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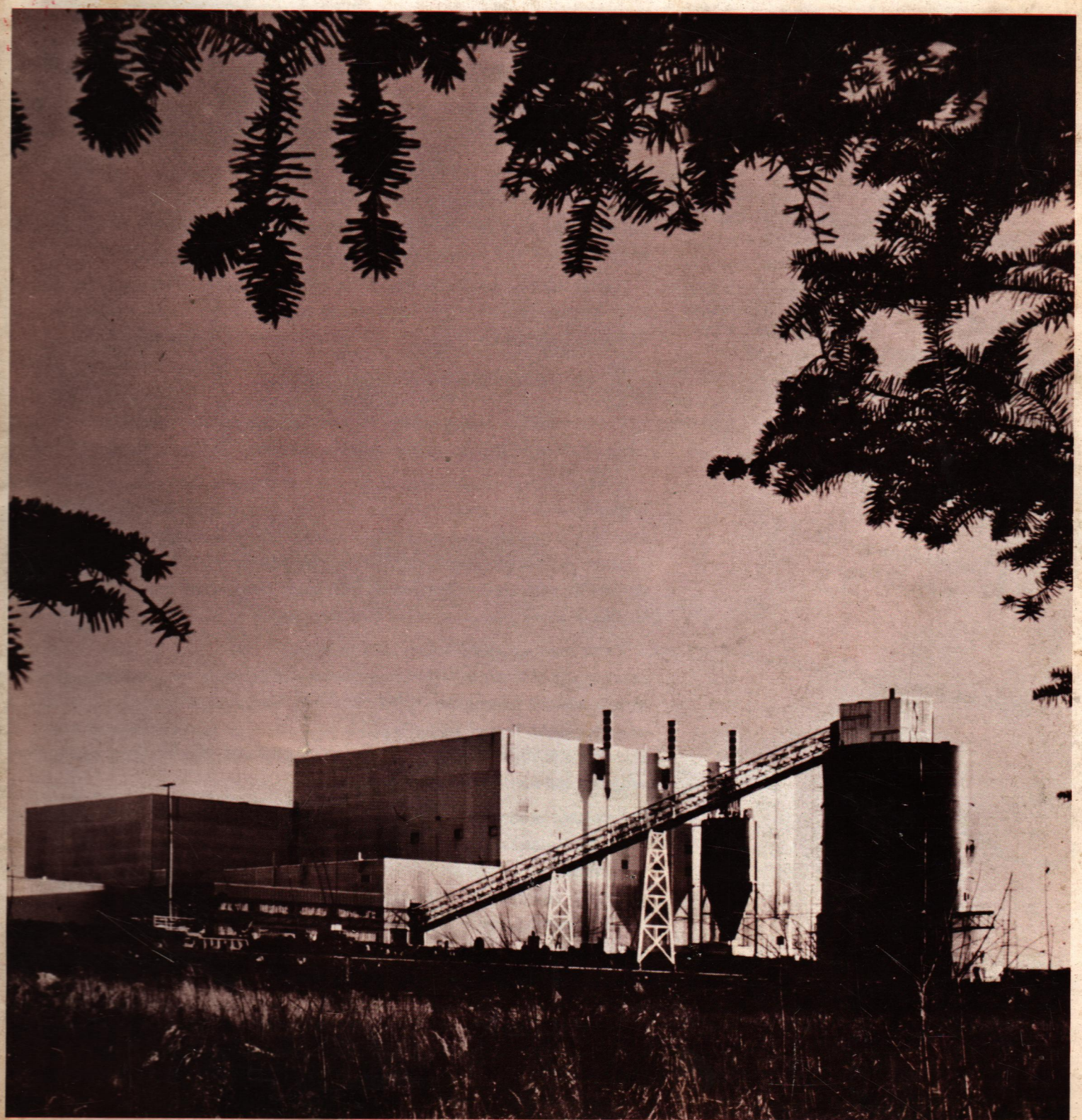
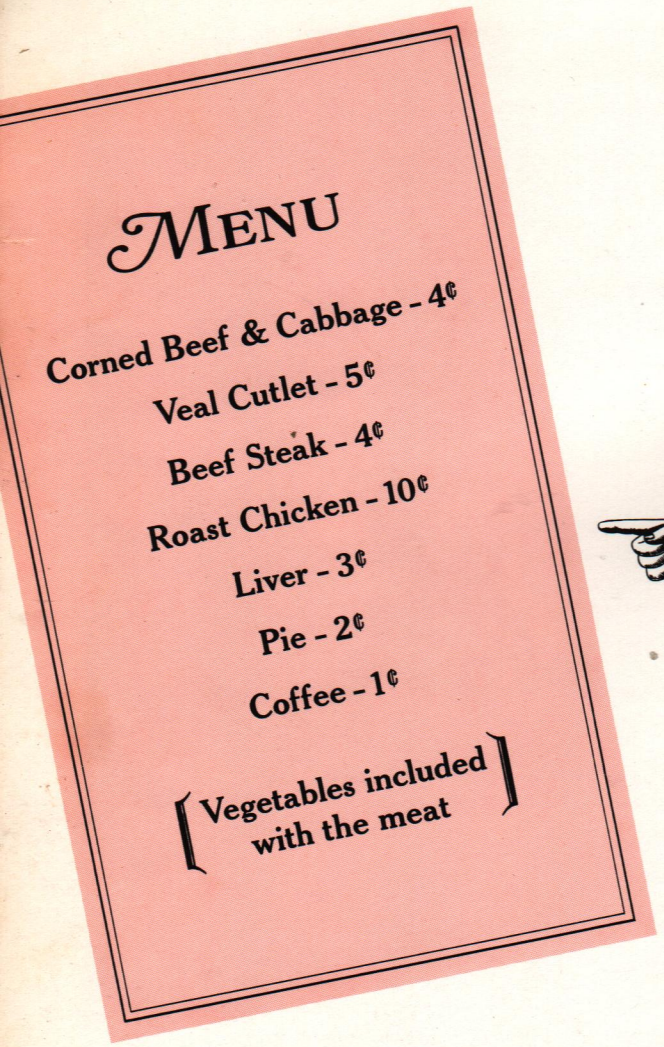
PM Producer



THE GRIFFITH MINE (Page 3)

Editorial:



To the inevitable twin evils—death and taxes—we must add another: inflation. Every currency in history has been inflated (has lost purchasing power) either slowly or swiftly. And there is no reason to think it will ever be different.

Moderate inflation, to most people, is an almost invisible process, because they do not see the extra, unearned money that is pumped into the economic bloodstream.

But they do see the results—prices go up.

It is shocking to look at a chart showing that since 1940, the American dollar has lost more than half of its purchasing power. But for the real shocker, we have to go way back and see what the dollar used to be worth.

One of the best measurements of the shift in the value of money is the cost of food. In New York City a 100-year-old restaurant celebrated its centennial, in January, 1968, by serving meals for one day at its 1868 prices.

Here is the 100-year-old menu:

The restaurant's management estimates that this one-day celebration cost them a loss of about $5,000 due to the change in the cost of food over the past 100 years.

A more general measurement of the value of money is the "living wage," which is now estimated at about $125 per week for an average American family. It is hard to believe that, on March 17, 1904, the General Advisory Committee of the Chicago Bureau of Charities agreed that no American family, or family of other nationality with similar living standards, could comfortably live on less than *one dollar a week per person*, at that time, owing to the *high price of foods*.

These extreme changes suggest a question: "How can it be that, in spite of inflation, the real income—the buying power—of the American people has increased almost without interruption." The answer is increased productivity with the aid of better tools. Buying power depends upon the ratio of the volume of money in circulation to the volume of goods and services for sale. And America's production of goods and services has been prodigious.

Increased productivity always softens, and sometimes temporarily overcomes, the impact of inflation. Here is approximately the way it is working today under the present rate of inflation, which is about 6% a year. Without increased productivity, the dollar would be losing about 6% of its value per year but, because of the 3% annual increase in productivity, the dollar has been losing about 3%.

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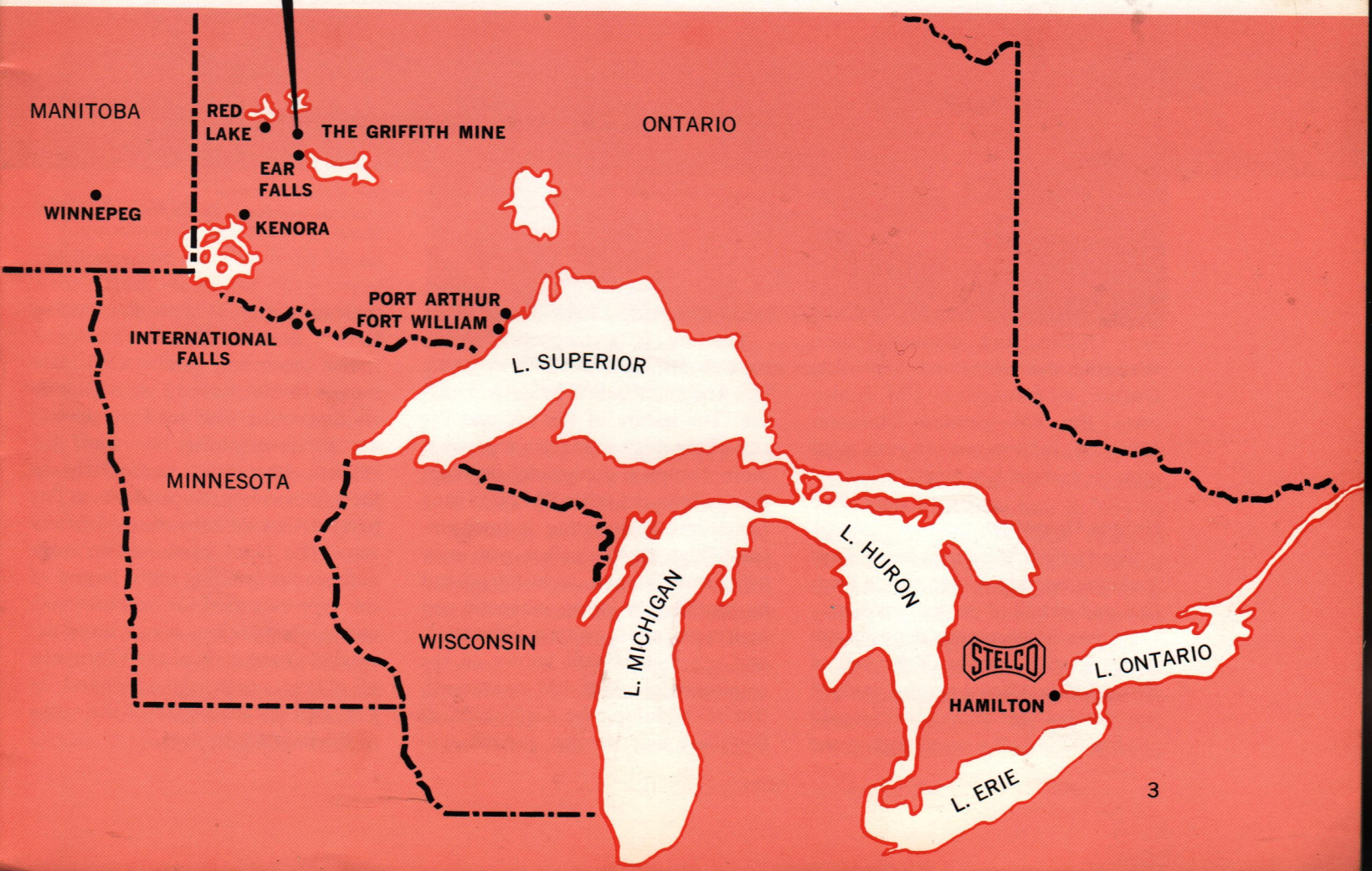
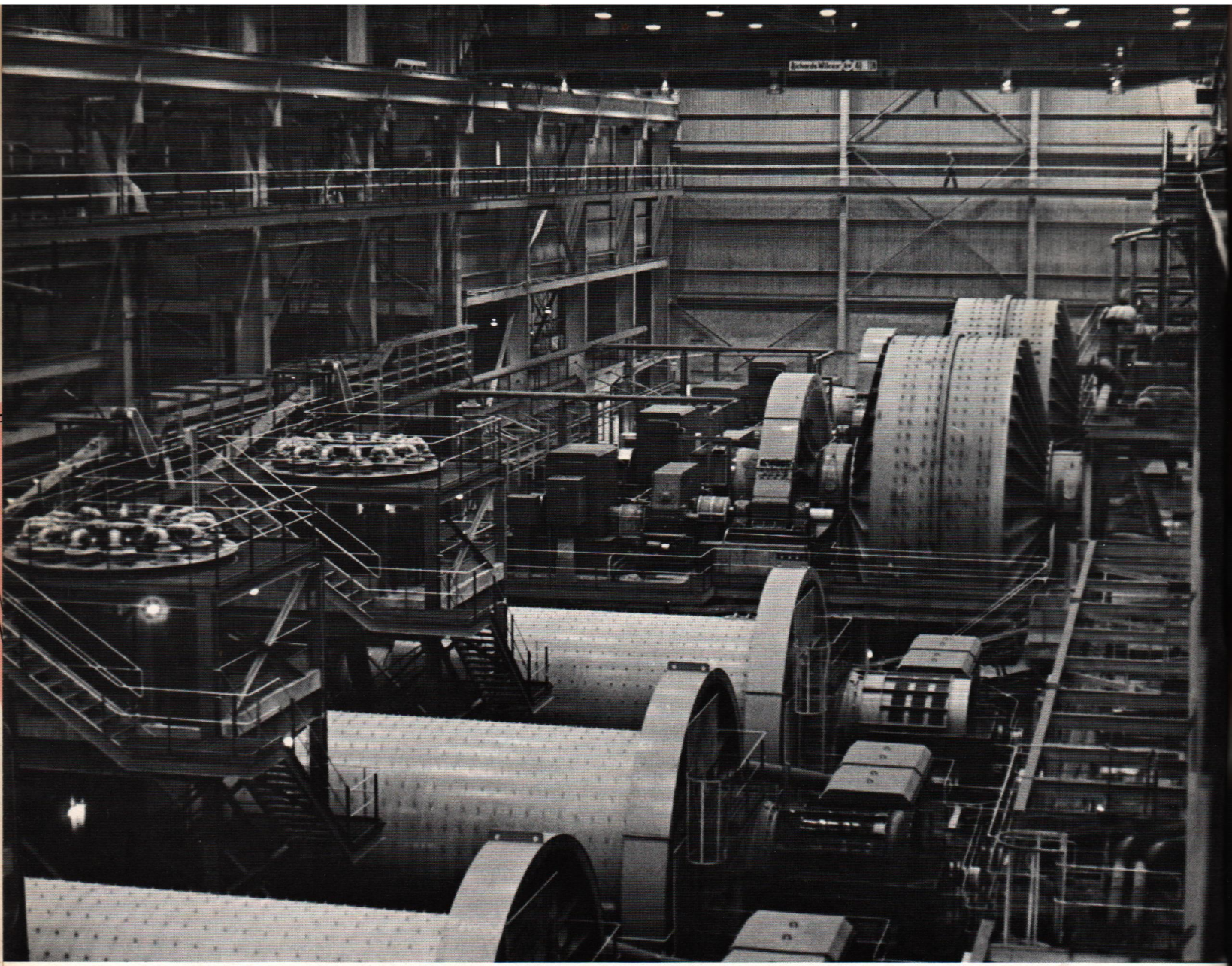
Newest iron ore pelletizing complex in operation under PM management is The Griffith Mine, on Bruce Lake, in western Ontario about 150 miles due north of International Falls, Minnesota.

The mine is named for H. M. Griffith, president of The Steel Company of Canada, Limited, Canada's largest steel producer. Constructed at a cost of approximately $62 million, and operated by PM for Stelco, the Griffith Mine fulfills Stelco's long-standing desire for a major source of iron ore in its home province of Ontario. Stelco can now provide Ontario industry, which manufactures about half the goods produced in Canada, with high-quality steel produced in Ontario from Ontario ore.

PM's relationship with Stelco on iron ore projects dates back to 1895. Stelco is part owner of Erie Mining Company, in Minnesota, one of the world's first pelletizing plants; The





Autogenous mills at the Griffith Mine are the largest of their type ever used for iron ore processing. (Note size of man on catwalk overhead.) In the foreground are three of the plant's four pebble mills.

Hilton Mines, in western Quebec, near Ottawa; and Wabush Mines, Wabush, Labrador, and Sept Iles, Quebec; all managed by PM. It also owns the PM-operated Chisholm Mine, a million-ton-per-year coal mine in eastern Kentucky.

Unique Operation

The Griffith Mine is in many ways a unique operation, due to the location and nature of its ore deposits.

Its two adjacent ore deposits are under a small portion of the bed of Bruce Lake. After a careful study it was decided that mining them would require diking off a small part of the lake and draining these areas.

The ore is a magnetite-bearing rock containing about 24% magnetic iron and some quartz specular hematite. The nature of the ore and the size of the mine calls for a somewhat more complex processing sequence than is found at other PM pelletizing operations. Converting it into uniform, high-quality pellets with over 66% iron content is accomplished by crushing, grinding, magnetic and hydroseparation, balling, indurating, and other steps well known to the employees of other PM operations. But in addition, the Griffith Mine flowsheet incorporates a final concentrating step — froth flotation — used at no other PM plant.

The processing plant itself is also unique in a number of ways. Nearly all processing and service facilities are enclosed under one roof, for efficient operation, particularly in the winter, when temperatures in this part of Canada can reach 65 below zero. The plant contains two huge autogenous grinding mills, largest of this type ever used for iron ore processing. In addition, it has three natural gas fired vertical shaft furnaces, of a type previously developed by PM, that are the largest of their type in the industry to date.

Mining

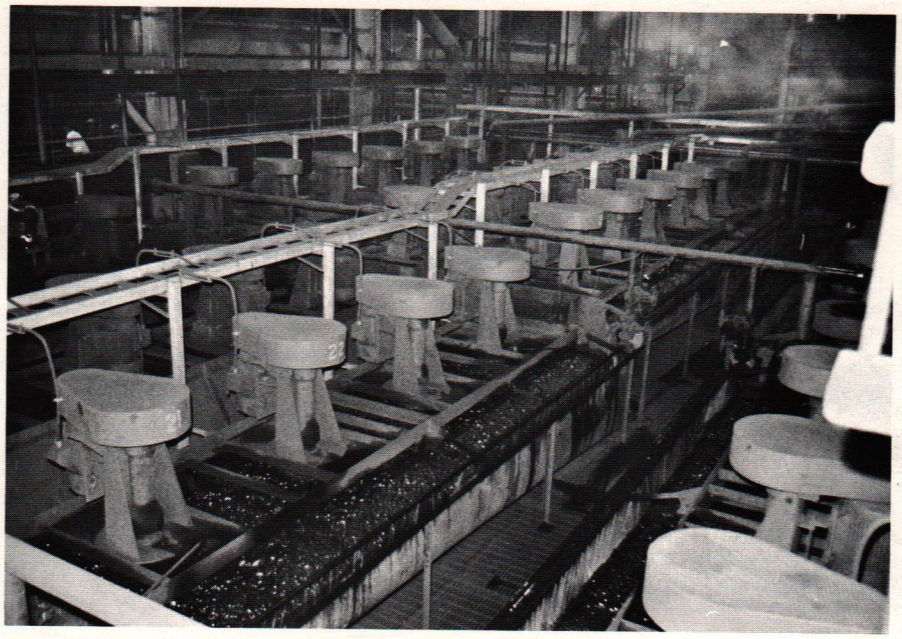
Many known ore deposits all over the world cannot be worked because their location would make it too costly to mine them and process their ore into a competitive raw material. This was almost the case with the Griffith Mine, with its ore bodies partly under a lake bed.

The existence of these low-grade iron ore deposits had been known since the 1920's, but such ore is unusable in its natural state. To this challenge PM brought its background of almost thirty years of study and practical experience in mining, concentrating, and pelletizing low-grade ore.

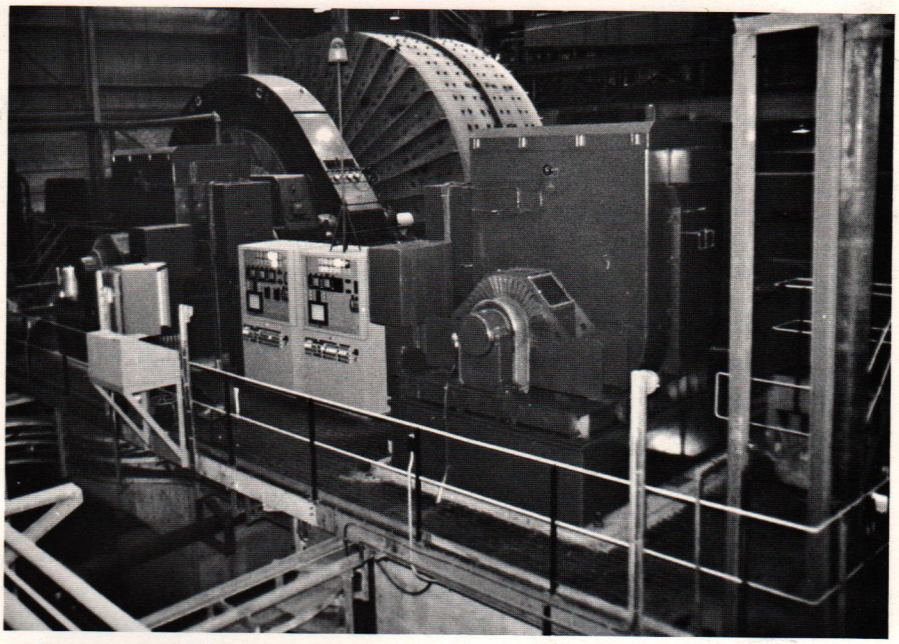
With proven methods and equipment available to process the ore, there was still the problem of getting it out safely from underneath the shores of Bruce Lake. Diking off part of the lake to hold back the water was the only possible approach. Since the mining pit will eventually be a mile long, an average of 1,500 feet wide, and 1,000 feet deep, the dikes must be extremely strong. To expose the ore body for mining, about 2½ million cubic yards of overburden, consisting of rock and other waste materials, had to be removed from on top of it. Most of the material used in constructing the dikes was obtained from this source.

Approximately six tons of crude ore and waste material must be removed from the pit for every ton of pellets produced. Mining is by conventional open-pit methods, on 20 eight-hour shifts per week. After drilling and blasting, three electric shovels load the broken ore into 45-ton trucks, to be hauled to the primary crusher.

The Griffith Mine's ore reserves are estimated sufficient for 30 to 50 years of operation.



Froth flotation circuits perform final concentration of the Griffith ore.



Unlike most other PM-operated pelletizing plants, the Griffith Mine plant has no need for a central control room. Processing equipment is controlled from individual stations like this one, at several locations in the plant.

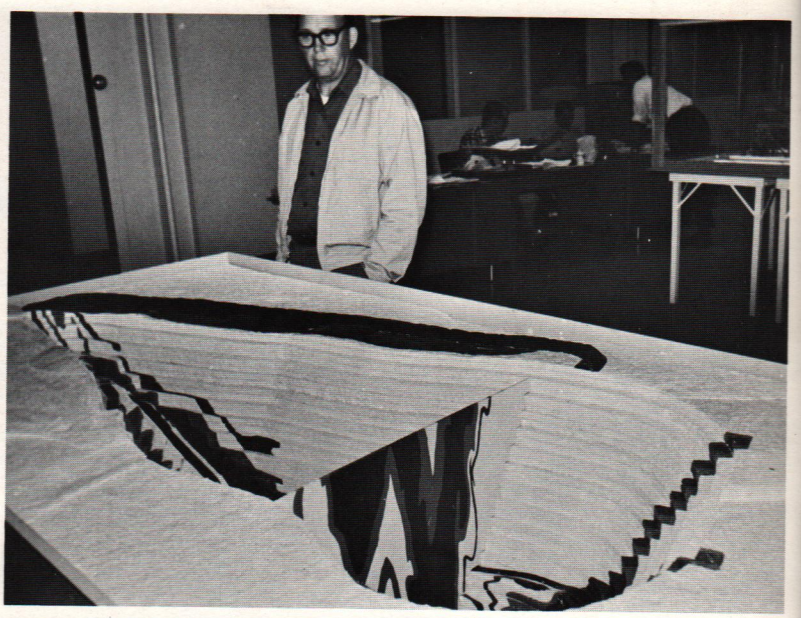
Processing

Crude ore from the mine pit is reduced by a 54-inch gyratory crusher to 12-inch chunks. The crushed ore goes to a stockpile, from which it travels through reclaiming tunnels into the main processing plant at the rate of 600 tons per hour.

It takes about six hours to pass completely through the process. First, it enters one of the two 32-foot autogenous grinding mills, which grind it by tumbling the ore chunks against each other. After primary grinding, 12 triple-drum magnetic separators remove much of the non-iron-bearing material.

Following size separation in a battery of cyclone classifiers, the material enters one of four pebble mills that further reduce its size by grinding it with 1½-inch material from the autogenous mills. About 99% of the ore discharged from these mills is minus 325-mesh in size—as fine as face powder.

Next, the material enters four hydro-separators, where a flow of water removes more of the undesirable material. Then it passes through



Visitors and new employees get their first view of the mine and plant from scale models. The model of the plant, built by the prime construction contractor, proved to be such a valuable training aid that a similar model of the mine pit was constructed of styrofoam, with removable sections to show the progression of mining over the expected economic life of the deposits.

another magnetic separation stage.

Three stages of closed-loop flotation, with a total of 72 flotation cells, perform the final concentration. Here, a chemical reagent coats the silica particles, while another causes the water to froth. Bubbles lift the silica to the surface of the cells, where it flows out.

After dewatering, the ore concentrate enters balling drums. With a small amount of binding agent added, it is rolled into pellets. The "green" pellets enter three vertical shaft furnaces, 65 feet high, each of which can contain a continuously descending charge of about 250 tons of pellets.

Finished pellets from the furnaces are conveyed to a 7000-ton load-out bin, from which they are loaded directly into railroad cars.

Trains transport the pellets over a 68-mile Canadian National Railway spur line to a junction with the CNR's main line. At Fort William, Ontario, they are transshipped into Lakes vessels for the trip to Stelco's main works, at Hamilton, Ontario.

Plant and Facilities

The Griffith's main processing plant building, 120 feet high with 100,000 square feet of area at ground level, has eight major concrete and grating elevations so that the concentrating and pelletizing equipment can be properly located and serviced. All concrete floors are pitched to facilitate cleaning.

The primary crusher, virtually the only processing equipment not housed in the main plant building, is enclosed in a concrete structure extending 80 feet down into rock, with a 50-foot steel building above ground.

A service extension of the main plant has over 300,000 square feet of ground floor area containing laboratories, maintenance shops, garage, warehouse, locker room, and safety and first aid rooms. Another section of the building contains offices and training rooms.

A separate truck storage building provides space for mobile equipment, including twelve 45-ton trucks.

Almost 100 miles of natural gas pipeline were laid to furnish fuel for the pelletizing furnaces.

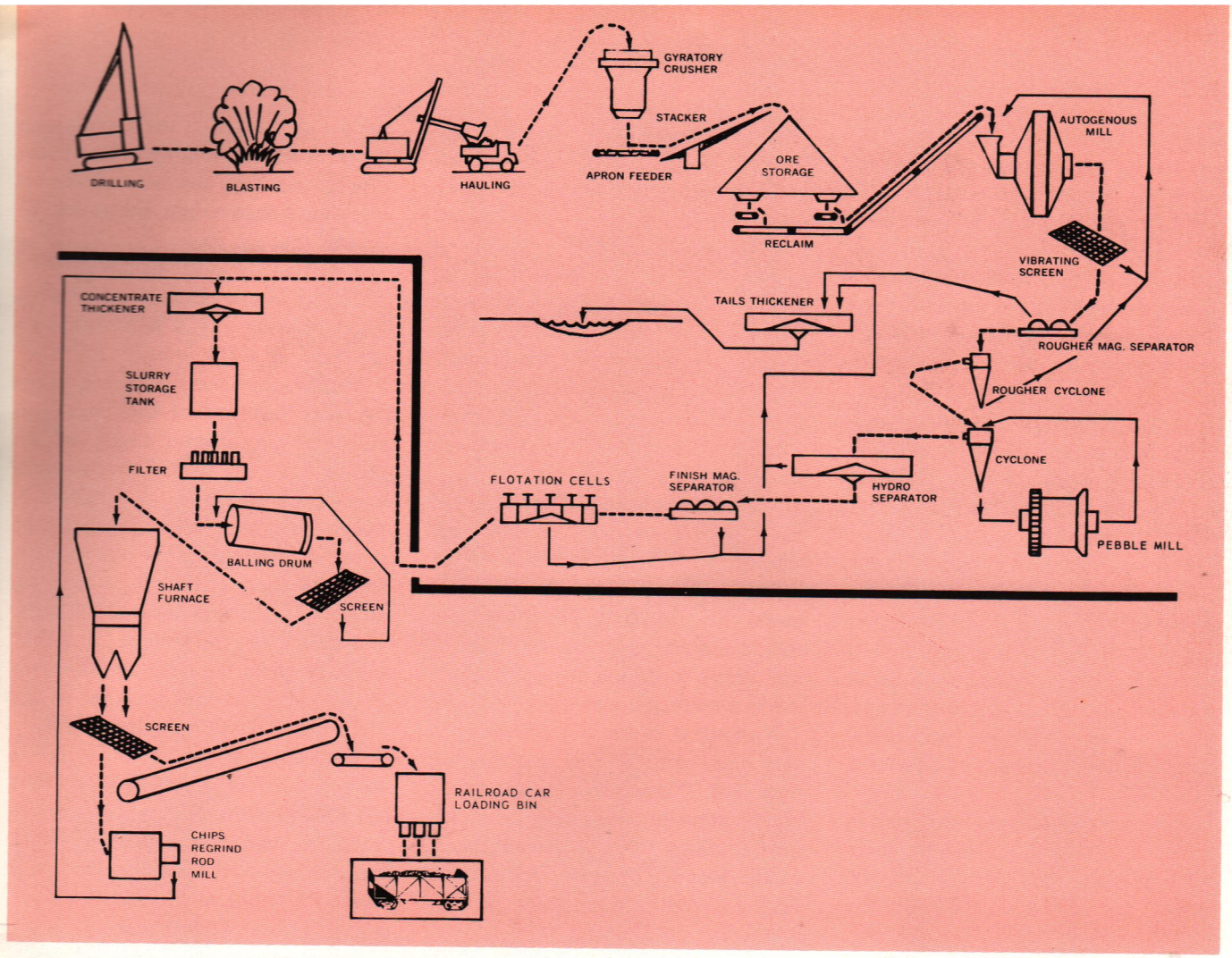
A Modern Frontier

The part of Ontario where the Griffith Mine is located is gently rolling country with clay soil over rock, covered with poplar, spruce, balsam, birch, and Banksian Pine. It is *lake country*, even more so than Minnesota. Bruce Lake, on whose shores the mine is located, is one of literally hundreds of bodies of water, large and small, that dot the landscape.

While some of the Griffith Mine employees make their homes in the communities of Cochenour, Balmertown, and Red Lake, about 20 miles northwest of the mine, a large housing center for the mine is the nearby town of Ear Falls. Here the government of the province of Ontario has built a modern housing development that looks like it could be part of a suburb of any large North American city.

Ear Falls is also the site of an Ontario Water Resources Commission hydroelectric power plant that furnishes electric power for the surrounding area, including the Griffith Mine's 50,000 connected horsepower.

Speaking at the dedication of the Griffith Mine this summer, Ontario's Prime Minister John Robarts called the mine "the very foundation for creating an entirely new permanent community" in the area, and predicted Ear Falls would have a population of about 4,000 within the



Typical of the innovative spirit of the Griffith's employees is the ingenious scaffolding built by maintenance welders on top of their truck. The platform provides convenient and safe access for servicing equipment like this electric shovel. In cold weather, canvas curtains enclose the rear of the truck, providing a small workshop area protected from the elements. The used tire mounted on the shovel serves as a protective bumper.

Modern housing to meet the needs of mine personnel and their families has been constructed at Ear Falls, 17 miles from the mine, at the tip of Lac Seul, by the Ontario Housing Corporation, an agency of the Ontario government. (Photo shows the final stages of construction this summer.)

foreseeable future.

The business hub of the area is the town of Red Lake. Focal point of a gold rush in the 1920's, Red Lake is today a thriving frontier town of over 2,200 inhabitants. Gold mining is still important in the district. Its four operating gold mines produce just under $17 million worth of gold bullion per year.

The term "frontier town" is employed by the Chambers of Commerce of the local communities, so we feel justified in using it here. But it is important to remember that this area is the modern, Canadian frontier, and its inhabitants enjoy all the advantages of stores, banks,

movie theaters, government services, hospitals, microwave TV, paved highways, and air transportation.

(Some of the mine's American employees, used to 70 m.p.h. driving in the States, tell us they've learned the hard way that the Ontario Provincial Police have all the modern law enforcement devices, including radar . . . in this part of Canada, 50 m.p.h. is the *limit*!)

The area is famous for its outdoor recreation opportunities. Muskies, bass, northern pike, walleyes, and lake trout inhabit its lakes. Hunters have the opportunity to take a trophy moose, deer, or bear, and fill out their bag with small game like ducks and grouse. Sportsmen can find a wide range of accommodations at numerous fishing and hunting camps. Many are accessible by road, while others fly their guests in by chartered air service.

Minnesota employees interested in trying the hunting or fishing there will find that the area is about 300 miles by good, all-weather highway from International Falls. (But remember that 50 m.p.h. limit when you estimate travel time!)

People

The many unique features of the Griffith Mine and the area where it is located make it an interesting place to visit. But what makes the greatest impression on you after a trip there is the enthusiasm and spirit of teamwork you feel among the people responsible for its operation.

With able assistance from the small handful of seasoned PM staff men who head up the key functions in his organization, manager F. P. Morawski has inspired his employees with a sense of personal involvement and desire to do the job right that is evident everywhere at this operation.

You see it in the housekeeping in the plant and shops, outstanding even for PM-managed operations, where good housekeeping is an 85-year tradition. You see an eagerness in the manner of younger members of the Griffith Mine team as they discuss the details of their work with the more experienced men. You sense a willingness on the part of almost every employee to put something of himself into his job.

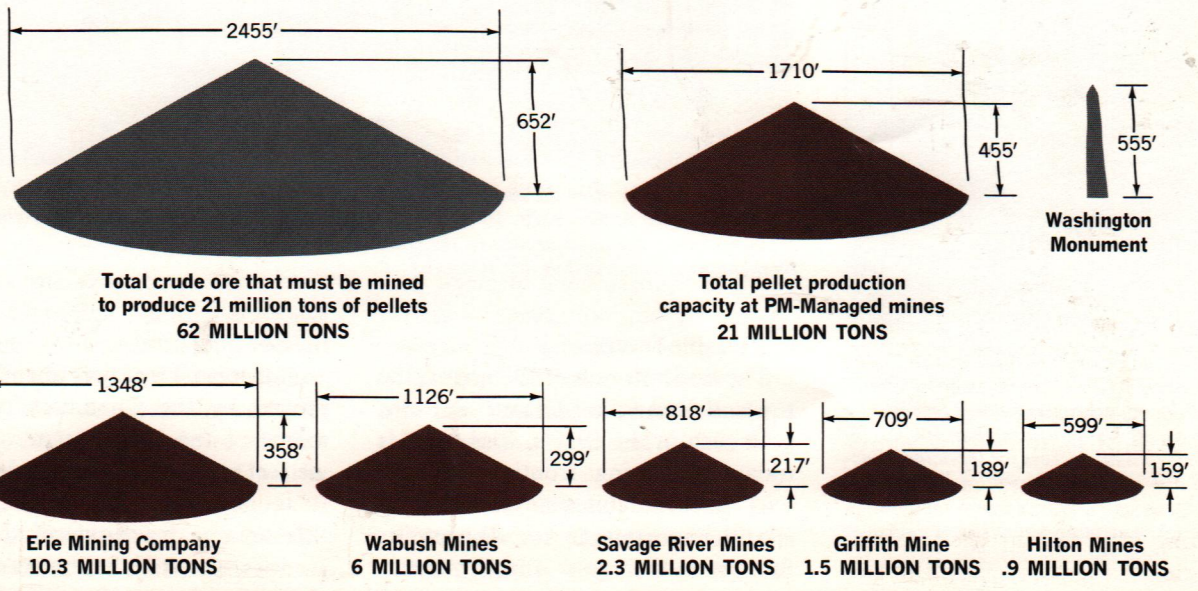
You hear the pride in the voice of a laborer in the concentrating plant when he asks you, "*Well, what do you think of OUR mine?*"

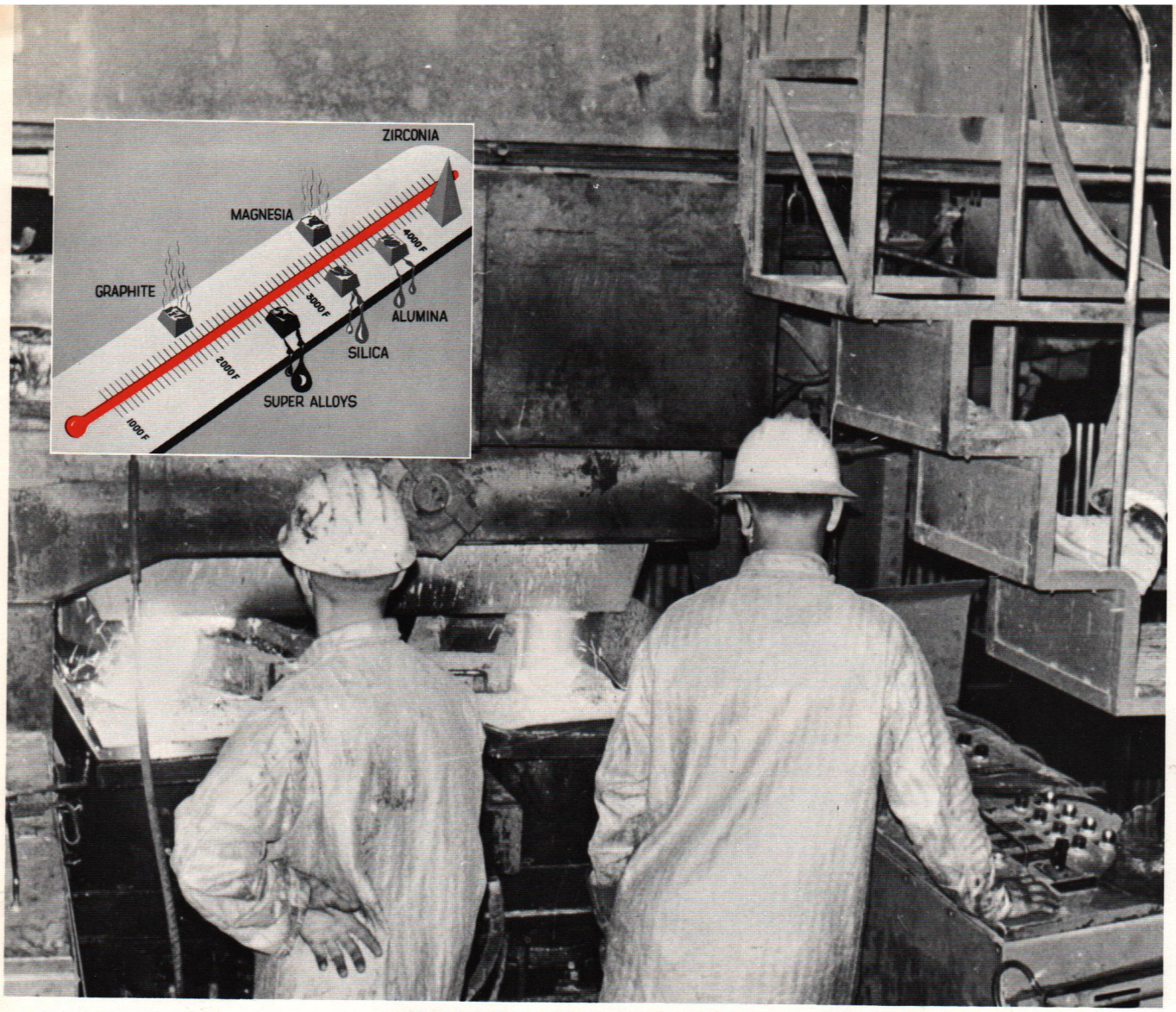
Maybe this feeling comes from the very newness of the operation and the opportunity many of its people have had to feel they've been a part of it from the beginning. Maybe it comes from the fact that many of them are very young men, some of them fresh out of school, new to the industry, new to the area. Maybe it's just the kind of thing that happens when the right combination of people is brought together in the right place at the right time.

But whatever the reason for it, it makes you feel proud to know that the Griffith Mine sign, out where the entrance road joins Ontario Highway 105, has the familiar red and black PM emblem in its center.

21 Million Tons ...That's a Heap of Pellets!

With The Griffith Mine, newest iron ore pellet plant under PM management, now on stream, annual pellet production capacity of PM-operated mines has climbed to a round figure of 21 million tons. Total annual production capacity of all operating pellet plants in the free world iron ore industry is 95 million tons, according to the American Iron Ore Association. Our drawing also shows the approximate amount of crude ore that must be mined at all PM-managed properties to produce this quantity of pellets, based on an extraction ratio of 2.95 tons of ore for each ton of pellets, about average for these operations. Piled in one place, this quantity of ore would make a mountain higher than the Washington Monument, and a half-mile across at the base!





Zirconium Oxide products are chemically inert and able to withstand extremely high temperatures. One of the uses for which these properties make them ideal is nozzles for casting molten metal, as in the steel industry application shown here.

Zircoa JOINS PM FAMILY

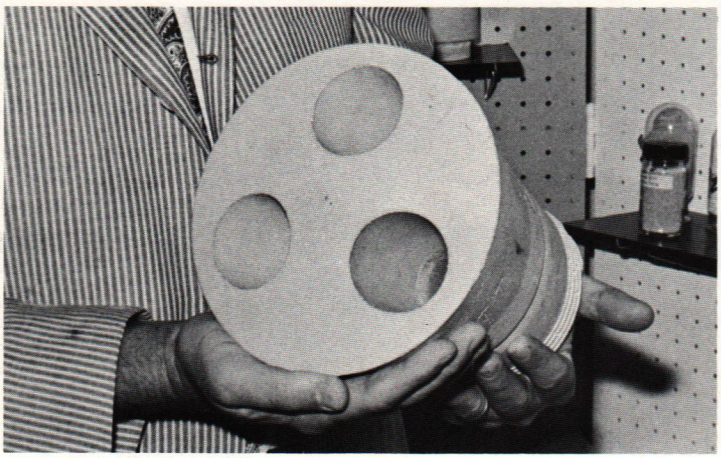
PM announced in August the purchase of the entire outstanding capital stock of Zirconium Corporation of America (Zircoa), of Solon, Ohio, a Cleveland suburb.

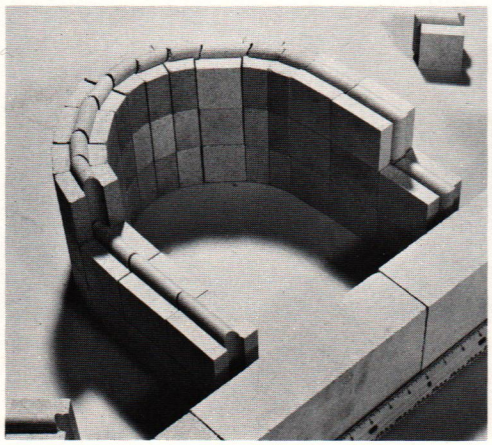
Zircoa is one of the nation's leading producers of high-purity zirconium oxide and related products, including ultrahigh-temperature refractories. Its major markets include the chemical, ceramic, metallurgical, electronic, nuclear and aerospace industries.

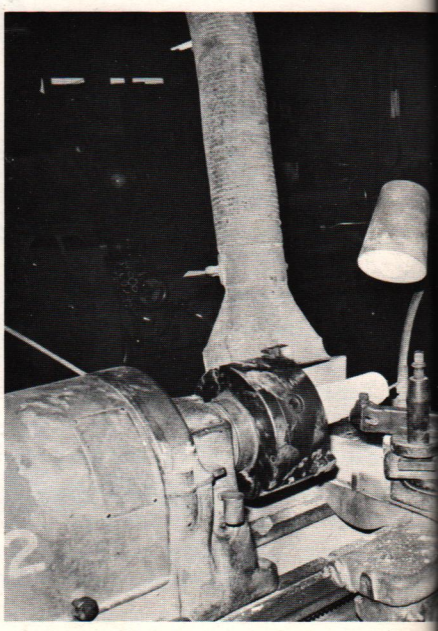
PM President Keith S. Benson stated that Zircoa will operate as a wholly-owned subsidiary affiliated with PM's Chemical Division. This is the third subsidiary acquired by PM in the past nine months, as part of a continuing diversification program.

According to F. R. Dykstra, vice president in charge of the Chemical Division, "Zircoa's technical capabilities and products will effectively complement our own experience in ferrous and non-ferrous chemistry, as well as our knowledge of structural and electronic ceramics." He predicted that Zircoa would help boost sales of this rapidly growing division to approximately $15 million during the coming year.

Zircoa's products include a wide range of specially molded shapes for high temperature applications, such as an experimental oxygen lance tip for steel-making, extrusion dies for various metal shapes (the H-shaped die shown is used for extruding molybdenum at 4,000 degrees Fahrenheit), a wide range of tubing sizes, and refractory brick with interlocking tongues and grooves.







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Zirconium Corporation of America started producing zirconium oxide (also called "zirconia") from zircon ore in 1954 at its raw materials plant in Solon. Within the next few years, the company added facilities for fabricating a variety of zirconia-based refractories such as kiln furniture, laboratory ware and similar products.

Under the leadership of Mr. E. C. Sargent, president of Zircoa, who is continuing in that capacity now that the company has become a PM subsidiary, Zircoa's sales and profits have been steadily growing at an average rate of about 30% annually.

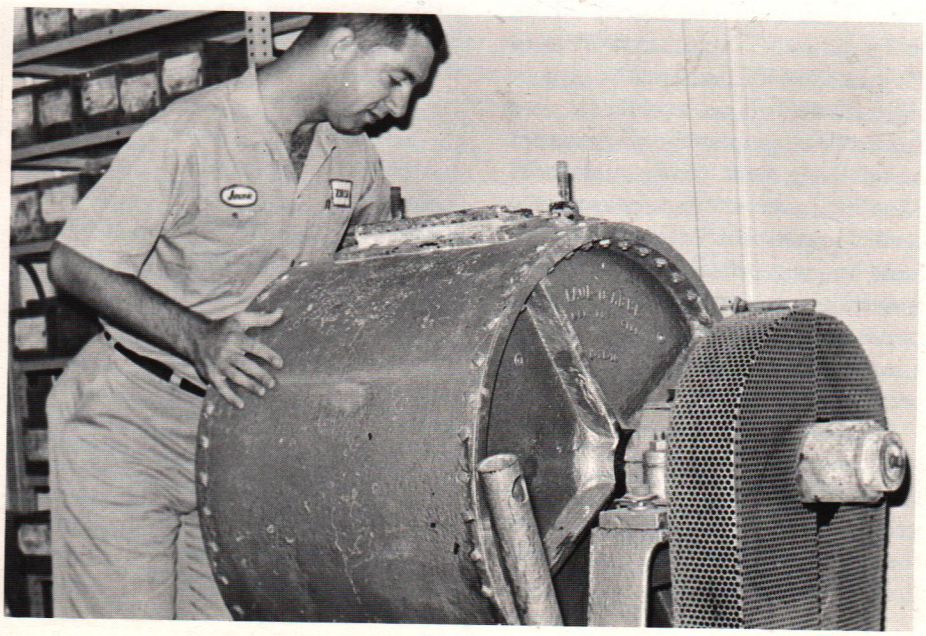
Because of the rapid development of markets and applications for its products, Zircoa is expected to increase its production capacity in the near future with new capitalization now available through its affiliation with PM.

Much of Zircoa's growth has resulted from its success in developing products to meet the rigid requirements demanded for some of today's most advanced aerospace, military, and industrial applications. Zirconia, which can withstand temperatures up to 4600°F. in an oxidizing atmosphere, has the highest temperature resistance and is the most chemically inert of all commercially available refractory materials. This makes it ideally suited for use in rocket nozzles, nose cones for space vehicles, high-temperature air heaters for wind tunnels, and industrial refractories.

Zirconia is also the first new die material introduced to the metal extrusion industry since the early 1930's, and is now used in producing extruded brass, copper, tungsten and titanium. Other important industrial applications include fuel cells, electronic capacitors, chemical compounds, ceramic colors, and refractories for the more advanced metallurgical processes such as continuous casting and vacuum degassing.

Microscopic examination of zirconia ceramics enables close control of their physical properties. Shown operating the camera-equipped microscope is A. G. King, Zircoa's technical director.

To PM people used to operations where production is measured in millions of tons per year, many of Zircoa's production methods and equipment for fabricating small batches of precision products are completely different. In Photo 1, a pressing die for forming a small crucible is hand-charged with a weighed amount of zirconia. Photo 2 shows how a "green" piece of zirconia ceramic, produced in a similar pressing operation, is machined to close tolerances before being fired to final hardness in a high-temperature furnace. Photo 3 shows one of Zircoa's larger ball mills, used for grinding batches of ceramic material from which many of the products are made.



In the mining and raw materials industry, practical geology is a very important part of our business. Basic geological research, such as the work described in this article, steadily increases the body of knowledge from which our practical geologists draw their understanding of the earth and its physical structure.

Geologists Study

With new geological discoveries to aid them, research geologists are at present actively engaged in the study of continental drift, a controversial subject in geological circles for many years. The basic theory behind the continental drift idea is that the present continents of the earth were originally concentrated in one or two land masses that later broke up and separated, in much the same manner as sea ice breaking up and drifting apart in the spring.

Recent advances in geology have increased the interest in this theory and have convinced many former skeptics that some form of continental drift has indeed occurred. Studies of rock magnetism indicate that certain rocks have moved thousands of miles from the geographic position where they first acquired their induced magnetism.

Work in rock mechanics shows that solid rocks subject to deforming stresses for sufficient lengths of geologic time behave essentially like fluids, thus supporting the concept of relatively light continental rocks "floating" over denser rocks of the earth's lower crust. Moreover, recent ideas about expanding sea floors and convection currents in the earth's upper mantle provide feasible mechanisms by which such a drift could occur.

Geologists studying this subject are currently attempting to reconstruct the pre-drift shape of the original land masses and determine the exact course of their fragmentation. Most of the reconstructions are based on the shapes of the present continents and the manner in which they can be fitted together most snugly, like the pieces of a jigsaw puzzle.

However, the ultimate test is the appearance of the "geologic picture" when the pieces of this puzzle are put together. For example, if opposing coasts of widely separated continents were at one time connected, geologic features on them should match closely when the continents are restored to their pre-drift positions.

Since similar geologic features can develop independently in different places, just a few comparable characteristics between the continents would not be sufficient proof that they were formerly connected. However large numbers of similarities, of different types and ages, would increase the statistical probability that such a connection once existed.

The most convincing evidence would be to demonstrate that two areas thought to have been adjacent in the past, such as northeastern North America and western Europe, have closely parallel geological histories. (In other words, show a wide range of geological features that developed in similar manners and at similar times over a long period.) To attempt this is an exceedingly difficult process that involves correlating patterns of sedimentary rock layers and successive structural changes that have occurred over many eons.

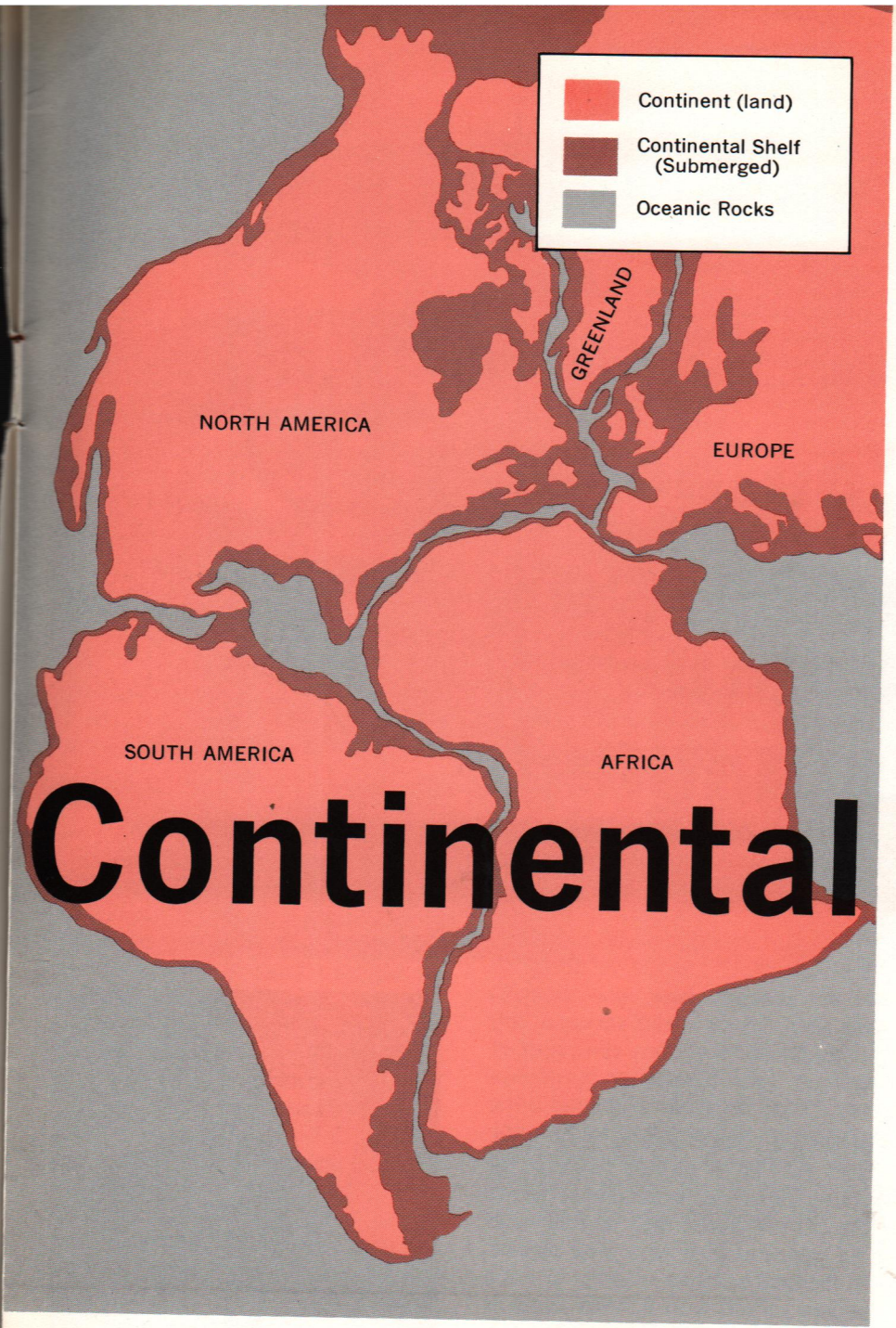
Among others presently engaged in work of this nature are two geologists at Wesleyan University, of Middletown, Connecticut: Lecturer Gregory Horne and Research Fellow James Dover.

Mr. Horne is trying to relate the Paleozoic Period history (400-600 million years ago) of the Appalachian Mountains belt in northeastern Newfoundland with that of the Caledonian Mountain system of western Ireland. Preliminary results from his work show many close similarities between the two locations.

Faults, or large fractures in the earth's crust, separating fundamentally different geological terranes are particularly useful structures for intercontinental comparisons, particularly if they intersect the continental margins. Fractures of this kind are found in the Canadian Maritime Provinces and in the British Isles. Chief among these are the Cabot Fault in the Maritimes and the Great Glen Fault in Scotland.

Before a correlation between these two faults can be suggested, however, several important questions must be answered. Do the geographical positions of the two line up when the continents are restored to their hypothetical pre-drift positions? Do both faults separate comparable geological terranes? Are the fractures consistent in age, geometry, and the type and amount of movement that has taken place along them?

In an attempt to answer some of these questions, Dr. Dover directed studies of these faults in Nova Scotia last summer. The preliminary results of this work suggest that the Cabot Fault is actually part of a complex zone of fracturing that has been vastly oversimplified. Researchers studying major faults and associated fracture and fold patterns in central Nova Scotia found two intersecting fault systems that showed evidence of opposite types of lateral movement along them. Of the two, a



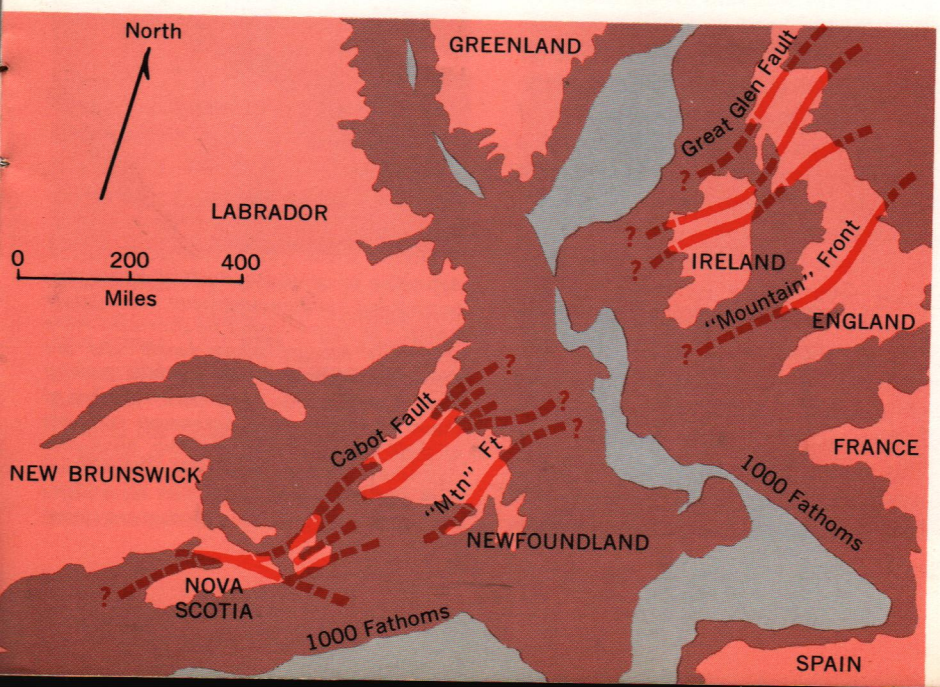
Parts of the continents surrounding the Atlantic Ocean interlock in striking fashion, like pieces of a giant picture puzzle. This hypothetical map shows how, hundreds of millions of years ago, they could have been part of a single land mass.

Continental Drift

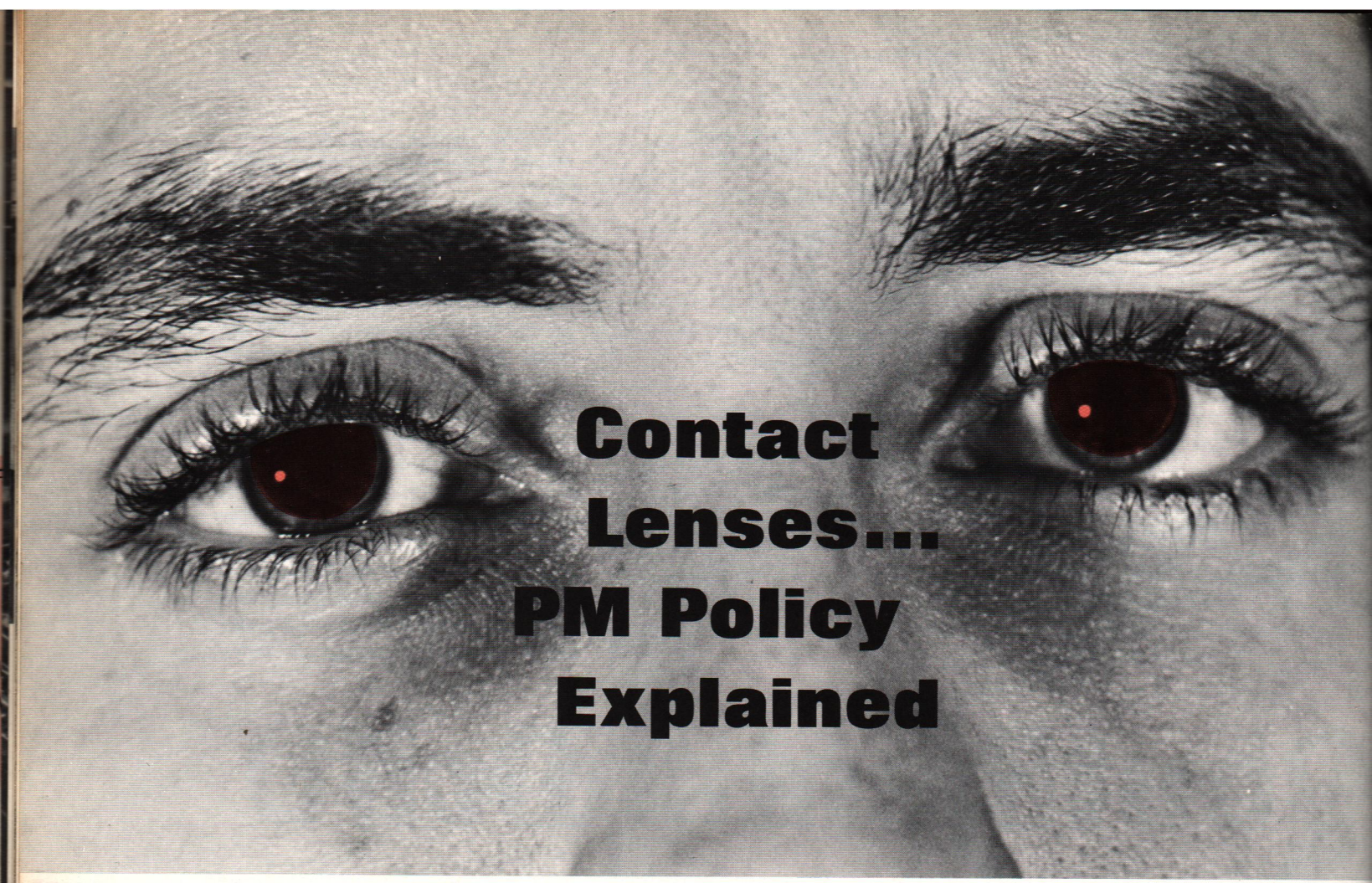
northeast trending system does indeed show remarkable continuity and similarities with faults found in Newfoundland and Britain.

A large East-West fault crosses the entire province from the Bay of Fundy to Chedabucto Bay, and tends to offset the displacement shown by the earlier system. Magnetic surveys were made across major faults in areas where bedrock is poorly exposed, in order to locate the faults more accurately and provide more information on the rocks they separate. Juxtaposition of geologic terranes with completely different characteristics suggests horizontal movements in Nova Scotia comparable with those believed to have taken place in Scotland. (British geologists believe more than 60 miles of horizontal movement has taken place along the intensively studied Great Glen Fault.)

The occurrence of fractures with tens of miles of horizontal displacement indicates that large continental blocks quite likely have moved great distances relative to each other in the North Atlantic. Preliminary findings suggest that North America and western Europe may be as closely related geologically as they are in history.



Researchers are studying geological similarities between the islands of Nova Scotia and Newfoundland (home of many PM people who work at Wabush), and the British Isles. Preliminary findings support the theory that the two locations were once considerably closer geographically.



Contact Lenses... PM Policy Explained

Since they were introduced to the mass market about 20 years ago, contact lenses have been widely accepted, especially considering their high initial cost, the difficulty most people have in getting used to them, and the psychological resistance most of us have to the idea of putting any foreign object into our eye.

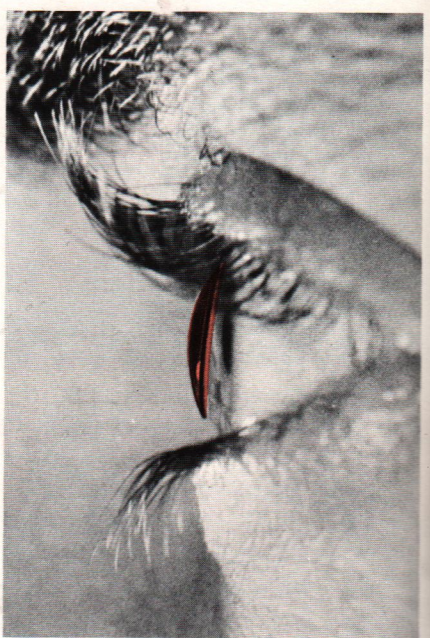
Recently, warnings have been published about the general advisability of most people wearing contact lenses. Some medical authorities claim that their long-time use can cause undesirable changes in the eye, or even lead to permanent loss of vision. It is not the purpose of this article to enter into or contribute in any way to this particular controversy.

It cannot be denied that contact lenses are useful for correcting vision in certain eye disorders that regular glasses will not help. They are also useful in certain specialized occupations where spectacles are undesirable or cannot be used, such as the acting profession. And at the very least, they can be a morale booster for young unmarried women who believe the old saw about men seldom making passes at girls who wear glasses. In the final analysis, whether or not a person should wear contact lenses is a matter for him and his ophthalmologist to decide.

Whether or not he wears them off the job, that is. Industrial safety considerations make on-the-job use of contact lenses another matter, and a very important one where most jobs in the PM organization are concerned.

PM's safety policy permits the use of contact lenses only on office jobs. They should not be worn by any personnel outside office areas at any mining operation, plant, shop, dock, or other operational area, or on any ship operated by the company.

Your PRODUCER reporter discussed this policy recently with PM safety director Glen M. Hostetter, and learned that he sometimes receives



According to a reliable medical source, between 3 and 5 million Americans wear contact lenses. The figure cannot be estimated more accurately because many people who are fitted for contacts do not continue wearing them. Consequently, an unknown number of those sold wind up as permanent residents of their owners' dresser drawers. Most contact lenses are almost invisible. Those shown here and in the other photos on these pages are more easily seen because they are tinted.

suggestions about modifying this policy to permit the wearing of contact lenses with safety glasses, because this would make it possible for employees who need glasses to wear the same type of eye protection as those who do not.

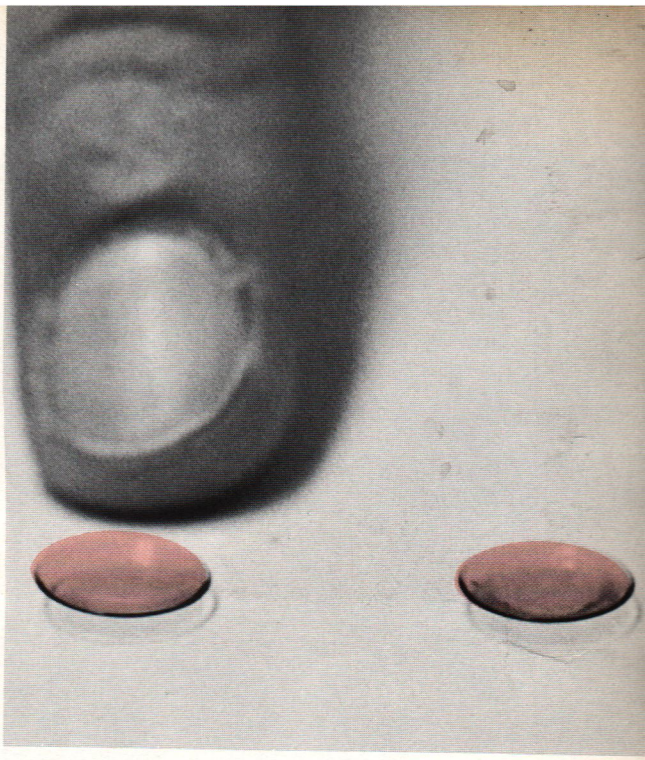
"*While these suggestions,*" says Hostetter, "*are prompted by good intentions, because the Safety Department's job would be simpler if all employees could be equipped with standard safety glasses, the people who suggest changing this policy have no idea of the problems that can come about from the use of contact lenses in an industrial environment.*"

He says these problems have been recognized for some time by medical and industrial authorities, but one of the best summaries of the subject is a 1967 article published in the *Journal of Occupational Medicine* by Samuel L. Fox, M.D., a professor of opthalmology at the University of Maryland. While the article itself is too technical for the average reader, we felt it would be worthwhile to spend some time reviewing it (with a medical dictionary and college physiology textbook close at hand!) for the interest of our readers.

The article discusses a number of hazards in wearing contact lenses in an industrial environment. Chief among these is the possibility, present in almost every non-office job, of excessive quantities of dust particles entering the eye.

When this happens to a person who is *not* wearing contact lenses, the normal fluids that constantly bathe the surface of the eye, to lubricate it and maintain its transparency, carry the dust away. With contact lenses, deposits can build up on the lenses that not only alter their optics, but make them tend to stick to the eyelid and cornea as well. In addition, the cornea of the eye (the transparent covering of the iris and pupil), normally the most sensitive part of the entire human body, loses much of this sensitivity when a person has accustomed himself to wearing contact lenses. This makes his eyes more susceptible to corneal damage from particles that may become trapped behind the contact lenses.

Both of these problems are aggravated by the fact that a person who wears contacts tends to blink his eyes two or three times more frequently than the normal 10 to 20 times per minute, and corneal lenses rotate slightly with each blink.



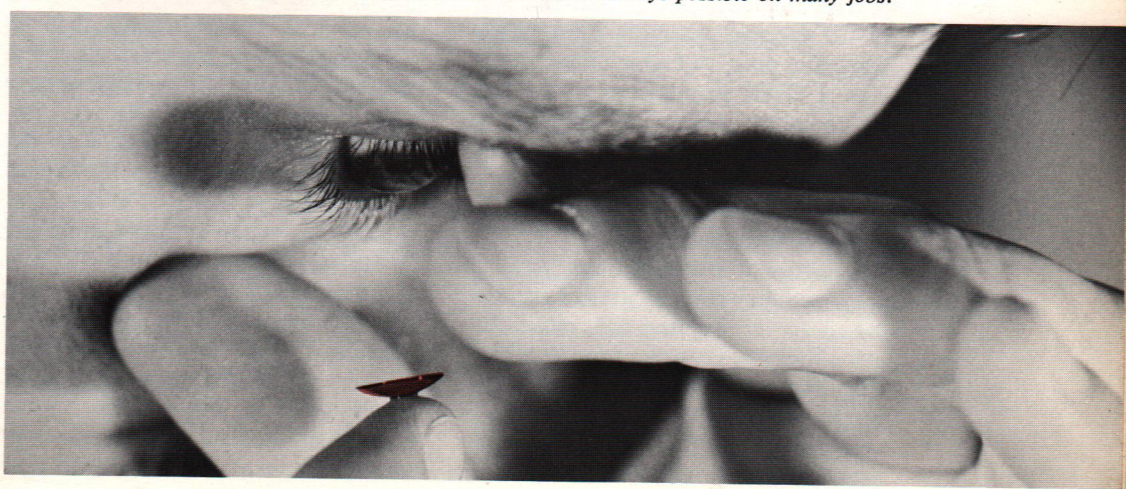
The basic idea of the contact lens—a corrective optical lens worn in direct contact with the surface of the eye, instead of in the conventional eye-glasses frame—was first conceived early in the 19th Century. But the first successful corneal contact lenses did not become available until 1948. Corneal lenses, shown here, are small discs of plastic, shaped to fit the eye and ground to prescription. Adhering to the eye by capillary attraction, they cover only the iris and pupil. Corneal lenses are the most common type of contacts. The larger scleral lenses, which cover the white of the eye as well, are much less common.

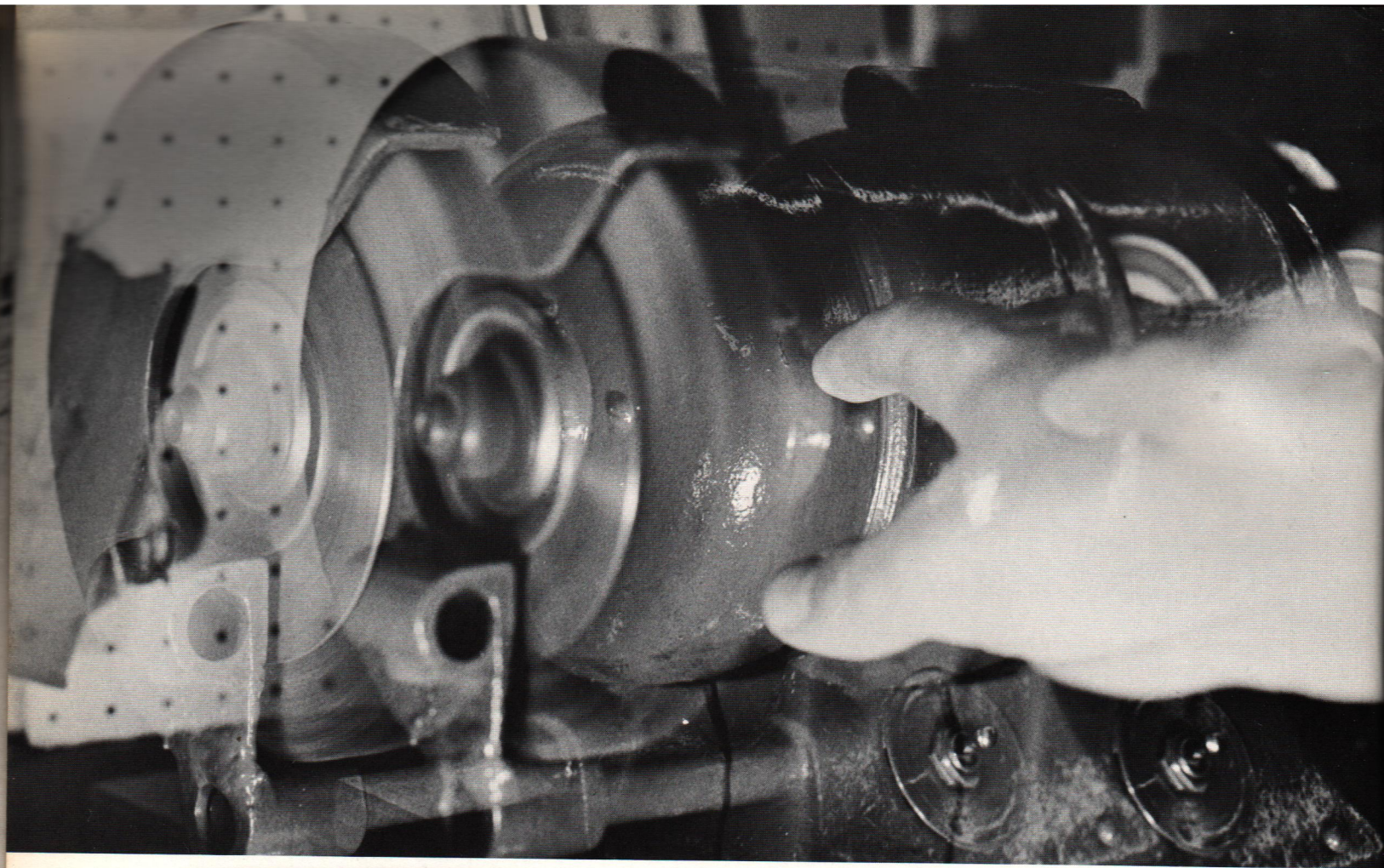
Chemical fumes in the air can cause similar problems by producing an oily output of fluids in the eye, which can result in pain or blurring of vision when contact lenses are worn.

Wearing contact lenses on the job can endanger you or your fellow employees in another way, if one of the lenses happens to be moved out of place or ejected from the eye. (Friends who wear contacts tell us this happens fairly often.) This can be especially serious if the wearer is operating equipment that requires good binocular vision. Even if a person carries a spare pair of regular eyeglasses with him, it normally takes 30 to 60 minutes for the eyes to adjust back to wearing them after the contact lenses are removed . . . far too long if you happen to be working close to moving machinery or driving a loaded mine haulage truck when you lose one of your lenses! (Incidentally, commercial airline pilots are forbidden to wear contact lenses for this reason.)

Another danger of on-the-job use of contact lenses occurs when they are worn along with a mask, hood, or goggles, or when exposed to high temperatures or extremes of infrared radiation. This problem stems from the curious fact that our eyes

Eye infections are an ever-present threat to contact lens wearers, unless fingers and lens are scrupulously clean when the lens is being inserted. This is not always possible on many jobs.





One of the dangers of wearing corneal lenses in industrial jobs is the possibility one of them may be suddenly displaced or lost from the eye.

have to "breathe". . . in the sense that exposure of the membrane covering the cornea, to the oxygen in the air, is necessary to keep the cornea several degrees cooler than the rest of the eye and maintain its metabolism. The plastic of which the contact lens is made, in addition to keeping the air away, acts as an insulator to keep heat in. Wearing any device that further reduces contact between the eye and atmospheric oxygen is inviting corneal damage.

Additional problems can arise if it is necessary for a wearer of contact lenses to receive first aid, either for eye injuries or for other injuries which may cause him to be unconscious or unable to tell first aid personnel he is wearing them. Colorless lenses are practically invisible when worn, and can be overlooked even by a doctor treating an accident victim he does not suspect is wearing them. A lens can also slip up on the portion of the eyeball that is not normally visible, and be "lost" temporarily in the eye.

Accidents have occurred in which metal particles or chemical substances have been trapped under an undetected contact lens and first aid attempts to remove them by irrigating the eye were fruitless. In the event an accident victim is unconscious for an extended period of time, eye damage may result if his contact lenses are not removed from his eyes. (In fact, Dr. Fox advises that even office workers permitted to wear contact lenses while in office areas should have their medical records conspicuously "flagged" to indicate the possibility they may be wearing contacts, in case an accident occurs.) Many doctors advise persons being fitted for lenses to carry a card with this information on their persons at all times, for the same reason.

Considering all these possible dangers, it is hard to see why anyone would be tempted to violate PM's safety policy regarding the wearing of contact lenses. It should be evident from the problems that arise in their use on the job that they're not likely to make you *see* any better. And if you think they might make you *look* a bit better on the job, try thinking about how you might look wearing dark glasses and carrying a white cane.

It just might make you change your mind.

THE Better Half

We like to share with our readers the occasional glimpses we catch of the "better halves" of PM families. Both male and female employees are invited to submit items to this department about spouses who have unusual occupations, hobbies, interests, activities, etc. Send one or more black and white snapshots, and be sure to tell us the address to which they should be returned.

Mrs. Ethel Hodgins has been a leader for the past five years in the Shawville Saddle and Pony Club. The club has fifty members ranging in age between seven and 21 years. Ethel's daughter, Kim, is second from left. Second boy from right is Terry McDougall, whose father, Roly, is a Hilton shovel operator.

Meet Mrs. Ethel Hodgins, "better half" of Neil Hodgins, who has been employed at Hilton Mines since 1963, and is presently a mechanic in the garage at the mine.

Ethel has combined her enthusiasm for both young people and horses by taking an active part in the Shawville, Quebec, Pony and Saddle Club. Pontiac County, in Canada's Ottawa Valley, where Shawville and Hilton Mines are located, is horse country.

Many of the local residents, including a good number of Hilton employees and their families, are vitally interested in horses and riding. The Shawville Agricultural Fair, an event with a 112-year history, features a large number of horse and pony events each year.

Ethel is a past director of the club and presently serves as its treasurer and booth committee chairman. Both jobs entail a large amount of responsibility, because the club owns a complete arrangement of corrals, chutes, stands, bleacher seats, and booths; and it holds an annual rodeo that attracts competitors from Ottawa, Toronto, Montreal, and as far away as the U.S.

Club members meet and ride every Saturday. One of the club's special activities is taking part in parades in Ottawa, Canada's national capital, and other cities in the Ottawa Valley. Ethel's daughter, Kim, 10, has her own horse and is an excellent rider. She has won many prizes, particularly in the parade class. Ethel, of course, enjoys riding too, and her particular interest is Western events.

In addition to Kim, Ethel is the mother of three boys: Douglas, 11, (a Cub Scout); John, 7; and Lee, 4, all active members of the club.

All this may sound like enough to keep a young mother busy eight days of every week, but it's not the whole story of Ethel Hodgins' participation in activities for the young people of Shawville. She is also president and a former vice president of the Shawville Brownies, Guides, and Rangers. (For the benefit of our readers in the U.S., Guides and Rangers are Canada's equivalent of our Girl Scouts and Senior Girl Scouts.) She also heads up the committee that sends cards or gifts to any of the 80 members of these organizations who may be ill.

Interest in youth activities is a family affair with the Hodgins family. Neil has been active with the Boy Scouts for the past 16 years, and is presently Scoutmaster of the local troop.

SERVICE AWARDS

Congratulations to the following employees who qualified for service awards representing 25 or more years of service with the PM organization during the third quarter of 1968.

Cleveland Office
F. E. Allen . . . . . 40 years
E. Helmink . . . . . 45 years

Chicago Office
V. Burfeind . . . . . 25 years

Danube Mine
J. A. Moren . . . . . 40 years

Erie Dock
L. J. Nosse . . . . . 35 years

Erie Mining Company
J. Sukovich . . . . . 45 years
W. F. Boben . . . . . 25 years
A. E. Faragher . . . . . 25 years

Interlake Steamship Co. Division
M. D. Tuttle . . . . . 40 years

Mahoning Mine
C. R. Johnson . . . . . 35 years
D. I. Kreps . . . . . 40 years
U. J. Maki . . . . . 40 years

Milwaukee Solvay Coke Co. Division
T. Gilbert . . . . . 35 years
E. Goldbeck . . . . . 35 years
E. Jacobson . . . . . 35 years
H. Jornlin . . . . . 35 years
A. Klinter . . . . . 35 years
G. Lynch . . . . . 35 years
E. Olm . . . . . 35 years
R. Talaska . . . . . 35 years
N. Tanger . . . . . 35 years
L. Toonen . . . . . 35 years

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industry notes

EUROPEAN MINING DECLINE

According to industry reports, European iron ore mining investments are feeling the pinch of overseas competition. While iron ore production there rose from 65.3 million to 95.5 million tons between 1952 and 1960, since 1960, overseas competition has been strongly felt. Since 1962 production *capacity* has fallen from 105.5 million to 84 million tons.

IMPORTANT FUEL SOURCE

According to the National Coal Association, coal accounts for four-fifths of the U.S.A.'s proved reserves of fuel, including uranium, and three quarters of all fuel government experts believe is likely to be found at any time within the U.S.

COLLEGE HELP

A booklet called '*Financing a College Education in Mineral Engineering*' may be helpful for students interested in a career in this field. It can be obtained free from the American Institute of Mining, Metallurgical & Petroleum Engineers, 345 East 47th St., New York, N.Y. 10017.

COIN TRICK?

Despite a fiscal 1968 federal deficit of $25 billion, the U.S. Library of Congress has published an elaborate booklet entitled "Italian Coin Engravers Since 1800," which it sells for 75¢ per copy—less than it cost to print it, according to the Chamber of Commerce of the U.S. Soon we may be paying 75¢ a loaf for bread, too, unless something is done to halt inflation caused by irresponsible federal spending.

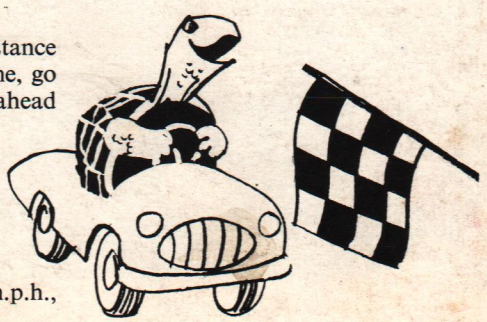
PM FOURTH

A compilation of 1967 iron ore shipments by free world companies, by Skillings' Mining Review, shows U.S. Steel Corporation as the largest shipper, with 39.6 million tons; the Hanna Group second, with 24.8 million tons; L.K.A.B. of Sweden third, with 19.8 million tons; and PM fourth, with 17.7 million tons. The figures include direct shipping ores as well as pellets and concentrates.

UNCLE SUGAR

Agency for International Development figures show that the U.S. government gave away or "loaned" more than $122 billion to other countries in the 21-year period following 1945. Of this, only $150.6 million, less than .2% has been repaid, this amount by the Union of South Africa.

STEADY FREDDY WINS THE RACE!



Our brainteaser on page 18 may have looked easy, but time, rate, and distance problems can be tricky. If you said they'd both get home at the same time, go to the foot of the class. Freddy got home two hours and five minutes ahead of Charlie.

Find this hard to believe? Let's work it out.

If Freddy drives 1,000 miles at 60 m.p.h., the round trip takes him $\frac{1{,}000}{60} = 16.66$ hours (16 hours and 40 minutes).

If Charlie drives the first 500 miles at 40 m.p.h., it takes him $\frac{500}{40} = 12\frac{1}{2}$ hours for the first leg of the trip. Coming home, if he drives 80 m.p.h., it takes him $\frac{500}{80} = 6\frac{1}{4}$ hours. So the whole trip takes him $18\frac{3}{4}$ hours.

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