, Captain G. Guthrie, E. Ceccheto, J. Shrigley.

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Heat Yardstick

Bituminous or anthracite coal produce more heat per ton than the lowly lignite. Butter or bacon produce more heat per mouthful than peas or prunes.

Heat from coal is measured in terms of British Thermal Units, a B.T.U. being the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit. Heat from food is measured in terms of calories (hateful word), a calorie being the amount of heat required to raise the temperature of one gram of water one degree Centigrade.

Well may the man with the shovel, or the woman with the menu, ask how the measuring is done. B.T.U.'s and calories are rather intangible things to which to place a yardstick.

Whenever it is required to determine the heat effect of a chemical reaction, whether it be the combustion of a fuel or foodstuff, or the union of two or more chemical substances, the measurements are carried out in a calorimeter. This is the black box shown on the table in Triangle's photo. It's one of the many pieces of apparatus in use at Copper Cliff's Research Laboratory.

R. S. Young, of the research staff, is about to demonstrate. Near his hand on the table are a metal capsule and a metal bomb. Into the capsule he will place the carefully-

weighed material whose calorific value is to be determined. A piece of fuse wire is placed in contact with the substance, and the whole assembly is placed in the bomb. The cover of the bomb is screwed down tightly and oxygen is admitted through a valve in the cover until a pressure of 450 pounds per square inch is attained.

Then the bomb is immersed in a tank of water in the calorimeter, and contact is made with an electrical current. When the current is turned on the fuse wire ignites the material, which burns vigorously in the compressed oxygen atmosphere of the bomb, and heat is given off. The water surrounding the bomb is warmed, and this is recorded by a sensitive thermometer. The total heat produced by the combustion of the material in the bomb can thus be calculated.

The bomb is a heavy forging of Illium, an alloy containing 56 per cent. nickel, 24 per cent. chromium, eight per cent. copper, and several other metals. It must not only withstand the high pressures and temperatures encountered in calorimetric work, but also be resistant to sulphuric and nitric acids formed in the bomb under these conditions. Here again, nickel, with its great strength and corrosion-resistance, returns to serve the industry which gave it birth.

Careful laboratory experiments, made possible by the use of such equipment as the calorimeter, usually precede or accompany developments in INCO plants or processes. The present position of our Company has been built on a solid foundation of research, and its position must be maintained against competing metals in this Age of Alloys by constant work in the laboratories.

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Dream Kitchen

No wonder "Duke" Jarrett of Copper Cliff mining engineers has a reputation for good nature. Nothing but contented meals could come from a kitchen like this. When "Duke" built his handsome new home on Riverside Drive in Sudbury, and got around to planning the kitchen, he let his good wife have a free hand with the details. Naturally she asked for a gleaming Monel sink. And naturally she got one, this being a modern home. (Toronto advertising department please copy.) Inset shows another installation which this INCO-minded homemaker ordered, a very smart brushed nickel chandelier which hangs in the dining room.

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South Africans

Led by Professor Biccard-Jeppe, a group of keen young mining engineers from the University of Witwatersrand, Johannesburg, South Africa, were recent visitors at INCO plants. They posed in No. 3 Shaft hoistroom at Frood for a Triangle photo with their guides on a trip underground. The guides, distinguishable by their darker clothes, were, left to right, D. Etzenhauser, B. Seli, George Thorpe, Andy Spy, and Gerry Smith. The South Africans also visited Creighton, Copper Cliff and ORCO.

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St. John Class

Two men from Nairn and 10 from High Falls were included in the St. John Ambulance class for which examinations were recently held at High Falls by Dr. W. C. Campbell of Copper Cliff. All candidates were successful. Pictured here are, left to right, back row, G. Hartman, Superintendent at High Falls; Jim McQuillan, A. McQuillan, Walter Wainman, G. McLenna, W. Wiseman, George Hilliard, Superintendent at Nairn; front row, Victor Kanerva, A. H. Tincombe, A. V. McGauley, S. McInnis, A. Daoust, G. Heney, E. Nickle. The High Falls class swells to almost 300 the list of INCO men studying St. John Ambulance work this year under the guidance of the Company's medical staff.

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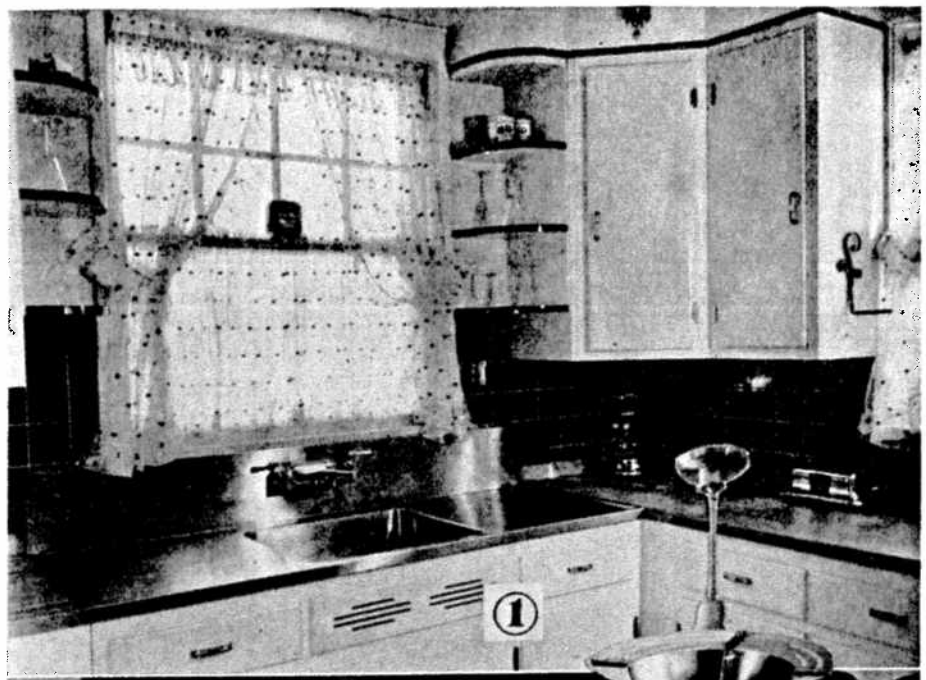

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FIRE TRUCK
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Order and Efficiency Mark Mine Fire Procedure

Local readers of a well-known science magazine were probably amused recently if they saw the story announcing that, to quote: "Artificial skunk odor now is used in many large western mines to carry the warning of fire . . . A few drops of butyl mercaptan are injected into the air-circulating system to create a vapor that is shot through ventilation lines at thousands of feet a second, flashing a silent warning that penetrates where a gong could not be heard . . . This synthetic smell is one of the many recent creations from the test tubes of the smell experts, chemists who tailor odor-producing materials to fit the needs of industry."

The system may be new to mining in some areas of the country, but in Ontario the industry has been using it for about 10 years. In this territory the artificial odor used as a fire warning is that of rotten onions. Triangle doesn't propose to argue the relative alarming potentialities of Skunk vs. Rotten Onions, but we do think INCO employees as a whole will be interested in the procedure which has been established to ensure the safety of the men in case of fire in a Company mine.

Standard Practice classes regularly drill this procedure into employees, and periodically a test alarm is put through. The system has also been tested when minor fires have been located underground, and although a major blaze has yet to be experienced, it is felt that the procedure will avoid disaster if that eventuality ever arises.

Procedure varies slightly at the various mines, to accommodate local conditions. Triangle's camera covered Frood for a series of sample shots.

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Sounding Alarm

1 The men discovering the fire underground have, according to the rules set down in Standard Practices, notified the No. 3 Shaft toplander and also their foreman, giving the approximate location and severity of the fire. The toplander, easily recognized by unmistakable contours as the veteran Frank Anderson despite the fact that his face is concealed in the line of duty, has received the call from underground to his office in the collarhouse. His first act is to despatch someone qualified to operate the stench machine in the small room which houses it across the collarhouse. Then he notifies the compressor man to blow the fire whistle. He sends an assistant across to No. 1 Shaft, where the ventilation fans are located, to break a bottle or "bomb" of stench in front of one of the fan intakes, so that in an instant the odor will be "gone with the wind" to the underground workings. Then he spreads the general alarm by underground and surface telephone wires. This done, he posts men at the entrances to No. 3 Shaft collarhouse to prevent anyone entering in case gases are coming up the shaft, and then he seals up the door of his office with clay, opens the windows, and stands by his telephone.

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Stench Machine

2 The toplander for the next shift, Earl Passi, was just coming on duty when the alarm came in, so it was he who hustled across the collarhouse to put the stench machine in operation and release into the compressed air lines the ethyl mercaptan whose odor will reach, within 10 minutes, the furthest heading in the mine in which compressed air tools are being used. And there's something about that rotten onion smell that leaves no doubt in the mind of a miner as to what's up.

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First Aid Man

3 Another key figure in spreading the alarm is the First Aid man, in this case Bert Debney. His first call is to Tom Fee at the government Rescue Station, who will arrive promptly with his special mine rescue equipment. Then the First Aid man proceeds with further telephone organization, notifying various key men in the Company and calling out the rescue team. He also places in readiness a special First Aid kit which can be taken underground in case of emergency, and which is seen in the foreground.

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Plan Methods

4 Headquarters have been established in the office of the mine superintendent, F. J. Eager, who is seated at the right. Because the danger to the men underground is not from the fire itself, which is localized, but from the gases arising from it, which may travel anywhere, the first consideration is how best to bring the men out safely, after which it can be decided how to attack the fire. Chief Surveyor George Thorpe has before him a plan of the mine ventilation system, and is pointing out the location of the blaze to the ventilation engineer, Bruce Seli, and the safety engineer, Jack McAndrew.

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Refuge Station

5 In the meantime, underground, foremen and shift bosses have seen that the men check out as usual and go to their respective refuge stations, the men to the main refuge station in their particular area and the stope bosses to the supply station. The foreman or senior boss present goes with the men to the refuge station. Once all men are accounted for inside this sanctuary, the steel door is shut and packed around its edges (see photo) with clay from a box which is kept in readiness in the station at all times. Drains are also plugged, so that no gases may enter. Then the compressed air lines are turned on, and a small opening in the door is uncovered in order that exhaust air may escape. Electric lights, fresh water, and a telephone to surface through the fireproof No. 1 Shaft are provided. So here the men may wait in safety until official orders are received notifying them that it is safe for them to proceed to the appointed escapement shaft.

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Rescue Team

6 Back to the surface swings our story to pick up the next scene in this orderly and carefully planned drama of human protection. The rescue team is ready. Looking like men from Mars in their McCaa self-contained breathing apparatus, which provides them with sufficient oxygen to last them two hours in gas-laden atmosphere, they proceed underground to the reported area of the fire. After locating it and noting its progress, they lose no time in testing the atmosphere in all the passages along which men from the refuge stations will travel when they are released to make way to the shaft. Then the rescue team returns to surface and reports to the conference in the superintendent's office. It is decided that the fire must be sealed off with a brattice or partition to prevent further escape of gases and make it possible for the mine ventilation system to clear the air in the passages to be travelled. Once again the rescue team goes underground, this time with the specially-equipped fire truck which is in readiness at all times in the collarhouse. Photo shows them about to leave the shaft station on the fire level for their job of building a brattice to seal off the source of gas. Hand-picked for physical and mental alertness, good habits, courage, self-control and initiative, they undergo extensive government-supervised training for their work.

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Fire Fighting

7 Fire hydrants, hose and extinguishers are available at strategic points throughout the mine, and members of the rescue teams have memorized their whereabouts. Here the captain of the rescue team is attaching hose to a hydrant in preparation for the attack on the fire, the bratticing job having been accomplished in a minimum of time.

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All Clear!

8 Well, the air has been cleared. With the source of gas sealed off, and the ventilation fans capable of pumping fresh air into the mine at the rate of about 400,000 cubic feet per minute, traffic in the passages to the shaft is declared safe after the rescue team has made follow-up tests of the atmosphere. A "come on up" message has been sent to the men in the refuge stations, and they have emerged and proceeded to the shaft for hoisting to surface. In the collarhouse members of the time office and engineering staffs, in this instance Gerry Smith and Bob Hall, check off every man as he comes out of the mine, to see that all are accounted for.

And that, briefly, is the general procedure when fire threatens at Frood. Standard Practices establish in much greater detail, of courses, the tasks which every man must perform in the emergency, and set forth regulations governing activities when fire is located in certain parts of the mine. But essentially that's the system, and to watch how it works in practice is to be impressed by the precision and efficiency with which this menace to mining is brought under control.

Ski Clubs Are Having Big Season

Despite a "snow drouth" which made it impossible for them to get in any actual skiing, the ski clubs at Creighton, Levack and Copper Cliff kept enthusiasm at a high pitch until the weatherman finally gave them a break, and now have activities in full swing.

Fortunate in their selection of a dynamo like Bruce Allen for their president, Copper Cliff Club have realized an old ambition by building their own chalet.

With Charlie Cerre as president, the Creighton Club have also secured headquarters and are in the midst of another successful season.

More favored than either of the others are the Levack skiers, whose trails and hills are considered the best in the district. Jack Carpenter is the leader of the Levack group, who have been hosts to both Sudbury and Copper Cliff excursions.

One manufacturing plant which in 1932 made 1,500 stainless steel cooking utensils in six months, now makes this number daily.

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An article from the December issue of the Engineering and Mining Journal, published in New York.

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The Public Policies Of International Nickel

Although the most important aspect of any company's public relations program deals with its attitude toward and treatment of employees, occasionally an example is found in which the international character of a business demands consideration also of the nationalistic policies of the countries in which the company operates. Under such conditions the public relations program becomes more complex and requires consideration of governments as well as of customers, stockholders, communities, and employees. A case in point is that of the International Nickel Company.

This company is Canadian in its incorporation. The majority of its stock is held in Canada and the United Kingdom, although it has a large number of shareholders, also, in the United States. All of the company's mines and most of its plants and expenditures are in Canada, but the greatest single market for its nickel production is in the United States, which normally takes half the company's output. The United Kingdom figures in the picture importantly both as producer and as consumer and distributor to Europe and other parts of the world. This multiple role is due to the merger of The Mond Nickel Company, Ltd., with The International Nickel Company of Canada to form the present INCO organization. Mond's nickel refinery at Clydach, Wales; the precious-metals refinery at Acton, London; and rolling mills at Birmingham and Glasgow, and its sales and distributing organization, thus became integral parts of the parent company.

From an industrial viewpoint INCO has a variety of relations. It mines and treats ore in a volume which makes it one of the world's largest mining enterprises. It operates four refineries and one conversion plant for separating and refining twelve distinct metals in commercial quantities. It operates rolling mills and a foundry for producing certain of these metals in commercial shapes. It owns two subsidiaries engaged in manufacturing finished products in which its metals are used. And it maintains an international organization of research, development, sales, and technical service to promote the industrial uses of the metals which it produces.

In this connection, the first point to consider is that, despite the fact that the company produces nearly 50 per cent. more copper than it does nickel, and that it has become the world's largest producer of the platinum metals, nickel is the control metal in the company's policy. All other metals are considered as byproducts, their output depending on the amount of ore treated to produce the nickel for which markets can be developed.

The second point is that these markets are developed on the basis of industrial uses for the metal. This has been the motivating force since the election of Robert C. Stanley, now chairman and president, to the presidency in 1922. It has established nickel, primarily as an alloying element, in a steadily broadening list of industrial fields. It has been solely responsible for increasing world consumption of nickel from a low point of less than 20,000,000 lb. in 1922 to 240,000,000 in 1937.

Despite this acceptance of nickel by the industrial world, the general public has not yet completely lost its prejudice that the metal is essentially a war material, a striking example of the patience and persistence required to change public opinion. One might hold that this prejudice could be ignored in view of the steady increase in sales to industry; but the public votes as well as buys.

RELATIONS WITH CANADA

From the national public relations standpoint Canada is the most important country. All of the company's mines and most of the plants are in the Dominion, as are some 60 per cent. of all employees. The dominant Canadian interest in the company is in terms of ore deposits and of primary production from these ores. The position of the company in the Dominion's economy is outstanding. Unlike most mining enterprises which are relatively temporary in nature, it has proved ore reserves sufficient for years to come. In developing the mines which tap these reserves, the company buys many million feet of Canadian lumber each year, as well as vast quantities of other supplies manufactured within the Dominion. The concentrator and smelter at Copper Cliff, Ontario, are topped by the two tallest stacks in the British Empire. Nova Scotian coal is consumed at the annual rate of about 250,000 tons. The company is among the largest purchasers of electric power and the heaviest shippers by rail.

As less than 2 per cent. of its nickel production is sold in Canada, the company is primarily a factor in export trade, bringing into the country many millions of dollars for payrolls, supplies, power, freight bills, taxes, and dividends to Canadian shareholders.

The company is developing its public relations in Canada through a policy of full, frank, and frequent reports to its shareholders (and the public), through institutional advertising in the newspapers and magazines, and through sound films produced for motion picture theatres.

Shareholders receive each year the annual report, which is notable for the fullness of its text and accounting; the president's address to shareholders at the annual meeting; quarterly financial statements for each of the first three quarters; a special letter from the chairman and president with each of these statements, and the president's annual review of the nickel industry, which is a detailed summary of significant developments in the uses of nickel and nickel alloys in world industry. These various documents are also distributed to the press and other media of public information.

The institutional advertising, now in its seventh year, consists of a series of full-page advertisements appearing in 44 newspapers and periodicals. The theme of the current series is the prevention of breakdowns through the use of nickel alloys for equipment parts.

Three one-reel films with sound have been produced primarily for showing in the Canadian theatres, the purpose being to bring home to Canadian audiences the extent of the nickel operations, the difficulties encountered in mining and treating the complex ores, the extensive use of Canadian labor and supplies, and the part which Canadian nickel is playing in industry the world over. These films have a record of showing in more than 90 per cent. of all the theatres in the Dominion. "This Changing World," the latest in the series, was so successful that it has been introduced into American theatres with a slight revision.

An illustrated magazine, "The Inco Triangle," is published bi-monthly for the benefit of the Canadian employees. It has no public circulation, except as it is taken home and read by the families and friends of the workers.

When the British Empire Economic Conference met at Ottawa in 1932, a 44-page illustrated booklet, entitled "The Story of Nickel," was distributed to all the delegates, as well as to Canadian officials and editors, to present the case for free world markets for nickel. The booklet was later reprinted in a popular edition.

The annual meeting of the Canadian Institute of Mining and Metallurgy in 1933 was made the occasion for celebrating the fiftieth anniversary of the Canadian nickel industry. Mr. Stanley and Premier Bennett were the guest speakers at the annual dinner, their speeches being broadcast on a Dominion-wide hook-up; and papers on various phases of the nickel industry were featured in the technical sessions. To commemorate the anniversary, the company established for award by C.I.M.M. a platinum medal for conspicuous service to the mining and metal industries of Canada. The medal was modeled by R. Tait MacKenzie, distinguished Canadian sculptor; and it has become the most prized award of the Canadian Institute. It is generally referred to as "the INCO platinum medal."

Although an important part of the company's productive plant is situated in the United Kingdom, the main public relations problems there are in popularizing industrial uses of nickel and in maintaining healthy personnel relations in the various works and offices. These parts of the program are discussed in the following.

Naturally, the British shareholders (and the press) receive the same literature as that regularly distributed in Canada and in the United States.

The main objective of the public relations program in the United States is to sell more nickel. Even though approximately 100,000,000 lb. were sold in 1937, American industry is by no means saturated with nickel and nickel alloys. There are three production units in this country, and labor relations necessarily loom large in the company's program.

The principal American unit is the Monel conversion plant and non-ferrous rolling mill at Huntington, W. Va., where Monel is produced from special Canadian matte, and where this alloy, pure nickel, and the nickel-chromium alloy, Inconel, are rolled into standard commercial shapes. The other two producing units are a foundry at Bayonne, N.J., and a plant at Cambridge, Mass., for

manufacturing Monel hot-water storage tanks.

RESEARCH, DEVELOPMENT AND MARKETING

In 1922 nickel, which had become almost a precious metal through the exigencies of war-time demands, surfeited the market. Production facilities had been greatly expanded, unused war stocks were still to be liquidated, and the then most important field of consumption had been destroyed by the disarmament conference. Popularly considered a war material, nickel had small place and few friends in a world revulsion against war. Scarcely seventeen years later nickel has become so inextricably woven into the fabric of world industry, that much of the performance which we now expect in transportation, communications, and manufactured products depends on uses of that metal.

How this about-face in the status of nickel has been achieved in so short a time is one of the great examples of successful public relations. It is based on a policy of first learning, then doing, and finally talking. Thorough-going research was instituted into the properties of nickel alone and as a constituent of various alloys. What was learned was carefully tested in the laboratory, then demonstrated under conditions of commercial production, and finally made the text of intensive educational programs in the appropriate industries. As one application after another was successful, other industries became interested in seeing what they could do in related or similar spheres of industrial enterprise. Metallurgical research was stimulated in various fields. The age of alloys began to take form, and nickel held its place as a common denominator among many of the new metallic combinations.

Behind this development there has been a single dominant leadership which is inspired by faith in the product and faith in research, development and advertising. The research laboratory at Bayonne, N.J., has twice been expanded and modernized to keep pace with the demand for ever more exact knowledge of nickel and nickel alloys, and of their behavior under even more exacting conditions of use. Since the incorporation into INCO of the Mond company, its laboratory at Birmingham, England, has greatly strengthened research facilities. This laboratory, which also was recently enlarged, is said to be the largest and most modern institution of its kind to be maintained by any industrial corporation overseas. These research facilities have been further strengthened by the construction of a modern laboratory at Copper Cliff, Ontario.

Supplementing the research staffs both here and abroad are corps of metallurgists whose function it is to offer technical service to industries in the introduction and adaption of nickel and nickel alloys to their special needs.

The success of the technical service has been such that the New York headquarters of the development and research division can no longer handle the requests for aid, and branch offices have therefore been established in Detroit, Chicago, Pittsburgh, Los Angeles, Hartford, and Toronto.

Further expanding this missionary work to world industry, nickel information bureaus have been established in Paris, Brussels, Milan, Frankfort, and Tokyo. These outposts are centres for collecting and referring back to headquarters information on important metallurgical developments in their territories, and for translating and circulating to their constituencies pertinent reports and literature. Thus the whole industrial world is covered.

Supporting this distribution of personal service is the program of trade and technical magazine advertising, direct-by-mail circulation of reports and leaflets, and the publication of periodicals for free distribution to specially prepared mailing lists which, in certain instances, contain more than 100,000 names.

PERSONNEL RELATIONS

At the end of 1937 the company's employees totalled 17,434, distributed as follows: Canada, 11,486; Great Britain, 3,421; United States, 2,472; other countries, 55. Each of the main geographical divisions has its own living standards and labor psychology. Each type of employment has its own working conditions. Thus the personnel programs differ in detail with plant location and activity, but there are certain general policies. These are:

1. **Retirement System:** Established Jan. 1, 1928, for all employees, it is financed by the company and provides for disability retirement as well as for service retirement, and also for death benefits. Government bonds to the amount of nearly $13,000,000 are currently held against the retirement system reserve.

2. **Non-occupational Insurance:** The company provides for contributory non-occupational accident and sickness insurance benefits for all its employees, who are paid on an hourly basis. This insurance provides a weekly income during absence from work as the result of non-occupational accident or illness. The company contributes approximately half the premium cost. Although the plan is optional, nearly 98 per cent. of eligible employees have elected to participate.

3. **Group Life Insurance:** The company has made available to all employees in the United States and Canada a group life insurance program which permits them to take out insurance at group rates. Upwards of 10,000 employees have taken advantage of this opportunity.

4. **General Welfare:** During the last nine years the company has expended more than $1,000,000 for recreational and welfare activities. This is in addition to all operating expenditures having to do with protecting the health and welfare of employees while actually at work, and also is in addition to the accident and sickness insurance and to the reserves maintained for the retirement system.

5. **Twenty-five Year Clubs:** Although the present corporate structure is less than ten years old, it contains elements which date back nearly fifty years in the case of the Canadian Copper Company and more than a century in that of the Wiggin Works, in Birmingham, England. The average service age of the president, four vice-presidents, and secretary-treasurer is almost 30 years, and this length of service is reflected in a notably stable personnel. The twenty-five year clubs in Canada, the United Kingdom, and the United States, which currently have a total membership of 591 persons, have therefore become an important factor in the company's tradition, and their annual dinners and welcoming of new members have become notable occasions.

6. **Inter-plant Education:** With so far-flung an international organization, including several units important in themselves, it has become increasingly difficult for the individual, or even the group, to visualize the entity and accept his or its relation to the whole. To overcome this difficulty a series of motion picture films has been prepared for showing to employee audiences. Each of these films depicts the plant and processes of a particular unit, thus providing an opportunity for the men of the rolling mill at Huntington, W. Va., for example, to understand the extent of operations in the rolling mill at Birmingham, England, and the staff of the electrolytic nickel refinery at Port Colborne, Ontario, to appreciate the part which the Mond refinery at Clydach, Wales, plays in producing Canadian nickel for world markets.

Black nickel, an electro-deposited alloy containing nickel, zinc and sulphur, is being used over white nickel plate for certain decorative applications.

Louis Chonka First Employee

The distinction of being the first workman to be employed on the construction of the Port Colborne Refinery goes to Louis Chonka. He was hired by the Foundation Company (contractors for the construction of the Refinery) in September, 1916.

Louis is one of the best known and most versatile mechanics in the plant. At the age of fifteen in Hungary, he began learning to do mechanical work and learned the trades of cooper, mason and millwright. He did not want to do compulsory military service so he left Hungary for Canada at the

age of 21. He came to Sherkston to live with friends there. This was in March, 1907; so that makes Louis 53 years old.

For about nine years Louis worked in the Sherkston locality, for Empire Limestone Company and Karl Bros., who operated a sand and gravel pit. He started with a pick and shovel, but soon was promoted and held various jobs, brakeman, hoist runner and track foreman with Empire Limestone Company, and then went with Karl Bros. as foreman.

LUCKY VISIT

On a visit to friends in Port Colborne in September, 1916, he heard the big news of the new Nickel refinery to be built here. With about 25 other men, he presented himself for employment and was the first man selected by the Foundation Company foreman. He started as a rod man and continued at various jobs with the Foundation Company until he was absorbed in the Nickel Company's mechanical department in April, 1918. He worked on shop machinery installation and then continued on shop operation work.

At present Louis is welder par excellence and expert scale mechanic, but he has worked on crushers, calciners, clocks, locks and almost any piece of mechanical equipment in the plant. Grandfather clocks, locks for which keys have been lost, jammed machinery, all yield to his inventive turn of mind. Many gadgets have been made by Louis to facilitate mechanical work in the plant.


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Many Sons Are Joining Fathers in INCO Employ

A company's purchases of supplies, its expenditures for freight and taxes, the dividends it returns to shareholders, its program for the welfare of those who work for it, the money it distributes in payrolls—by these things often is measured its contribution to the national fabric and its value to the country. Often overlooked is another natural consequence of firmly established industry, and one which invariably indicates that a company's roots are deep and strong in the land whose resources nourish it. When a glance through the payroll shows that sons are taking places beside their fathers, and that a new generation is coming up within the ranks of the employees, then a company has become an institution.

Although it is still a comparatively young organization, INCO can be proud that there are many father-and-son combinations on its force. Every plant boasts several, and to introduce some of them to its readers, Triangle turned its camera lens on the following, reading in each case from left to right:

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Coniston

1 The Coniston representatives picked for this father-and-son survey were Bill Blake and his boys. Next to smelter work, their steadfast occupation is scanning sport pages for the latest dope on the sensational hockey career of still another son and brother, the toast of Coniston, "Toe" Blake. Despite the fact that Montreal Canadiens, a la Copper Cliff, are sighing in the cellar of the National Hockey League, "Toe" is battling away with Johnny Gottselig of Chicago for top spot in the individual scoring records. It takes a hot hockey player to do that with the league's weakest team hanging like a millstone around his neck, and the whole INCO family is pulling for this ex-Woofer in his fight. The Blakes, the dates on which they enrolled with INCO, and their occupations at Coniston, are: Aldege, September, 1926, converter foreman; George, January, 1939, smelter labor; Snell, April, 1929, chemist; Bill, the dad, seated, April, 1921, motorman. Another son, Leonard, is a pumpman at Frood, where he has been since September of 1929.

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Levack

2 There is peace and contentment in the Serpell home at Levack when son Jack plucks gently at the strings of his guitar and produces soft Hawaiian strains, but when he picks up his cornet, tilts it at the chandelier like a coyote pointing his snout to the moon, and becomes a second Benny Goodman, the protests are both visible and audible. Pere Paddy claps his hands over his ears and makes no effort to conceal his pain, while brother Roy tries to muffle the mouthpiece. Jack is a machinist's helper and started work in September, 1937. Roy has been on the job since May, 1935, and is an apprentice. Paddy's service dates away back to 1916, and he's master mechanic. If his hands hadn't been busy when the picture was taken he would have been rolling a cigaret, because that's his most natural position. You can see the Bull Durham tag sticking out of his pocket. He is famous for a vocabulary of classic expressions and descriptions; he has a name of his own for everything. For instance, riggers are "scorpions," carpenters are "wood-butchers."

Frood

3 Both Jim Regan and his son, Bill, are enthusiastic golfers, and the camera caught them looking over a nifty new set of clubs which arrived at Christmas. Bill is probably extolling the virtues of his 300-yard-drive grip. If that's the case, there's no need to explain the indulgent smile on his father's face. Chief Timekeeper at Frood, Jim Regan has a service record dating away back to 1906. Bill has been with the company since 1934, and is a timberman's helper at Frood. His career as a hockey star has already been covered in Triangle (February, 1937). As far as is known, he is the only hockey player ever to return from professional ranks to amateur status and then play on an Allan Cup championship team. Retired now from senior competition, he is this year doing a defence job for Frood's entry in the intermediate playdowns.

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Creighton

4 At Creighton the Villeneuve family were suggested as an example of father and sons in INCO employ. John, with the Company since May, 1934, is a steel sharpener's helper. Angus Villeneuve, the father, has been a familiar figure around Creighton since September of 1913, and is a shift boss. Grant, the second son in the business, was enrolled in August, 1933, and is a timberman.

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Garson

5 Garson produced Nestor Mattson and his son, Olavi, for the father-son page. With the Company since November, 1915, Nestor Mattson is a shaft inspector. His son may be a first-class chute blaster, but he is much better known as a top-flight goal blaster with the championship Garson Gunners football team. Apparently good enough to play almost any position in the field, he usually appears at centre half, and is regarded as one of the club's most valuable performers.

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Port Colborne

6 From Port Colborne we learn that there are no less than 51 father-son combinations working in the refinery there, and of these the largest representation is Robert Rivers I, et al. Three of his sons are in the employ of the Company, and the fourth is with the contractors who are working on the electrolytic building roof replacement, which after all is practically just upstairs. So four of them there are, as follows: Robert I, 16 years' service, boilermaker foreman; Robert II, three and a half years' service, electro shears; Jack, five and a half years' service, blacksmith; Victor, two and a half years' service, electrical helper; Alfred, roofing contract. Then there is Robert Rivers III, son of Robert II, but he has not yet reached employable age.

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Ontario Refining

7 Another Refinery family, this time from ORCO, has three sons with the Company. The Picards, pictured here in a "jam session" at their Minnow Lake home while their father listens in, are of a family of 12 children. Their names, dates of service, and occupations: Rene, May, 1934, casting department helper; Arthur, February, 1931, millwright; Roland, August, 1938, inspection; Henry, the father, July, 1930, millwright foreman.

★ ★ ★

Copper Cliff

8 Representing Copper Cliff are Bill Jessup and his son, Dalton. Unless the printers cross us up on their presswork schedule, Bill Jessup will be celebrating his 23rd anniversary with INCO on the day this issue of Triangle is distributed, February 21. He's a crusher foreman in the smelter. Dalton, better known as "Nifty," is a clerk in the paymaster's office, has been with INCO since November of 1928, and is recognized as one of the most vociferous rooters ever to back a Copper Cliff hockey team. The family's favorite radio program, Charles the McCarthy, has just been tuned in. "Nifty," it would seem, does not entirely approve of it.

Bowling Still Major Club Item

Bowling continues to be the major attraction at INCO Employees Club, although badminton, basketball and bridge are all big features of the program.

As Triangle went to press the best individual score of the month was credited to C. Mason, of Frood, who knocked 'em over for the fine aggregate of 358. Others over 300 were C. Burton, 341; T. Hennessy, 331; L. Trahan, 325; M. Bray, 307. Among the ladies Mrs. Ernie Steadman was out in front with the remarkable score of 319, considered an exceptionally good count for lady bowlers. Others of the fair sex with large tallies were G. Jones, 288; L. Dunn, 265; M. Craddock, 258; V. Woods, 251; I. Cumming, 248.

Standings of the teams in the various leagues follow; the number of wins and losses being given in that order in each case:

FROOD LEAGUE

C. Mason, 18-2; Hurd, 15-5; Stevens, 14-6; Scott, 14-7; Stone, 13-7; Van Hamme, 13-7; Kilby, 13-7 McGee, 12-8; Inglish, 12-8; Gilchrist, 12-8; Price, 12-8; Gordon, 12-8; Boyce, 11-9; Henry, 10-10; Charsley, 9-11; Amon, 9-11; Fields, 9-11; Moore, 8-12; Aylings, 7-13; Thirkill, 6-14; Pickard, 6-10; Andrews, 6-14; Elford, 6-14; Goldie, 6-14; Krufske, 4-16; Parker, 3-13.

COPPER CLIFF

Carleton, 14-2; Edward, 11-1; Charron, 10-2; Trahan, 11-5; Gillen, 7-5; McDonell, 7-5; Orasi, 7-5; Lawson, 7-5; Johnson, 7-5; Crowthers, 7-5; Carrol, 6-6; Wooten, 6-6; Hodges, 6-6; Roper, 6-10; Morrison, 5-7; Halliwell, 5-7; Lafleche, 5-7; Knuth, 4-8; Pitchford, 4-8; Thoms, 4-8; Wilson, 3-9; Sheppard, 2-10; Ramsay, 0-12.

LADIES' LEAGUE

D. Paul, 10-2; H. Hammell, 10-2; W. Knuth, 9-3; H. Myers, 7-5; R. Carleton, 7-5; S. Kupchank, 7-5; A. Turner, 6-6; V. Woods, 5-7; O. Mahon, 5-7; H. Stevenson, 5-7; E. Armitage, 5-7; L. Williams, 4-8; A. Setton, 3-9; M. Edwards, 1-11.

An average attendance of 35 is turning out each Wednesday to the newly organized ladies' gymnasium classes which are being conducted at the Club by Mrs. Ottosen. Pleasant as well as beneficial, the classes are proving very popular.

Introduction of bowling and other games has resulted in considerable increase in the interest being shown in both the boys' and girls' gymnasium classes. Joe Costigan, coach for the boys, now has an average of 50 in his group of Wednesdays, and approximately the same number are turning out for the girls' classes under Miss Verna Cliff.

Warehouse On Big Store Scale

Just like a big store, except that requisition slips take the place of money and there are no charge accounts or bargain days, Copper Cliff warehouse handles a range of supplies that would make many a hardware merchant's eyes jut out like the stops on an organ. Its corridors of bins and shelves, avenues of castings and regiments of reels and cylinders cover a floor area of 8,540 square feet.

1 Big shipments are trundled through side doors onto trucks for delivery to different parts of the plant, but smaller supplies go over the front counter. "Customers" present slips from the heads of their departments, and carry away the materials they want. Here is a group from various sections of the smelter giving the counter a brisk early-morning run of trade.

2 Just one rather sizeable item issued at the warehouse are common garden-variety, every-day pails. In 1938 a total of 2,306 pails went over the counter. Biggest pail customers are the masons.

3 It takes a good deal of office efficiency to keep tab on what goes in and out of the warehouse, since inventory must be maintained from day to day and there are more than 11,000 items on the books. Because operating costs must be tabulated by every smelter department, the warehouse must charge all supplies to the department receiving them, and that takes a spot of penwork, too. This view of the office staff hard at work will probably, incidentally, be something of a shock to Pete Stuart (extreme right) when he sees what's happened to the top of his head in the past few years.

4 In dozens of bins the warehouse keeps its stock of bolts and rivets, and by thousands it issues them. To be exact, last year it turned out a total of 420,118 bolts and 62,585 pounds of rivets. Machine bolts were most in demand, of course, and more than 330,000 of them were issued, in sizes from one-quarter-inch to two-inch.

5 No less than 40 different types of electric lamps are carried in stock at the warehouse, and in 1938 more than 52,000 of them were issued. The 100-watt size led the field, topping the 24,000 mark. Photo shows a section of the electrical supply department, which also handles miles of wire and cable. Inset, with a lead pencil for comparison of sizes, are the biggest and the smallest lamps handled. The tiny fellow is a two-amp. bulb used in dictographs in the general office, and the big one is 1,000 watts. The most powerful lamp carried is 1,500 watts, but it has less bulk than the 1,000-watt type.

6 This looks like a scene from shearing time back on the old rancho, but actually it's a supply of rock wool insulation leaving the warehouse for the Cottrell plant, where high temperatures demand careful insulating measures. Rock wool is also used extensively throughout the plant for insulating steam pipes.

7 This phalanx represents one of the largest items on the warehouse books. Last year some 50 carloads of oxygen and acetylene cylinders crossed the floor from freight cars to delivery trucks. Of acetylene there were 3,180 cylinders containing a total of 781,675 cubic feet, and because the ratio of oxygen to acetylene in burning is about six to one, there were 16,993 cylinders of oxygen containing 2,747,120 cubic feet. With a No. 2 tip on a torch, this quantity would be sufficient for cutting a strip of steel plate half an inch thick and 110 miles long.

8 Comparatively little blasting fuse is used in smelter operations, but Copper Cliff warehouse handles fuse for all INCO

12 Wins — No Losses Their Record to Feb. 10th

Port Colborne refinery hockey team, dubbed "Metallurgists" in their Intermediate "A" group of the O.H.A., have been blazing a trail of victories this season. The coaching of the veteran Sailor defenceman, Walter Horne, has produced wonderful results in this lineup. Their goalie, Walker, is a league standout, and the scoring prowess of the Concessi brothers, "Jiggs" and "Umbo," has been another big feature. In a scheduled match with Thorold it was a real Concessi Night; "Jiggs" and "Umbo" ran wild and accounted for eight of their team's 10 goals. Left to right, back row: F. Gallinger, executive; C. Hilson, executive; W. Zuck, sub goalie; H. Boyer, forward; F. Oneil, forward; A. Stubbins, forward; J. Sacco, forward; L. Gonyou, defence; H. Ellsworth, manager; W. J. Freeman, O.H.A. representative. Front row: U. Concessi, forward; C. Wells, forward; V. Huffman, forward; O. Roy, forward; R. Brown, defence; M. Walker, goal; W. Horne (coach) defence; K. Gallinger, defence; J. Morrison, forward; L. Concessi, forward; J. Forbes, mascot. The entire Port Colborne plant personnel is pulling for a championship for the squad.

mines so an imposing quantity is built up for this inventory item, too. In 1938, for example, 12 carloads were brought in, containing almost 8,000 reels or more than 23,000,000 feet. Stretched out in one length, it would have reached from Montreal to Calgary, and back again, and, if some adventurous sprite had touched a match to one end, it would take 30 years to burn. Which is even slower than Clarence Buck's pipe.

Here's another view on the main floor of the warehouse, and another idea of the range of materials carried. In the foreground are some of the castings, of which more than 2,000,000 pounds were bought locally alone in 1938. Those tall brass cylinders on the right are inner and outer bushings for the eccentric of a Symons cone crusher. The huge gear wheel, which is more than eight feet in diameter, is a spare ring gear for the electric shovel at the Garson sand pit. Biggest gears carried in stock are the master gears for the roasters, each of which weighs 5,333 pounds. And in the background is part of the supply of piping kept on hand. Last year the warehouse handled half a million feet of piping, in sizes from one-eighth of an inch up to three inches. In somewhat the same category come punch bars for the converters, tapping bars for the reverbes, and poker bars for the cupola furnaces. In 1938 about 115,000 of these were issued, with a total weight of almost 2,000,000 pounds.

Many a big item never reaches the warehouse floor, but is either stored separately or is delivered straight to the department in which it is to be used. Take brick, for instance. Through the separate shed where it is kept went more than 150 carloads last year, with a weight totalling some 13,000,000 pounds.

Playoff Time On Hockey Front

It's playoff time in hockey. It's the time when friendships are forgotten, form charts are feverishly fingered and sport seers go screwy. It's the period when playoffs to right of him, playoffs behind him and playoffs in front of him, mean nightmares for the Triangle's puck yogi. Compared to the cluttered condition of the ice scene, that "Valley of Death" the Third Book poem tells about was a cinch. The cannons there finished off the mistake of whomever sent in the "Six Hundred." The poor scrivener's mistake will live till next year in a hockey family as hot and clearly divided as INCO's is.

In senior hockey it's Creighton and Frood for the Swenson Cup. Series dates in senior circles were set out as February 13, 17, 20 and, if necessary, February 22 and 24.

Intermediate hockey finds Frood and Copper Cliff squaring off. They seek the United Cigar Stores trophy and the right to proceed in N.O.H.A. intermediate playdowns.

Junior hockey will feature Coniston or Frood against Copper Cliff, the winner to meet Sudbury Canadian Legions. The age-limit lads are going for the Hiram Walker trophy and, also, a crack at outside junior forces.

And now should be the time for your correspondent to go out on a limb and say what the finish will be. For, while this Triangle doesn't roll off the presses till midway through the finals, this story is being written on the eve of the battles.

But the way the puck forces shape up this year, no limb looks safe for even the most conservative prophet.

In the senior race, Creighton and Frood have been knocking one another off all year. Creighton had a one-game edge in victories on the season's record. The squads were neck-and-neck in scoring, too. Dillon Brady, Frood winger, topped the parade with 21 points, but "Nick" Nicholson, Creighton centreman, had 20 points.

Mel Carey in Frood's goal had two shutouts and Leo Sargent got one perfect night in Creighton's hempen home.

So, maybe your correspondent doesn't lack "moxie" in steering the middle course. Taking the two teams on pre-playoff showings, Creighton seems to have more balance on the front line. Frood packs a little more punch back of the blue line. The goalies are about even. Creighton has shown more fire throughout the schedule, but, Frood may find its spark-plug during the series.

Actually, play throughout the season is of little help in calling the playoffs. It's man-for-man hockey now, far different from what the schedule featured. In its grim tension and the background of the prize at stake, playoff hockey makes up for what it may lack in open play. So for all of us, you can write your own ticket in the senior series. Take a blindfolded pick and bet the choice with confidence.

In intermediate hockey it's just as hard to call. Bill Regan's bouncing buckos from Frood 3100 level made a real comeback against Copper Cliff. The light Copper Cliff squad waltzed to a 3-2 victory over Frood on the Palace Rink's cozy surface. All the experts said Frood, a big heavy team, had its only chance on the Sudbury surface, which fits rather tightly under the goalie's arms. But, when the checks were down at Stanley Stadium, where Copper Cliff was supposed to run away with the Froodians, it wound up 6-3 for Frood.

Junior hockey does not bring much solace to the INCO hockey family. Sudbury Legions look like the team there, but, don't sell Copper Cliff short. Copper Cliff should knock over whichever of Coniston or Frood emerges in the playoffs. But, in a tussle with the Legions the Sudbury squad should pick up the marbles.

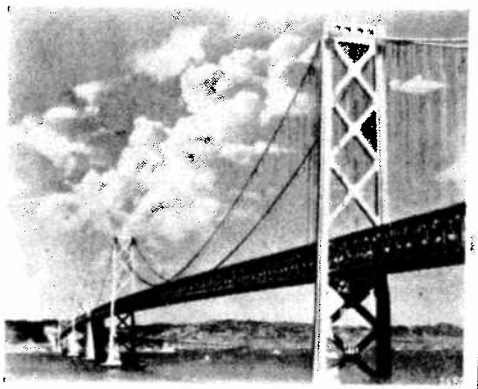
Don't figure we're calling Legions over the Cliff, though. That neck is no longer and no tougher than it was for senior crystal gazing.

. . . in bridges

The longest steel bridge in the world is the great San Francisco-Oakland Bay Bridge pictured below, which covers a distance of eight and one half miles, with the length of actual bridges over open water amounting to four and one-half miles. Into this bridge went 3,680 tons of 3½ per cent. nickel steel for anchor plates and structural sections and 370 tons of heat-treated nickel-chromium steel for pins in the cantilever portion. A total of 200,000 tons of steel was used in the entire series of structures which link communities having a combined population of about 1,250,000.

The bridge consists of two structures, each of which is anchored at Yerba Beuna Island in the bay. There are two levels of traffic, the upper level which accommodates six lanes of passenger car traffic and the lower level which allows three lanes of truck traffic and two interurban car lines. The connection of the two structures on either side of Yerba Buena Island required the construction through the island of the largest vehicular tunnel ever built, the double deck roadway of which accommodates the full stream of traffic from both bridge levels without narrowing.

One of the greatest engineering problems encountered in undertaking the huge project



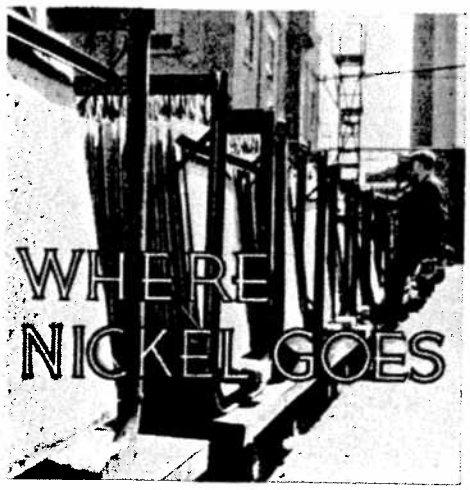
was that of reducing weight without consequent loss of strength, especially in highly stressed parts of the structure. It was here that the nickel alloy steels proved invaluable. Use of the high strength nickel steels made possible lighter members with consequent reduction in calculated dead load and in earthquake stresses. Were it not for the high strength alloy steels, many of our long span bridges would not be feasible.

The use of nickel alloy steels for bridges dates from 1903 when 6,000 tons of nickel chromium steel were used in the Queensboro Bridge which spans the East River in New York connecting the island of Manhattan with Long Island.

In the construction of the present Quebec Bridge, the original structure failed during its erection, whereupon a Board of Engineers was created in order to make painstaking and exhaustive studies of all phases of the project. After extensive tests, some 16,000 tons of nickel steel were included in the finally completed structure.

PORTABLE ROADWAY

Where busy thoroughfares cross equally busy waterways in Chicago, bridges have to be both strong and mobile. The world's largest bridge of its kind has recently been installed to span the Calumet river at 134th Street. It is a vertical lift which raises a 1,525-ton section of the roadway between towers to give a maximum clearance of 200 feet above the water. Features of the mechanism are eight buffer cylinders of nickel cast iron, which brake the vertical movement at the limits of travel when the bridge is raised and lowered.



. . . in the home

A combination kitchen unit which has been designed to handle every function of the home kitchen except refrigeration is shown in the photograph below. The sink and gas range are constructed in one complete cabinet unit, the entire top of which, including the sink bowl, is stamped out of "Monel" in order to obtain a continuous working surface of the corrosion-resistant solid metal with no cracks or spaces where food and dust can collect.

The new equipment has been designed primarily to provide rust and acid resisting working surfaces for kitchens in apartments and in small houses where limited size places a premium on available space and demands a maximum of convenience and efficiency. Its cabinet provides space for storing supplies of food, for pots and pans or for other kitchen utensils. Its range section includes four gas burners, an oven and a broiler.

In order to provide more working space on the top of the combination unit, it is possible to use a solid monel drainboard which completely covers the range top, fastening over the sink side when the range burners are not in use.

Although first designed and intended for small kitchens, the continuous monel surface

idea has proven so practical for kitchen cleanliness and efficiency that the unit has been further developed to extend with its unbroken surface for any desired length. In cases where larger cooking facilities are required, the range section can also be enlarged to desired proportions.

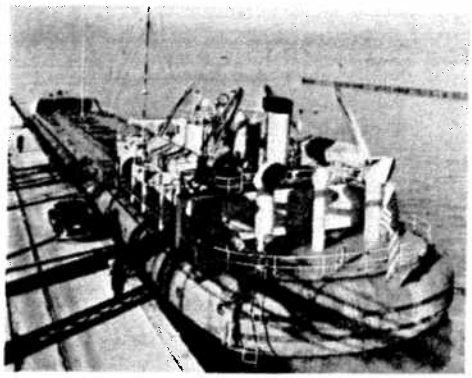
"Monel" has come into home kitchens only after having first been thoroughly tested during more than a quarter of a century in the kitchens of hotels, restaurants, hospitals, food processing industries and other institutions. Its first appearance in the domestic role was in custom-built sinks but its acceptance has been so popular that leading manufacturers of various kitchen equipment now use it to top their products.

. . . in ships

What is the most thorough protection against corrosion to the cargo of any freight vessel ever built, has been accomplished in the tanker Dolomite 4, pictured below, by the use of pure nickel sheet for lining the five main holds. It took over 60,000 pounds of nickel for the installation, which also includes a centrifrugal discharge pump as well as discharge pipes lined with nickel. Through the use of nickel-lined holds, the Dolomite 4 can carry such a diversity of wet or dry cargoes as kerosene, wheat, gasoline, lye, crude oil, potatoes, liquor and flour, changing from one highly corrosive bulk cargo to another in the short space of five or six hours.

On her maiden trip, Dolomite 4 carried 1,000,000 gallons of waterwhite kerosene, the first time that that liquid had ever been transported in bulk by water. After the trip, the tanks were cleaned and filled with water for ballast purposes, the water being so clean that members of the crew jumped in for a swim. Cleaning is accomplished by introducing live steam into the holds. A special boiler in the vessel provides the steam.

The tanker herself is one of the most revolutionary in design and construction ever



to come into any port. For one thing, she was never launched. Built in an abandoned lock in the Erie Canal at Pittsford, New York, she was floated by admitting water to the locks, then opening the gates to permit passage to the canal and thence to the Great Lakes.

What is most unusual about the tanker is that she is ribless and rivetless, having been built entirely of electrically welded steel channels or "U" beams, bent to a cross-section shape of the ship. The vessel is readily convertible from ocean to Great Lakes service, the 50-ton deep-water deck-house being removable by crane so that a forward pilot house can be substituted for lake work. She is now operating between the Atlantic seaboard and the Gulf of Mexico.

APPOINTMENTS

Effective January 1st were the following appointments announced by Vice-President Donald MacAskill: F. Benard as Assistant to the General Superintendent of the Mining and Smelting Division; R. H. Waddington as General Superintendent of the Ontario Refining Company Ltd.; R. Hewgill as Assistant to the General Superintendent of the Ontario Refining Company Ltd., H. A. MacDougall as Chief Metallurgist of the Ontario Refining Company Limited.

Eighty-eight different kinds of nickel alloy steels have been approved by the Society of Automotive Engineers for use in passenger cars, buses and trucks, the nickel contents ranging from a fraction of one per cent. to 32 per cent. Twenty-eight separate vital parts of the automobile chassis make use of these alloy steels.