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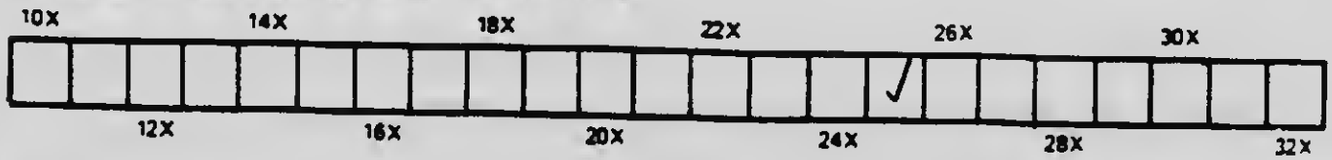

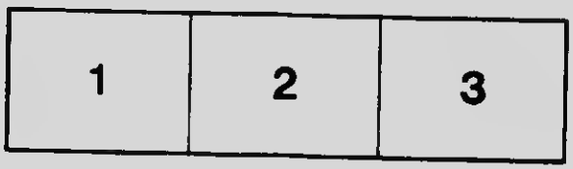

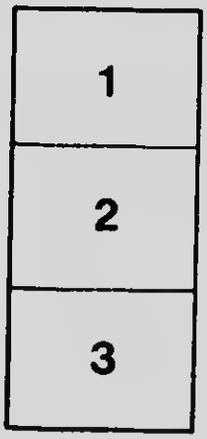

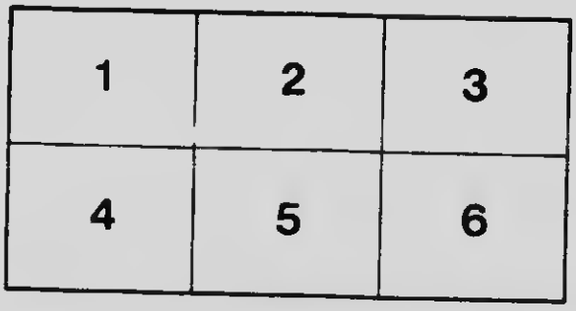

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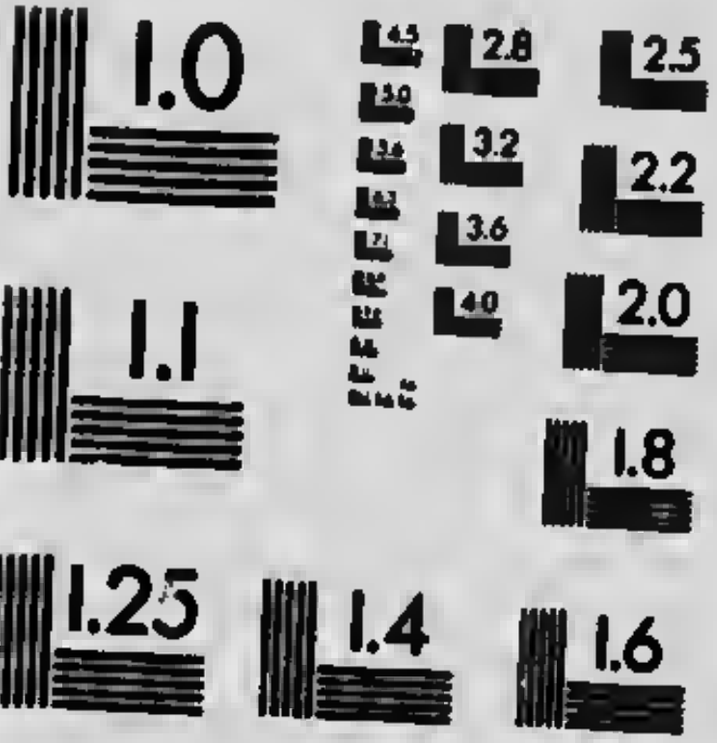

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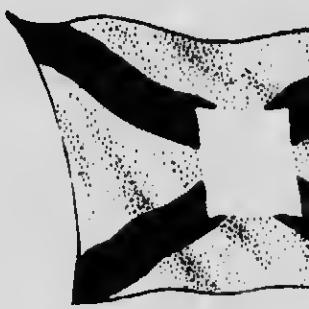

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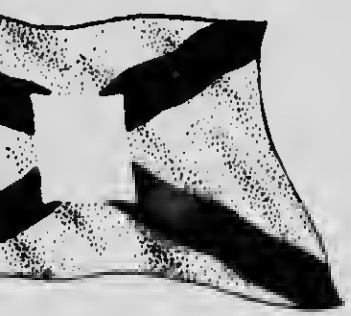

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A BRIEF HISTORY OF A

HE history of the Nova Scotia Steel and Coal Company, Limited, is a record of the activities of many industries. It dates back nearly three centuries to the time when Nicholas Denys, then Governor of Eastern Acadia, was granted certain concessions that included the whole of Cape Breton Island, one of the richest coal fields in the world.

Even at that early day coal was known to exist at Sydney, but this immense property was not systematically developed until the organization, in the early part of the nineteenth century, of the General Mining Association of London.

The first shaft was sunk in 1830, and from that time to the present coal mining in Cape Breton has been a steadily growing industry.

In 1900, the holdings of the General Mining Association were taken over by the Nova Scotia Steel and Coal Company, Limited, in whose control the property still remains.

Equally interesting is the story of the rapid growth of the iron and steel branches of this great industry. Starting in 1872 with a capital of $4,000 and a working force of eight men, the little Hope Iron Works of New Glasgow quickly developed surprising possibilities. Six years later, in 1878, their rapid expansion made a larger plant necessary, and the works were removed from the centre of the town of New Glasgow to a point two miles down the East River, then called Smelt Brook, but now known as Trenton or North New Glasgow. There they began the manufacture of railway car axles.

It was decided in 1882 to engage in the manufacture of steel, and the Nova Scotia Steel Company, Limited, was organized with a capital of $160,000, an increase in ten years to forty times the original capital.

One year later a Siemens-Martin open-hearth plant was completed, and a twenty-six inch blooming mill, the first of its kind in Canada, was installed, together with a twenty-two inch plate mill. Two years later a nine-inch bar mill was added to the equipment.

OF A GREAT INDUSTRY

In 1889, the Nova Scotia Forge Company and the Nova Scotia Steel Company, Limited, were amalgamated under the name of the Nova Scotia Steel and Forge Company, Limited.

The New Glasgow Iron, Coal and Railway Company, Limited, was organized in 1890 with a capital of $1,000,000. Extensive iron ore lands were purchased, including a valuable section on the East River near Pictou, a line of railroad from Ferrona Junction to Sunny Brae was constructed and many other improvements were made, the most important of which was the building of a large coal washing plant, coke ovens, and modern blast furnace at Ferrona.

In 1894, the New Glasgow Iron, Coal and Railway Company, Limited, acquired the now famous iron ore deposits of Bell Island, Conception Bay, Newfoundland, and added a new name, Wabana, to the list of the world's shipping ports. The mines were opened up machinery installed and a double track rope-way, storage pockets and pier were constructed. The first shipment of ore was made on Christmas Day, 1895. Since that date about 13,000,000 tons of ore have been shipped from Wabana,—more than 2,600 cargoes, averaging over 5,000 tons each.

The Nova Scotia Steel and Forge Company, and the New Glasgow Iron, Coal and Railway Company, Limited, were consolidated in 1895, and the new Company was called The Nova Scotia Steel Company, Limited. After the purchase in 1900 of the coal and other properties of the General Mining Association, Limited, the corporation now known as the Nova Scotia Steel and Coal Company, Limited, was formed.

Upon acquisition of the Cape Breton coal fields, and owing to the short water carriage from their Newfoundland ore mines, the Company decided it was advisable to erect a new blast furnace and open-hearth plant near their coal mines, which are situated on Sydney harbor.

In 1904 a new blast furnace and open-hearth plant were put into operation. To further improve the quality of their open-hearth product, in 1911, a Harmet fluid compression plant was installed in connection with the

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NOVA SCOTIA STEEL & COAL COMPANY LIMITED

open-hearth works. During the same year there were also added two steam hydraulic forging presses, one 4,000 tons, the other 600 tons.

To take care of the increased output in the most profitable manner, and to meet the growing demand for cars in Canada, a subsidiary company was formed in 1912. This is known as The Eastern Car Company, Limited, the control of which is vested in the Nova Scotia Steel and Coal Company, Limited.

"Scotia," as the company is more familiarly called, has now become one of the largest industries in Canada, and a very important world factor in the production of iron and steel. Five distinct industries are combined in its operation:

1. The Iron Mines at Wabana, Newfoundland.
2. The Coal Mines at Sydney Mines, N.S.
3. The Blast Furnace and Smelting Works at Sydney Mines, N.S.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

4. The Steel Works at New Glasgow, N.S.
5. The Car Works at New Glasgow, N.S.

These we will visit and wander among the vast workings of what some day will be the heart of the world's great iron and steel industries. It is doubtful if there exist anywhere deposits that combine to so great an extent the advantages of an abundance of good ore, economical mining facilities, excellent location and cheap transportation.

WABANA
THE ISLAND OF IRON

The Wabana (Newfoundland) Iron properties are the largest on the continent, if not in the world. Available reserves of ore, as estimated by experts, are between 2,000,000,000 and 3,500,000,000 tons, an amount which at present rate of mining will not be exhausted for more tha· 3,000 years.

By comparison with the next largest holdings on this continent, that of the United States Steel

HYDRAULIC FORGING DEPARTMENT

FORGE PRESS SHOP AND SHELL INSPECT

NSPECTION SHOP

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

Corporation (1,300,000,000 tons), an idea of the magnitude and great wealth of this field can be formed.

Equally important is the excellent quality and richness of the ore, which is a fine grade of red hematite, ranging from fifty-one per cent. to sixty-five per cent. pure iron.

Only in recent years was this valuable property discovered and developed. Just how attention was first attracted to these deposits is not known. There is a legend that one day a Bell Island fisherman came into St. Johns Harbor with an anchor in his boat made from a large piece of iron ore. Much he had found on the beach. The peculiar color and great weight of it attracted the attention of some men with a knowledge of mining. Perhaps the first steps were taken by them. At any rate, the property eventually came into the hands of Messrs. Butler of Topsail, who, after vainly endeavoring to interest other capital in the venture, finally leased the deposit to the

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

Nova Scotia Steel Company in 1893.

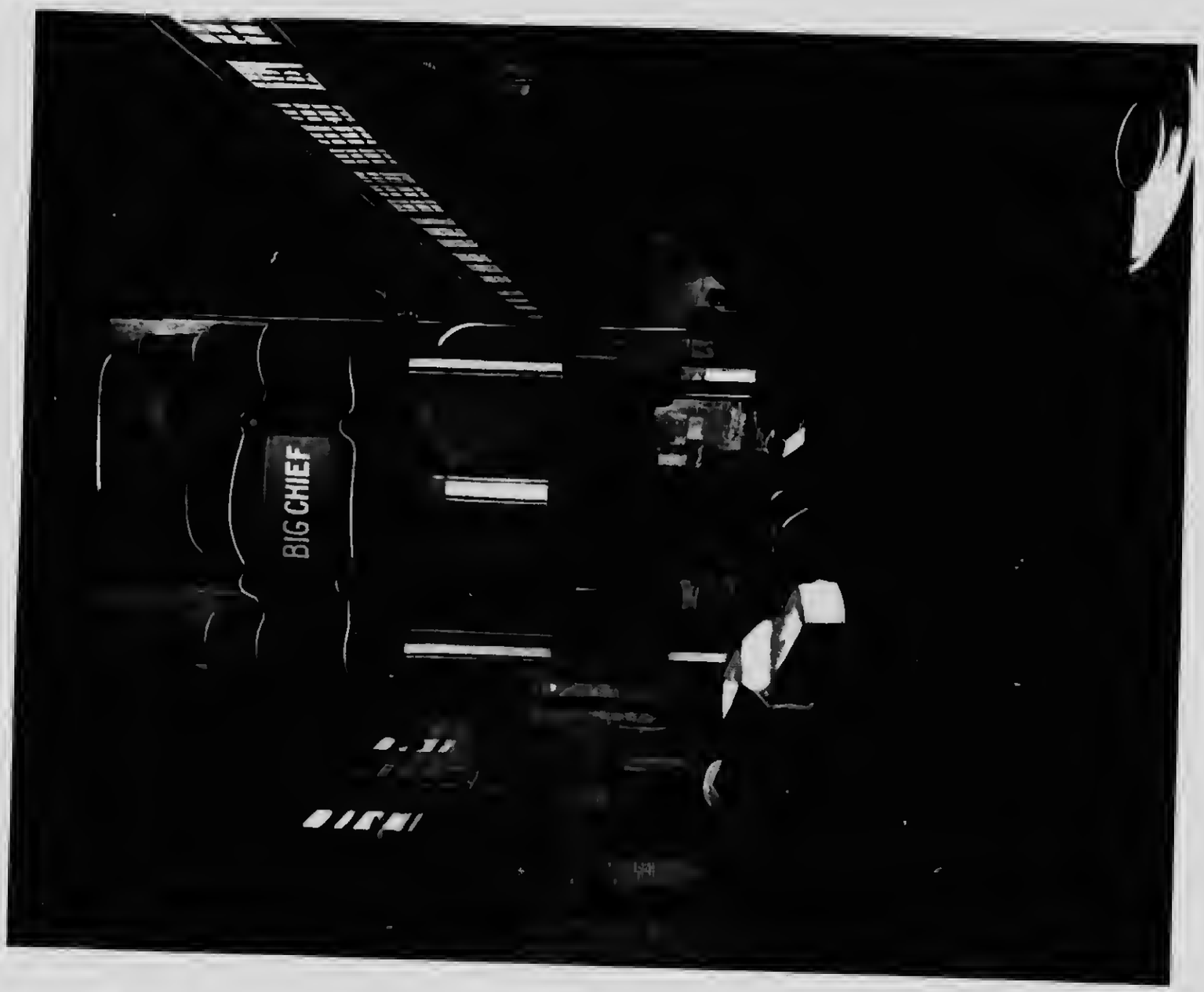
Two years afterwards that company commenced to mine the ore in a small way. The work, at first, consisted entirely of open-cut mining, the earth covering being stripped off the deposit as it lay in the ground and the ore then carried by an endless rope tramway to a pier on the south side of the island. This pier was nothing more than a block set out some distance from the shore and connected with it by a suspension bridge. Later, however, this was supported by a trestle.

At first the ore was used solely to supply the Ferrona blast furnace of the Nova Scotia Steel Company, and large quantities were not required. The Wabana plant consisted merely of a hopper pier of two thousand tons capacity, and the tramway. This, however, met all the requirements, for the mining was quarry work and did not need a more elaborate outfit.

Three years later the possibility of shipping ore to European mar-

GENER

GENERAL VIEW OF FORGING PLANT



FOUR THOUSAND TON HYDRAULIC PRESS

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kets called for an enlargement of the plant. Storage pockets were built, giving an increase of from twelve to fifteen thousand tons storage capacity. At the same time a horizontal ore conveyor was installed, tracks were laid, and a number of other additions made.

In the year 1899, work began in earnest. Twelve hundred men were employed during that season in mining from the old property and developing the new, tramways were constructed, a new pier was built, and the " Scotia " Company went ahead producing ore without a single break in deliveries.

For two years after opening this new bed the ore was secured by stripping and quarrying the deposits lying near the surface. In 1902, however, work was commenced sinking two slopes on the land areas. Operations were carried on rapidly, and within a year the two mines had been opened up and were being worked in a manner similar to the bore-and-pillar method followed in coal mining.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

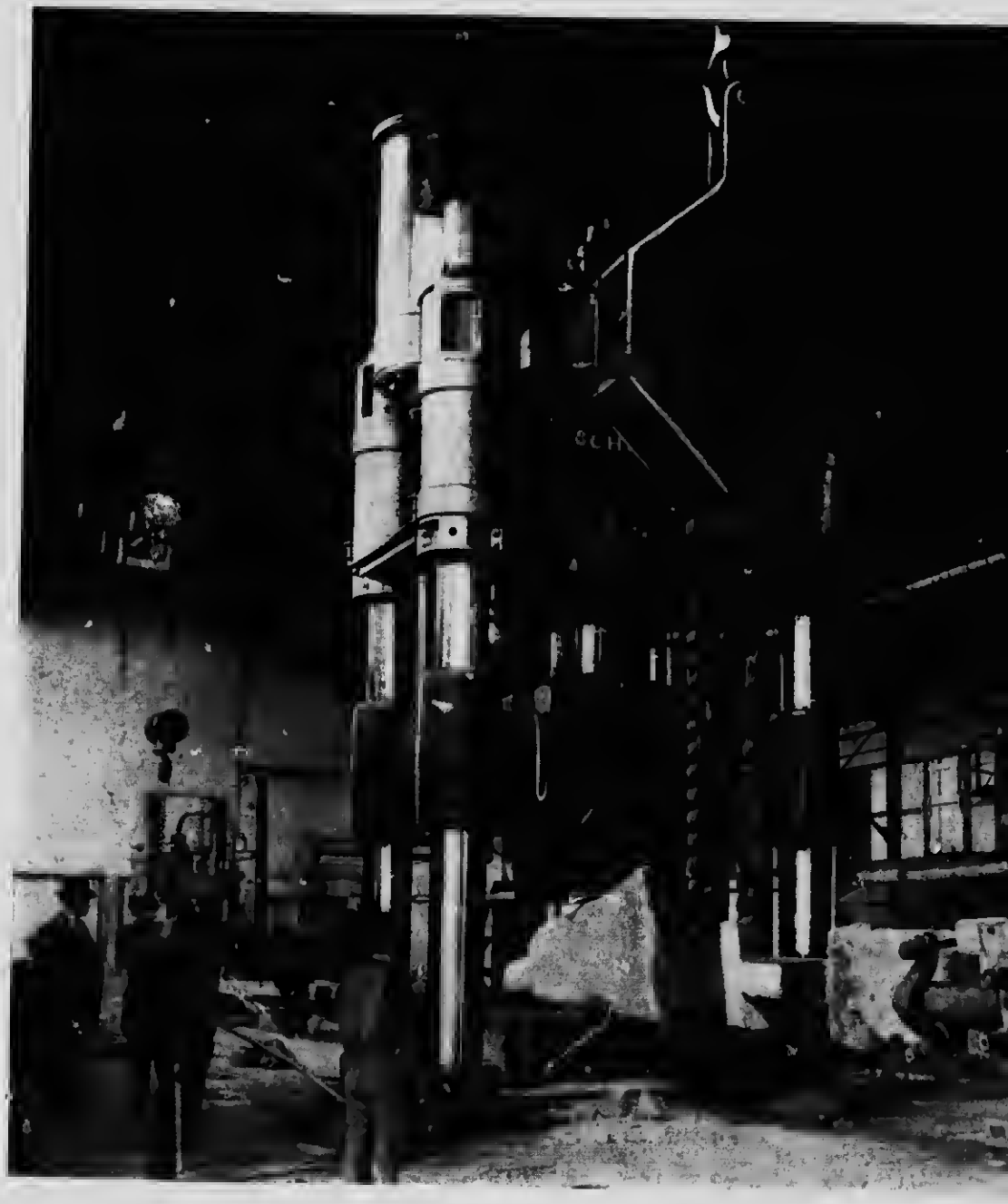
Both these slopes were sunk to a considerable height above tide-water and one of them was driven so as to come out on the shore above high water mark, thus forming an adit. The other slope, Scotia No. 2, was destined eventually to be driven under the sea.

About the year 1905 the possibilities of developing the submarine areas began to attract the attention of the "Scotia" Company. Further additions to its under-water holdings were secured, making the total of submarine property held approximately 35 square miles.

After deciding to drive a couple of slopes to the submarine fields, an arrangement was entered into with the Dominion Iron and Steel Company for piercing their section which divided the Scotia fields. Work on this began in May, 1906. In two and one half years the feat was accomplished and the "Scotia" Company entered its own property.

Bore-holes were sunk and proved that the same beds that out-

FORGE HYDRAULIC PRESS, SHOWING PARTLY FORGED INGOTS IN FOREGROUND



FORGE HYDRAULIC PRESS, SHOWING FORGING BE

RGING BEING PRESSED

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

cropped on the surface extended under the sea with an appreciable increase in the thickness of the mineral.

The "Scotia" areas were entered at a distance of about 4,000 feet from the shore, and conditions were found to be more favorable than had been hoped for.

Since that time the slopes have been driven a considerable distance further, and mining is now being done on a larger scale.

To-day the enormous underground excavations extend for miles beneath the sea, where electric shovels, hurrying trams and the rush of large twenty-ton skips present an ever busy scene and a noisy one. Commingled with the deafening sound of these are the sharp rattle of air drills, the hum of modern electric pumps and the whirr of the large fans that carry fresh air to the most remote parts of the mine. All is apparent confusion, but in reality there is an orderly sequence of operations of a magnitude that is astounding to one unaccustomed

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

to the speed and immensity of an enormous mining industry like that at Wabana.

All this emphasizes strongly the great difference between the crude methods of twenty years ago and the efficient system of the present day.

The equipment of the land mines consists of deck-heads at each slope where the ore is picked and screened. In the summer season the ore is shipped direct to the pier. During the winter it is stock-piled by means of a system originated and patented by engineers of the company. This method is unique, inasmuch as no trestle work is required, although at times the pile reaches a height of seventy-five feet. The system has proved itself efficient in every way. The equipment further comprises a power plant of large capacity, hoisting engines, air compressors and ventilating fans, with all the necessary pumps and other appliances.

The development of the submarine areas also has necessitated

PRESS SHOP. SHOWING BIG CHIEF IN CENTRE

HYDRAULIC PRESS, SHOWING FORGING IN F

NG IN FOREGROUND

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

large additions to the equipment. A deck-head of an absolutely new type, in which the cars are handled without any horizontal landing, has been completed and is now in operation. The cars, each containing twenty tons of ore, are hauled up out of the mine by a rope one and one-eighth inches in diameter and eight thousand feet long. They dump their contents automatically, thus reducing to the minimum the number of men required to attend them.

The hoisting is done by a Fraser & Chalmers first motion, duplex, steam-hoisting engine, which is said to be the most powerful of the kind in British North America. The engine is equipped with the most modern overwind and automatic braking devices, and is capable of considerable speed, rushing the big cars up the two-mile slope at the dizzy rate of thirty miles an hour. The cars are filled in the mine from bins, which in turn are supplied by small two-ton mine cars.

Drilling, hoisting and pumping

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

are all carried on by compressed air. When the Company commenced to mine on its land areas two compressors were installed, a 1,200 cubic feet capacity Norwalk machine, and a 2,500 cubic feet Norberg machine. Since then a Walker compressor, with a capacity of 3,500 cubic feet, has been added to this equipment, and the piping of the three machines is connected together so that they may be operated as one plant or separately, as required.

From April to December, inclusive, small two-ton cable cars carry the ore from the mine or stockpile to the shipping piers, two miles distant. The never-ending string of cars coming and going on the double track road bring their loads to tipples at a point two hundred and fifty feet above the sea. These tipples constantly empty the loaded cars into vast natural gorges that have been dressed up to serve as receiving pockets.

There is a certain fascination in watching this slow but constant

HINE SHOP — TURNING A 28 F[illegible] SHAFT 18" DIAMETER

MACHINE SHOP—WABBLING 28" MILL

28" MILL ROLL

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

creep of the 60,000 ton mass of iron. Two great endless chains of buckets convey the ore from the pockets to a point where it falls in a roaring, deafening cataract of sparks and iron ore through smaller pockets, chutes and automatic trimmers, a distance of 90 feet to the ship's bottom. All present a most interesting spectacle well worth travelling miles to see. Vessels of twelve thousand tons capacity have been loaded in from one to five hours. The normal capacity is 2,500 tons per hour.

Recently there has been installed a modern electrical plant of considerable power. It consists of modern water tube boilers and stokers, built on piles at the shipping pier and adjacent to coal discharging plant. These supply steam to Belliss and Morcom marine type engines, operating Brown Boven generators, producing 60 cycle, 3 phase current at 6,600 volts. At this voltage it is transmitted to the various points of consumption in both the land and submarine mines.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

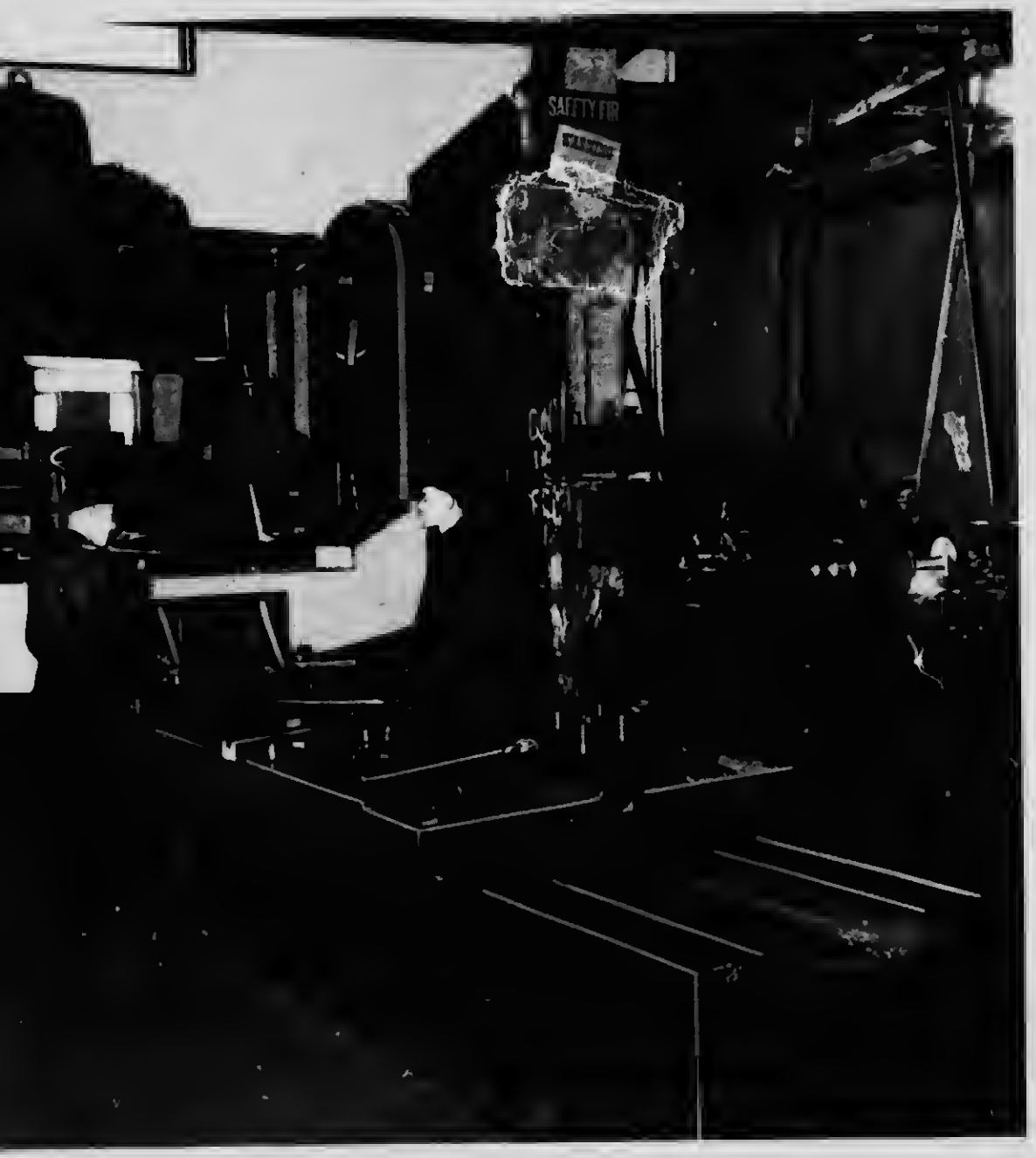
A glance at the map of the world will show the strategic position of Wabana, Newfoundland, which is located, practically, at the centre of the world's largest markets. It is directly upon the route of North Atlantic shipping, and the seaboard markets of both Europe and America lie open before it.

The "Scotia" Company sells one-half million tons of ore a year in the United States, Europe, and Canada The remainder of the output is shipped to the Company's furnaces at Sydney Mines, Nova Scotia, and there converted into finished steel products that eventually find their way to every section of the globe.

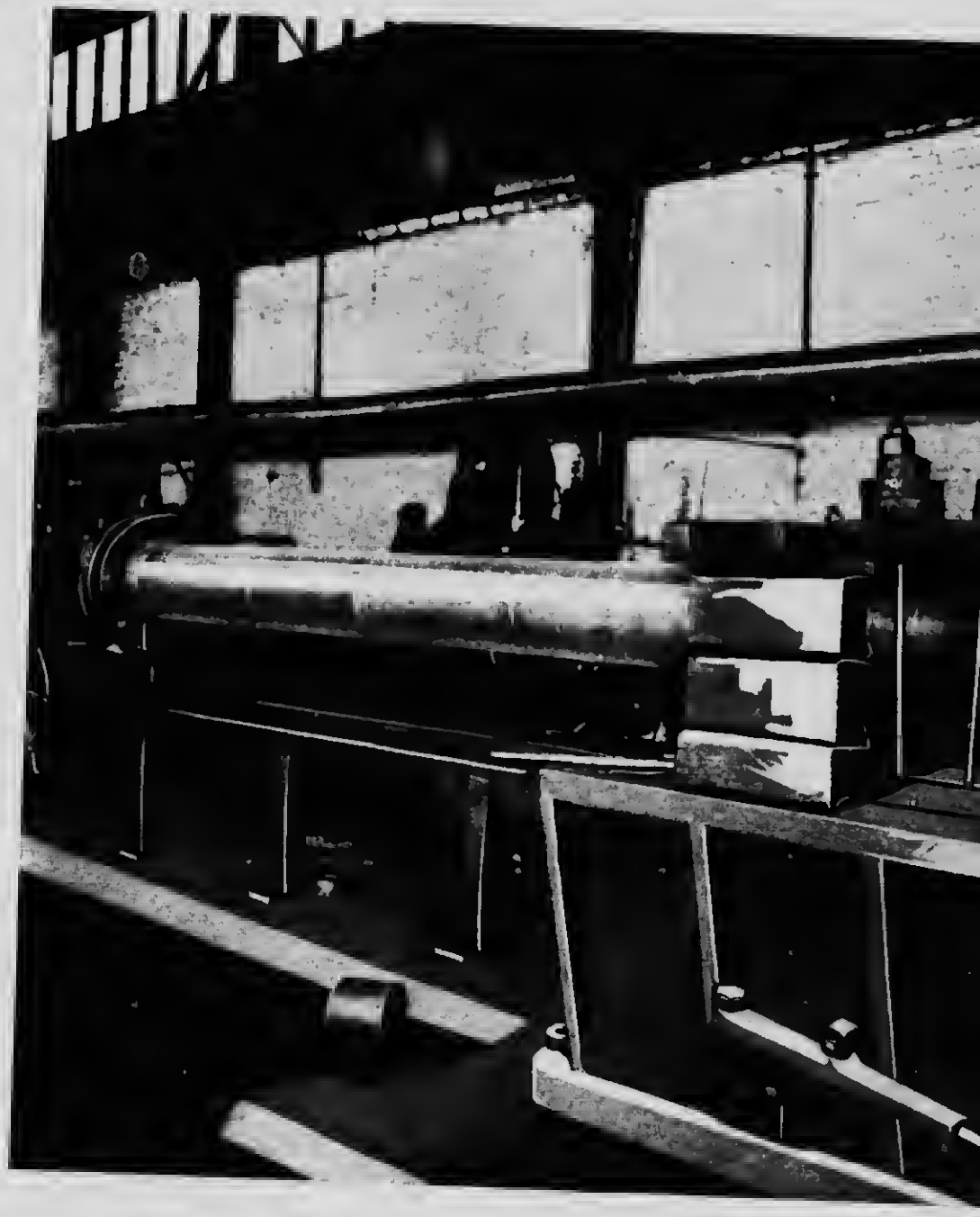
LIMESTONE QUARRIES AT POINT EDWARD.

To secure an adequate supply of suitable limestone for the Sydney Mines furnace, the company has acquired a property at Point Edward, nine miles away, which is connected with the main line of the Intercolonial Railway by a

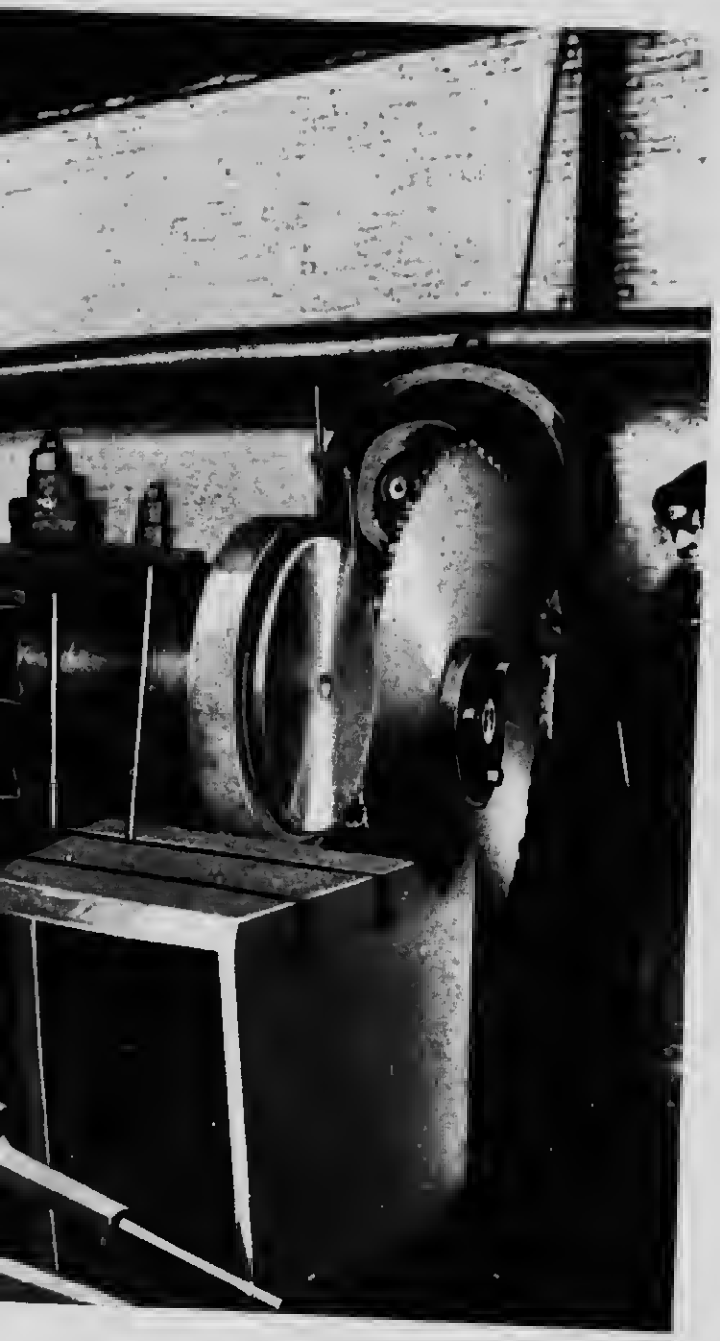
MACHINE SH



HINE SHOP—PLANER MACHINING A FORGING



MACHINE SHOP—FINISHING AN 18"



AN 18" SHAFT

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

branch two and a half miles long. This property is about 250 acres in extent. The stone is carboniferous, occurring in layers, is of high grade and very uniform in quality. The quarry is operated by a Lidgerwood overhead cableway, with two towers, having a radius of 800 ft. The limestone is mined by the open cut system, as there is little top soil to remove, and as it is brought direct to the blast furnace from the quarry in railway cars, an abundant supply of it at a very low cost is readily at hand for the company's smelting purposes.

CANADA'S GREATEST COAL FIELDS.

Containing, it is estimated, over 2,500,000,000 tons, the Cape Breton coal areas of the Nova Scotia Steel and Coal Company, Limited, rank high in their list of assets, and are among the most important holdings in Canada. When the General Mining Association secured the Duke of York's grant of all the minerals

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

on Cape Breton Island, and inaugurated systematic coal mining in Nova Scotia, it commenced operations in the Sydney Mines district, on account of the excellence of this coal.

During the 80 years of that association's history, it worked nearly every district now operated in the province, but when absorbed by the present owners it held only the areas first mined, having retained these in preference to all others because of the superiority of the coal. For steam, metallurgical and general purposes, this coal is regarded as the best in Nova Scotia, being the purest and having a very high calorific power.

Four different blocks of coal areas are held by the Company, the Sydney Mines land, Sydney Mines submarine, Boulardarie land and the outer submarine areas. The first three areas run continuously from the north side of Sydney harbor to the south side of the Great Bras d'Or, a distance of about ten miles. The outer

CHINE SHOP—FINISHING PROPELLER SHAFT

MACHINE SHOP—FINISHING A 25-FOOT STEEL SHAFT

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

submarine areas extend from Cape Dauphin to Cape Percy, covering the entire Cape Breton coalfield, and within their area of twenty-one square miles is believed to be every seam which exists in this district—by far the most important and extensive in Canada.

A comparatively small portion of these areas has been worked in the ninety years that the mining has been carried on, operations having been confined almost entirely to the southern part of the Sydney Mines land and submarine areas. Collieries have been opened in the central portion of that district only within the last four or five years, while as yet not a pound of coal had been taken from the northern, the Boularderie or the outer submarine fields.

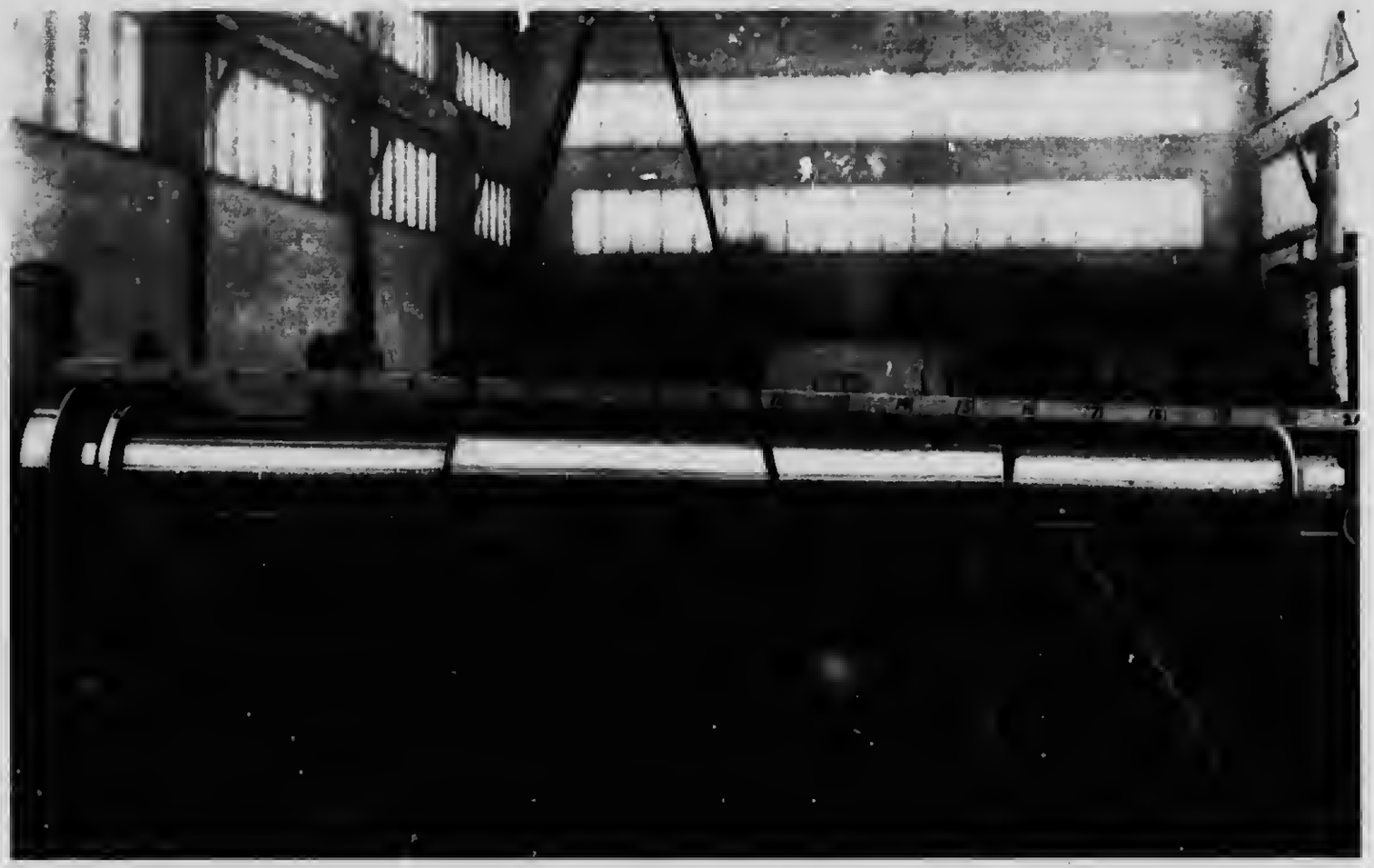
The thickness of the coal in the various mines runs from five to six and a half feet, the dip being uniformly about eight per cent. The coal is largely mined by the room and pillar method, but several different systems of min-

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

ing, pumping, haulage and ventilation exist in different mines to meet varying conditions.

Since the Nova Scotia Steel and Coal Company, Limited, took over these properties a large amount of development has taken place at Sydney Mines. Where, in 1900, one colliery was in operation, with an annual output of 240,000 tons, to-day five well equipped mines are producing about 900,000 tons, and during the present year a new colliery will be adding 360,000 tons to the yearly output.

At Sydney Mines there is also a modern steel plant with a blast furnace and open-hearth steel capacity of about 100,000 tons per year, equipped with all the necessary coke ovens, coal washers and engineering shops. The railway system has been practically rebuilt and greatly extended, while at the shipping port of North Sydney, only three miles from the collieries and steel works, extensive docks, with the most modern facilities for coal shipping and ore receiving, have been con-



FINISHED COUPLING SHAFT, 18" DIAMETER, 21 FEET LONG

RUDDER FOR S.S. "DART," WEIGHT SEV

HT SEVEN TONS

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

structed. This development has given new life to the sister towns of Sydney Mines and North Sydney, and they have become two of the most important industrial centres in the Maritime Provinces.

A brief description of the collieries now being operated will prove of interest.

Princess (No. 1) This colliery was the only one in existence when "Scotia" took over the property from the General Mining Association in 1900.

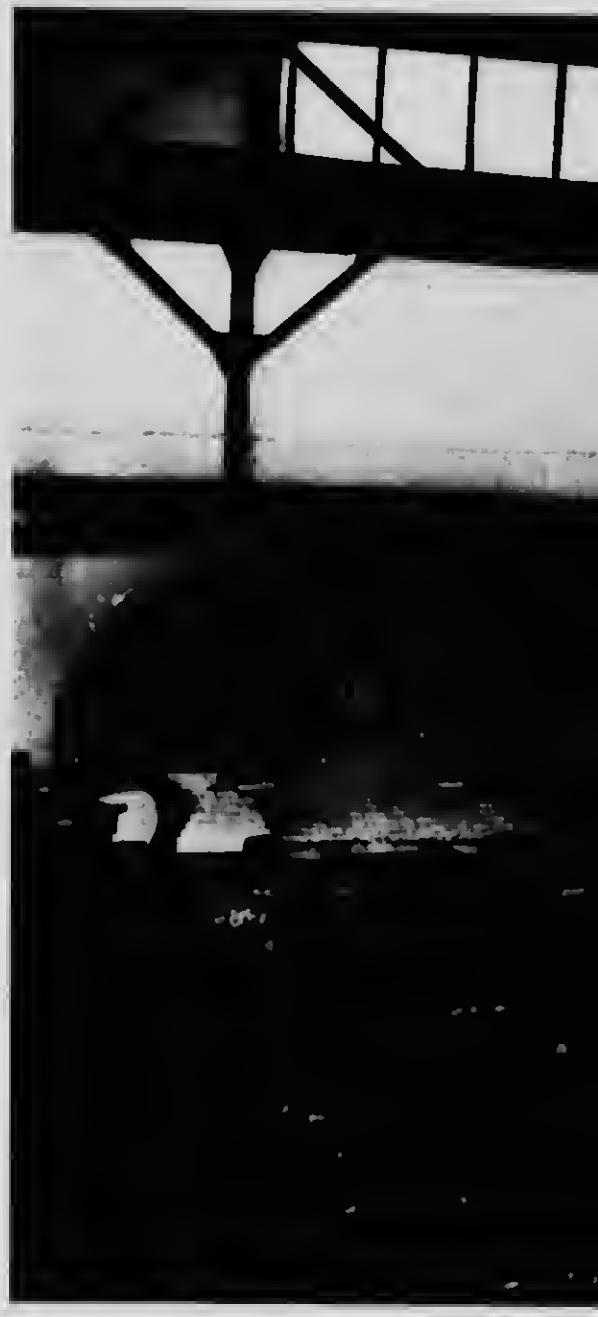
The coal cutting here is done by hand, about six hundred men are employed underground, and the mine is equipped to maintain an average daily output of eight hundred tons. The surface plant here is the most extensive of any of the collieries, being used as a central plant for many of the operations of mines numbers 2 and 5. Half the boilers at this plant burn waste gases from the nearby coke ovens and the remainder are fired with refuse stock from the coal washing plant.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

Lloyds (No. 2). -The capacity of this colliery is six hundred tons per day. Cutting is done by machines driven with compressed air. The power for operating these machines, the haulage engine and others is furnished by the big plant at the Princess mine.

Florence (No. 3).— This colliery is located about two miles north of the Princess, and has the largest output of any of the present mines, averaging nine hundred tons daily. Five hundred and fifty men are employed. Six 240 h.p. Sterling boilers supply steam for the different engines, and are equipped with forced draught fans to facilitate the burning of the fuel, which consists principally of waste from the washer.

Scotia (No. 4).—This is considered one of the most interesting mines on the Continent, not because of its size, but because of its being operated underground wholly by electricity. The cutting and handling of coal and the pumping of water is all done electrically. It is the only colliery



RUDDER F

DDER FOR S.S. "LUX." WEIGHT NINE TONS

RUDDER FOR S.S. "GRYFERVALE." WEIGHT ELE

GHT ELEVEN TONS

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

in Canada in which mechanical appliances are utilized to the utmost, although it does not contain a single steam or air pipe. The daily output of nine hundred tons is secured with a minimum of capital outlay and working costs.

Queen (No. 5).—This mine was opened up and first operated by the General Mining Association. It was one of the best producers at that time and was more familiarly known as "Queen Pit." The haulage system is now operated by electricity and its equipment is modern in every way. Its capacity is five hundred tons per day.

Jubilee (No. 6).—This is a new mine now being opened up. It will have the largest capacity of the "Scotia" group, as its output will amount to about 1,500 tons per day. The shaft which was started in 1914 is now nearly finished, and other preparations are being made for the mine's operations in 1916.

The three latest collieries of the company are unique in this re-

spect: the underground haulage, or method of conveying the coal from the working places to the main haulage of the mine, is being done by small engines, driven in one colliery by electricity and in two collieries by compressed air. Not a single horse is employed underground in either of these three collieries (Nos. 2, 3 and 4), and no horses will be employed in the new Jubilee Colliery. This is a most unusual condition of underground coal mining; either horses or ponies are used in nearly every coal mine. This adoption of electricity by "Scotia" on a large scale is the result of the thorough and satisfactory trial which has been given to this motive force. The Jubilee mine is to be operated altogether by it, both on the surface and underground.

All the coal mined from these collieries is screened as it is raised, and of the output 75 per cent. of merchantable coal is shipped by rail and water to the various markets, while the remaining 25 per cent. is washed and is at once

RUDDER STOCK

STOCK. S.S. "ABESSIMIA." WEIGHT 6815 LBS.

AXLE HAMMER IN OPERATION

RATION

converted into coke suitable for "Scotia's" metallurgical purposes. The refuse from the washing is conveyed automatically to the colliery boilers.

COAL WASHING PLANT AT SYDNEY MINES.

The construction of this plant was begun in June, 1913, and completed in the autumn of 1914.

This washer is of the Baum type, the general arrangement of the plant being designed by Messrs. Simon-Carves, Manchester, England. It will have a capacity of washing 1000 tons of fine coal in ten hours. In general, it consists of a reinforced concrete building elevated about eighteen feet above the yard level and is supported by a number of reinforced concrete columns. Ahead of the building and under the tracks is a large pocket in which the raw slack coal is dumped from the railway car, after having first passed over a pair of two hundred ton track scales.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

Alongside of the washery building is an elevated settling tank built of reinforced concrete and designed to hold 150,000 gallons of water, the water tank being protected on the outside by a suitable enclosure which provides sufficient air space to prevent freezing.

In the usual operation of this plant, the raw slack coal is dumped from either of two tracks into the elevator pit, and from there the coal is fed to a bucket elevator which delivers it to the large wash box on the upper floor of the building. Here all the coal is washed. No further treatment is necessary for the larger sizes, but the smaller sizes are rewashed and passed over a system of screens. The larger sizes are delivered by a series of bunker pockets to the crushers, while the smaller sizes are passed along to another washing box and rewashed. In the process of washing, the heavy slate and dirt eventually sink to the bottom of the box and are removed automatically by a

COGGING MILL—

G MILL—SHOWING 3½-TON INGOT BEING ROLLED

COGGING MILL—SHOWING INGOT BEING

BEING ROLLED

spiral conveyor and elevator. This dirt is finally collected in a storage bin or is dropped through a cast iron pipe through which runs a stream of water that flushes the refuse material to the sea.

In the operation of the plant it is the intention to remove as far as possible all slate and sulphur from the coal. It is also essential to keep coal from being carried away with the refuse material. To reduce the waste to a minimum a third or middle product is made by varying this, the loss of coal becomes very slight and the quality of the washed product is considerably improved.

After the coal is washed, the larger sizes are divided into two grades of nut coal and may be shipped separately, or these may be again mixed and passed through a pair of rotary crushers and reduced to sizes sufficiently small for coking purposes.

After passing through the crushers the coal is mixed with the fine slack and taken by a twenty-inch

conveying belt to the storage tower near the coke ovens. The middle product coal, after being collected in a storage pocket, is transferred to a sixteen-inch belt conveyor, which carries it to the boiler-house, where it is weighed and distributed to pockets for use as fuel. The water used for washing the coal is collected in a drainage tank where it is clarified and used over again, the settlings being easily removed through a valve at the bottom.

COKE OVENS

The washed coal is at once conveyed into the neighboring coke ovens. These have been continuously improved and added to, so that at present they consist of 30 Bauer ovens at Princess Colliery, and 120 Bernard ovens, the total capacity of the united batteries being 300 tons of coke per day, all of which is used by the Company for smelting purposes. These latter ovens are situated right at the foot of the blast furnace, where the coke is consumed, so that

ROD AND BAR MILL. NEW GLASGOW

NES

after the coke is produced there is only one handling of it, and thus much breakage and waste is avoided.

COAL HANDLING PLANTS AT NORTH SYDNEY, QUEBEC AND MONTREAL

At North Sydney are situated the coal loading and ore discharging piers. There are two coal piers, high and low level. The former is 60 feet above high water and is 1,000 feet long, including approaches. It is equipped with bins to hold 5,000 tons. Seven thousand tons have been handled over this pier in six hours.

The low level pier is thirty-four feet above high water, and has a length of 1,300 feet. This is used principally for loading small craft and for bunkering. The commanding geographical position and fine harbor of North Sydney, together with the high grade of Sydney coal and quick despatch secured, gives the Company high rank in the bunkering trade.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

The Company also possesses extensive docks at Quebec and Montreal. The Quebec plant consists of three gantry cranes situated on the Louise Basin, which discharge on the stock piles or into cars or lighters without further handling. The plant has a capacity of 3,000 tons per day.

The Montreal plant, located on Bickerdike Pier, on the tracks of the Grand Trunk Railway, consists of two quick acting Brown hoists with a capacity of 3,000 tons per day. These hoists are particularly adapted for bunkering steamers alongside the plant, and some of the largest liners in the Canadian service have been loaded with despatch.

TRAFFIC AND TRANSPORTATION.

With its yearly tonnage of material handled, the transportation problem is one of much importance. In the wide range of its activities, the Company has to deal with freight handling of all kinds, from the trucking of a load

BOLT AND NUT D

AND NUT DEPARTMENT—BOLT MACHINES IN FOREGROUND

CHINES

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

of logs, to shipping over a million tons of coal and ore annually.

A fleet of fifteen to twenty steamers, mostly built to the Company's specifications and secured on long term charters, are engaged in this trade. They have large hatches and are built on the cantilever principle, with holds absolutely clear of any obstructions, such as beams, pillars and stanchions.

Two other steamers, the Wagama and the Wascana, each with a dead weight capacity of 8,200 tons, are built on the same principle, with large hatches and clear holds. Like the Themis and Tellus, they are especially suitable for the transportation of ore and coal and for carrying railway cars and heavy machinery.

Another boat built for the St. Lawrence coal trade is the Wacousta, a fine type of her class, with a dead weight capacity of 5,700 tons.

There is extensive railway equipment in connection with the Sydney Mines plant. The main

line is eight miles long, and there are upwards of twelve miles of sidings. Direct connection is made with the Intercolonial Railway of Canada at Sydney Mines and at North Sydney.

The ore-receiving pier is 42 feet above high water, and 1,140 feet long. It is equipped with two Wellmen - Seaver - Morgan steam discharging cranes, which have a working load of 20,000 lbs. and a capacity of 5,000 tons per day.

* * *

METALLURGICAL PLANT

BLAST FURNACES

All the raw material for the New Glasgow Mills and forges is supplied by the Sydney Mines steel plant, one of the most efficient and modern in Canada. Its construction was commenced in 1902 and completed three years later. It has since replaced the original metallurgical works in Pictou County.

ANGLE BARS, TIE PLA

. TIE PLATE BOLTS AND NUTS. SPIKES AND RIVETS

SHIPPING ROOM—LOADING ANGLES ON F

S ON FLAT CARS

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

The iron ore is reduced in a blast furnace with a daily capacity of 300 tons. This furnace is 80 ft. high, 12 ft. 6 in. in diameter at stock line, 18 ft. 10 in. at bosh, and 13 ft. at hearth. It has nine tuyeres.

The equipment includes four Cowper air-heating stoves, each 85 feet high and 12 feet in diameter. Besides these, there are two compound blowing engines of the latest Southwark type, with air cylinders 72 inches in diameter and with a 60-inch stroke.

The steam is supplied by Sterling water tube boilers, and the firing is done by firing gases, which also heat the stoves. A skip hoist with a double bell filling apparatus feeds the furnace and is supplied with coke, ore and limestone from a system of modern storage bins.

Four batteries of retort ovens, 150 in all, supply coke for the furnace. Thirty of these ovens of the Bauer type are at the Princess colliery; the remainder, of the Bernard type, are located at the furnace.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

A notable feature of the equipment at Sydney Mines is that the waste gases of the blast furnace and coke ovens are all used for fuel, and that every effort is made to reduce the consumption of coal under plant as much as possible.

Near the blast furnace, and in close proximity to one another, we find all the materials necessary for the production of pig-iron assembled.

These comprise coke manufactured by the company from its own coal mines in the immediate vicinity, the iron ore which comes from the company's Wabana mines, and the limestone which comes from the company's quarries near by.

The blast furnace is fed by an inclined skip hoist carrying this coke, ore and limestone, which is supplied by a modern storage bin system. The blast furnace was blown in nine years ago, and with the exception of the necessary lay-off for repairs, has been working uninterruptedly ever since.

SHOP—36′ GISHOLT BORING MACHINE ON 4.5′ SHELLS

SHELL SHOP—24' GISHOLT BORING MACHINE ON

INE ON 4.5" SHELLS

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

OPEN HEARTH FURNACES

The product of the blast furnace is conveyed in huge ladles, containing forty tons of molten metal, to the open hearth furnaces, situated a few hundred yards from it. The open hearth department consists of four 50-ton basic furnaces of modern type, and one tilting hot metal mixer, with a capacity of 180 tons. Into these furnaces the molten metal is poured, and from them it shortly emerges converted into molten steel. The open hearth furnaces are heated by gas made in the most modern gas producers from coal from the company's mines, which is specially adapted for this work. A certain percentage of pig and scrap iron and the other materials necessary for the manufacture of steel suitable for the special uses for which it is required, is added to the molten iron already in the furnaces. These solid ingredients are introduced by means of a gigantic electrically-driven charging machine, the long arm of which is intelligently projected

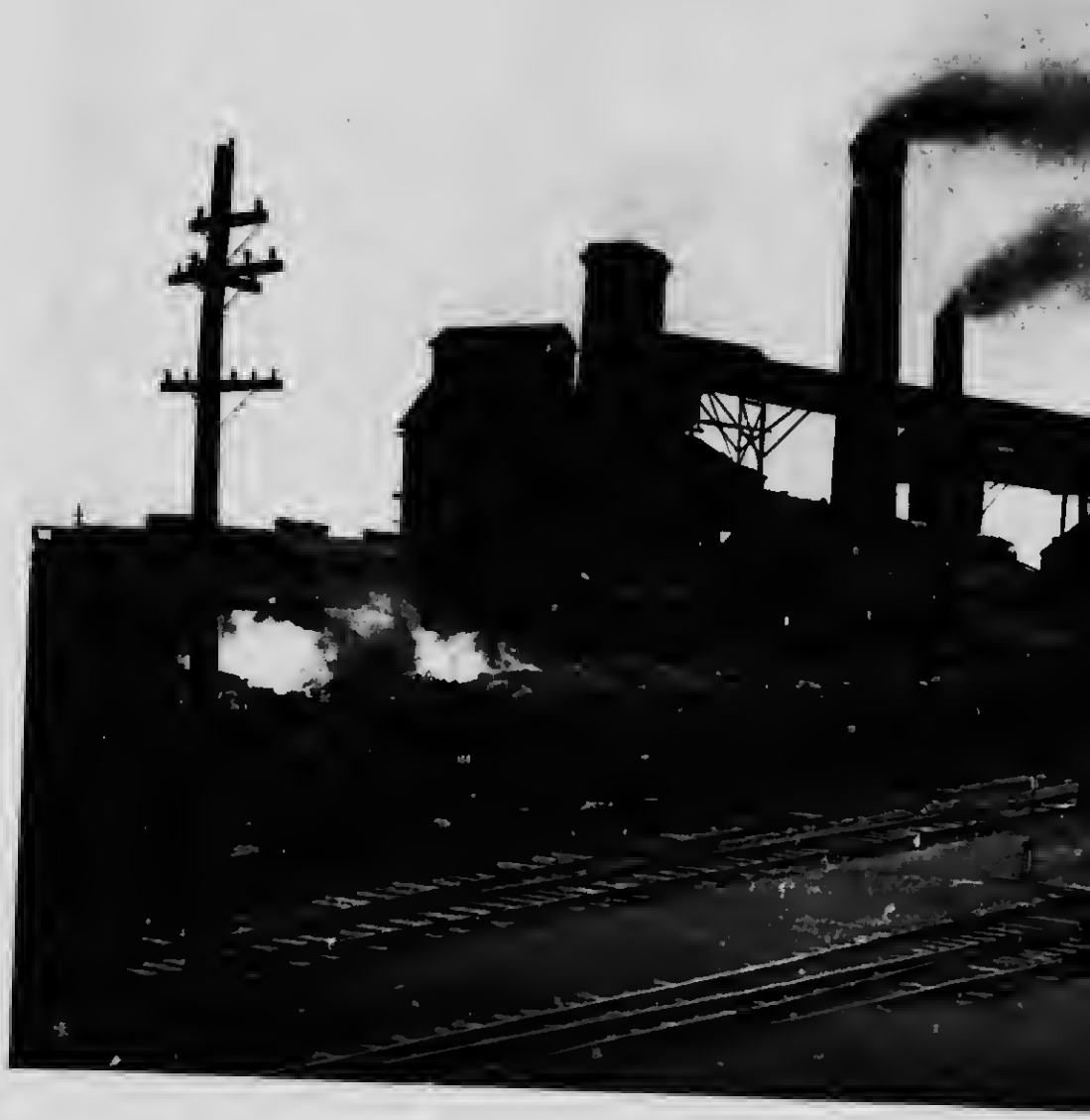
into the open hearth furnace and there scientifically distributes its load on to the bubbling, incandescent mass. This molten mass having become steel, it is poured into large ladles with a capacity of 60 tons, which are raised and handled by huge 75-ton electrically-driven Shaw cranes, from which the liquid is poured into ingot moulds. These vary in capacity from 3½ tons to 30 tons each. In the ordinary way the ingots are allowed to cool in the moulds, and then, being ejected, are sent to the New Glasgow steel works. But if compressed steel is wanted, then the ingot containing the molten steel is taken to the hydraulic steel compression plant, which is the first of the kind to be installed in Canada.

FLUID COMPRESSED PLANT

For years past much time has been devoted to the study of basic open-hearth steel, and many forms of treatment have been

SHELL INSPECT

INSPECTION, SHOWING SHELLS PILED ON TABLES



PRINCESS COLLIERY

devised by which to improve the quality and remedy the defects inherent in various stages of its manufacture. Of these defects, those causing unsoundness are to-day recognized as most important and widespread in their influence.

Various degrees of success have been attained with different modes of treatment, but of all of these, the Harmet Fluid Compression process undoubtedly gives the best results.

The Nova Scotia Steel and Coal Company, realizing the importance of fluid compression as a valuable aid in producing reliable and first-class steel products, has purchased the Canadian rights of M. Harmet, and has thus secured the monopoly to use his process in the Dominion. Thus, advancing with modern progress, it maintains its policy of taking advantage of every important metallurgical development, so that its high reputation as manufacturers of the best marine, railway and machine forgings obtainable shall be maintained.

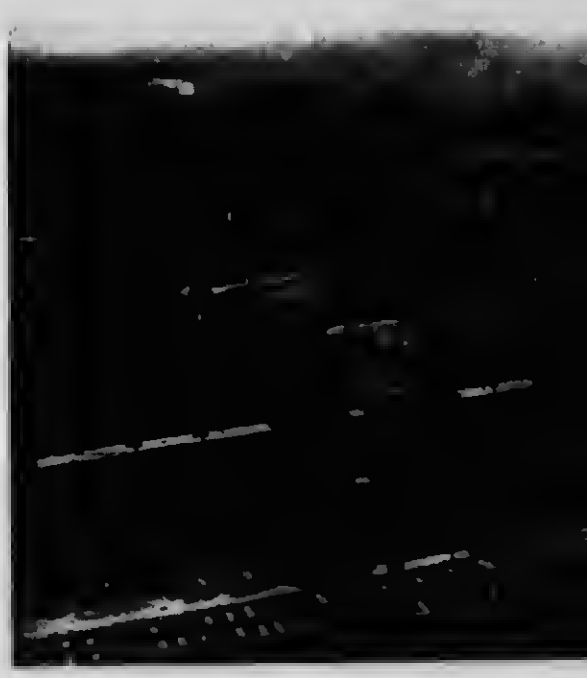
NOVA SCOTIA STEEL & COAL COMPANY LIMITED

By the installation of a Harmet plant at Sydney Mines, the most modern means has been adopted for obtaining the highest grade steel of its class in Canada. It has always been the policy of this Company to maintain a position in the front ranks, and by recent additions to its plants this policy has been demonstrated in a practical manner.

Not only has the most approved means of producing high grade steel been adopted, but the recent installation of steam-hydraulic presses at New Glasgow, N.S., has made it possible to finish this steel so as to produce the best forgings obtainable.

This forge is modern in every respect—designed and installed after a close study of the best forges in foreign countries, and in line with the latest developments in the market.

Believing a short description of the plant, with a statement of its merits, will be of interest, a brief note on this department will be found herein.



QUEEN CO

UEEN COLLIERY AND ENGINE ROUNDHOUSE

PRINCESS COLLIERY—COAL-WASHING PLAN

G PLANT ON RIGHT

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

FLUID COMPRESSED STEEL FORGINGS

Nowadays we frequently find railway derailments and other disasters explained as due to the failure of some part of the equipment which is composed of steel. The offending member may have been a steel rail, axle, shaft, connecting rod or any vital part of the system. The opinion undoubtedly exists that steel is liable to unaccountable failures: this opinion is not new. In the early days of steel, when it was fighting for its existence against iron, this was the cry. Since then steel has proven its worth and superiority, and now has, for most purposes, almost completely replaced iron.

Yet an occasional unaccountable failure does occur, and reminds us of how much there is yet to learn. Frequently, when the individual cases have been studied, it has been found that the steel in question was of normal chemical composition, or, at least, contained no constituent that explained its weakness.

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

Most competent and experienced metallurgists agree in crediting the majority of these inexplicable results to variation in molecular structure, and, if pressed further, would talk of pipes, cracks, segregation, blowholes, occluded gases, internal strains, crystallization, non-metallic inclusions, etc.

That such defects exist is common knowledge, as is the fact that the critical time for the inception and growth of these evils is during the period when the steel passes from a liquid into a stable solid condition.

Most steel manufacturers are doing little, if anything, to remedy these imperfections, because, for ordinary purposes, the usual merchant brands of steel are satisfactory, and any extra cost of treatment is prohibitive.

However, the producers who are to-day placing on the market the highest grade of steel for heavy forging purposes have adopted the method known as the "Fluid Compression Process," in which the metal is subjected to a high pres-

COAL-WASHING PLANT

LLOYD'S COLLIERY, SYDNEY MINI

EY MINES

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

sure while it passes from the molten to the solid state. The product of this process is used in the manufacture of high-grade forgings, such as locomotive axles, crank shafts, marine forgings, artillery tubes and armour plate of the highest grade; in fact for all articles in which maximum reliability and homogeneity of structure are demanded.

In order to appreciate the ultimate effect of this process upon steel, it is necessary to consider the various stages in its manufacture. With this in view the production of marketable steel may be divided into three stages, as follows:

1. The production of liquid metal with the desired chemical composition, without admixture of slag, and without gases or oxides in solution;

2. The transition from the liquid to the solid state within the ingot mould, this being attended with many risks, since the violent contraction accompanying rapid cooling is apt to cause serious internal strain, and even rupture the metal

mass, thereby causing defects impossible to remedy later on;

3. The conversion of raw, solid metal into more finished products, such as billets, bars, rods or shapes, accomplished by reheating and rolling or forging.

The first stage is carried on within a furnace, but, even at the high temperature found necessary for refining, may be reasonably controlled.

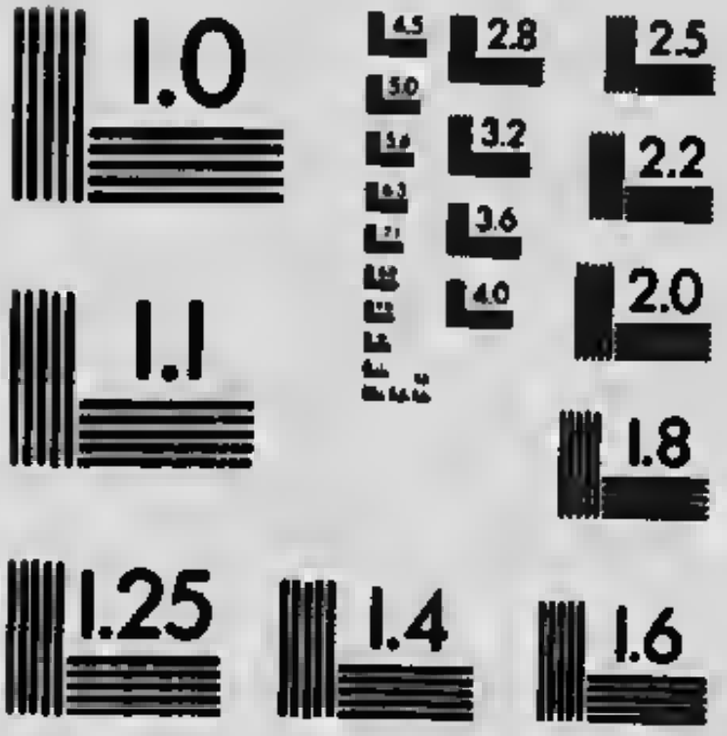
The second stage, when the physical qualities and molecular structure of the metal is decided, least admits of control of the three divisions of manufacture under consideration; nevertheless, realizing the importance of controlling this stage, steel makers have steadily sought to check the occurrence of its defects, notwithstanding the magnitude and wide-spread influence of the forces involved. Although for years past an adequate method for their control has been sought by manufacturers of high-grade steel, not until recently has a satisfactory solution been found.

LIMEST

LIMESTONE QUARRY, POINT EDWARD

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

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BLAST FURNACE AND AIR COMPRESSIO

PRESSION PLANT

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

The defects most commonly occurring in steel that has been cast in ingot molds are: blowholes, pipes, porosities, cracks, internal stresses, segregation and excessive crystallization.

Blowholes are caused by the presence of occluded gases in the liquid metal. Iron, like water, has a higher solvent power for gases, such as carbon monoxide, nitrogen and hydrogen, when liquid than when solid. Thus, during the solidification of the steel, the excess gas which has been dissolved when the metal was liquid, is expelled, and this gas becoming entangled in the hardening mass, causes bubbles or blowholes. These may be either deep-seated or situated close to the surface. While both are highly undesirable, the latter are particularly so. Ordinarily, deep-seated blowholes close up upon rolling or forging, and probably do little harm if sufficient work is done upon the metal, but in the case of large sections the necessary amount of work to effect this is seldom given. The blowholes which occur close

to the surface are liable, while the ingot is being rolled or forged, to burst, thus causing a break through which atmospheric oxygen and slag may enter the cavity. Should oxygen do so, it would react with the iron of the interior wall of the blowhole, forming iron oxide, the presence of which effectually prevents welding and leaves a permanent flaw. It is also said that under certain conditions, during the solidification of the ingot, oxygen diffuses inward from the atmosphere, oxidizing the walls of the cavities, with a similar effect. To surface blowholes are due, therefore, most of the surface cracks and inclusions frequently found on turning up steel.

The "pipe" or central cavity is due to shrinkage, and is distinguished by an opening or void, usually found most highly developed near the top and toward the centre of the ingot. The same cause—shrinkage—produces a continuation of this defect downward along the longitudinal axis, the visible pipe gradually tapering away

DRAWI

DRAWING SLAGGING AT BLAST FURNACE

AIR COMPRESSION PLANT FOR BLAST FURNACE

until its presence is only marked by the spongy or porous structure of the affected metal.

If the ingot is allowed to cool undisturbed in the mold, this pipe, including the lower porous section, cannot be avoided.

In cooling a freshly poured ingot, the outer crust of the steel first becomes rigid, and thus determines its outer dimensions. The greater part of the contraction has already taken place in the metal forming this shell, but there still remains the "interior" liquid, the volume of which is greatly modified by shrinkage during cooling. Little by little this molten metal becomes plastic, and, attaching itself progressively to the solid shell, adds to its thickness, and tends to leave a hollow portion or cavity equal in volume to that of the shrinkage of the metal. Simultaneously there is a tendency for the more fluid metal from the hotter portion of the ingot to flow in and fill up this area. The visible "pipe" is, therefore, caused by the gradual descent

of the still liquid metal to fill up the void due to shrinkage.

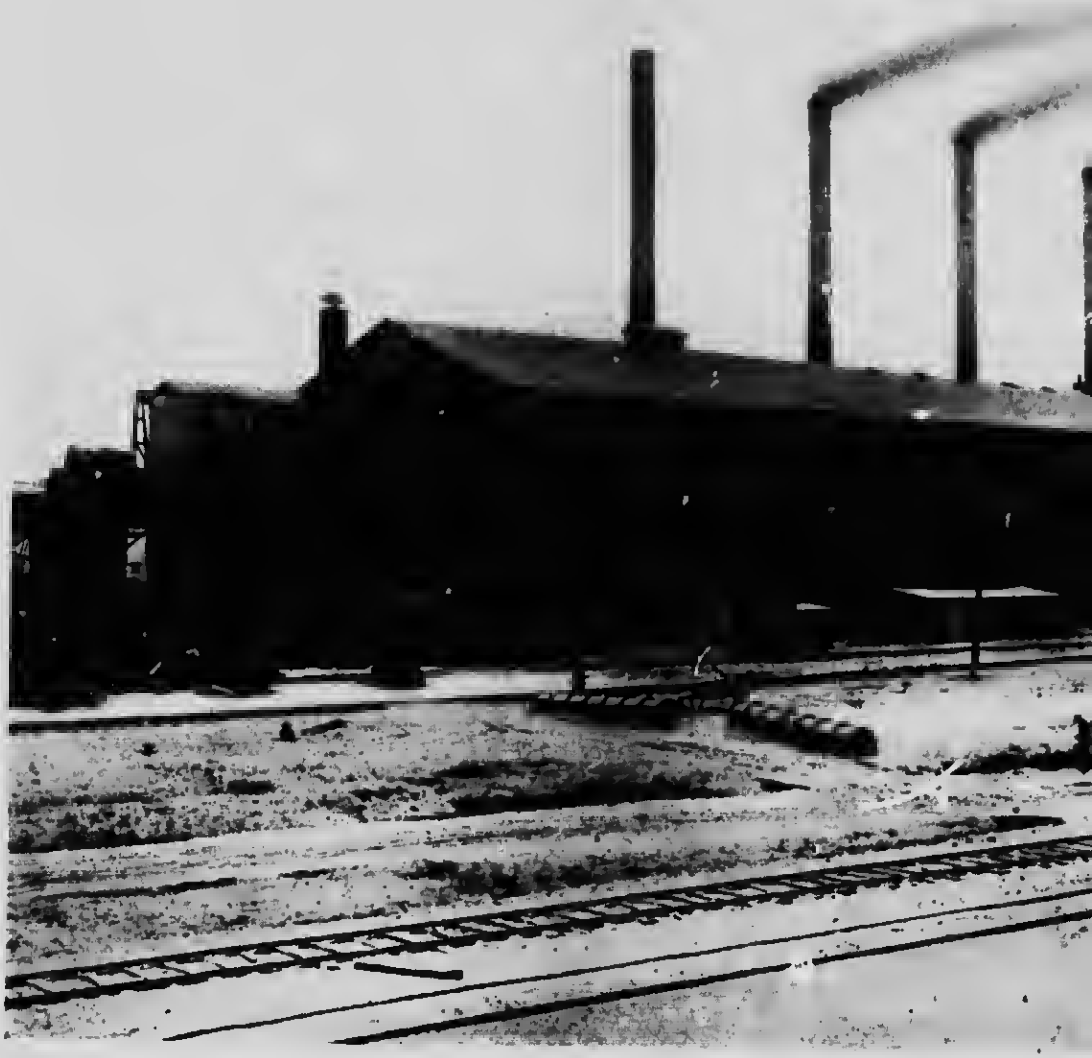
But, further, the shrinkage continues after solidification, and, as the metal of the outer shell of the ingot is colder and more solid than that toward the centre, therefore, the inevitable contraction accompanying cooling is made possible only by the growth of minute voids, thus causing a porous structure along the lower part of the central axis.

Internal stresses are also set up in a similar fashion, due to the contraction of the metal, and these rend the metal with small fissures or cracks, which further increase the porosity of the central part of the ingot.

Cleavage planes are developed by the crystallization of the metal, and the action of the internal stresses set up by the shrinkage.

Segregation, or the unequal distribution of impurities throughout the ingot, is chiefly due to the melting points of these constituents being lower than that of iron. The cooling of the outer portions

COKE OVENS, POWER HOUSE, BLAST FURNACES



OPEN HEARTH FURNACES

ACES

of the ingot causes a flow of these impurities to the more molten metal of the interior. The central and upper portions, being the last to solidify, thus sho the greatest degree of segregation.

The advantages claimed for the Harmet treatment, and substantiated in practice, are :

1. Prevention of cracks due to shrinkage, of internal stresses, and resulting cracks and fissures.

2. Early cessation of the crystallization of the metal, as pressure hastens the transition from the liquid to the solid state, and the production of the fine crystallization without cleavage planes.

3. Lessening of segregation, i.e., reduction of the tendency of carbon and other impurities to concentrate in the central and upper parts of the ingot. The gradual movement of the ingot upwar the cooler portion of the mo to this tendency.

4. Pr tion of "pipes" or interior ca ities, due to the internal pres re, thus preserving the absolute lidity of the ingot.

5. Improvement of the physical properties, due to the mechanical effect of the operation being similar to forging.

6. Reduction in the waste of the ingot, practically no cropping being necessary, as the uniformity of composition and absence of cavities are maintained throughout the whole of the ingot.

The fluid compression plant installed at Sydney Mines consists of one group of four Harmet presses, each 1,250 tons, with capacity to handle 3½ to 5 ton ingots, and one of 4,000 tons to handle ingots of 10 tons and upwards to 50 tons.

The presses are equipped with the necessary pumps, accumulators, manipulating valves, etc., and are placed in an extension to the open-hearth buildings. They are situated close to the furnaces and arranged so that the pouring ladle containing the metal to be compressed, as it comes directly from the furnaces, has to go only a short distance to the pouring platform.

MACHINE

ACHINE SHOP AND OPEN-HEARTH COKE OVENS

COKE OVENS. SHOWING DRAW IN FORE

IN FOREGROUND

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

To prove the superiority of the Harmet process, an investigation was made of the relative merits of the two classes of steel.

The first step taken was to examine the internal structure of the ingot. Two ingots selected at random from the same heat, one compressed and one uncompressed, were cut in two along the central axis. The surfaces thus exposed were planed and photographs taken. A brief study of these proved many of the advantages claimed for the Harmet steel. The claims, however, will be taken up in the order named, and a statement given of the conditions found supporting them:

1. A careful examination of the surfaces of the split ingots revealed no signs of fissures or cracks in the compressed ingot, while in the uncompressed ingot many indications of their presence were noticeable.

2. The grain size of the metal, as visible to the eye, was much smaller in the compressed ingot than that of the ordinary ingot.

This was also shown by photo-micrographs made of various sections taken from the interior of the ingots, even where sections of the compressed metal were compared with the most favorable parts of the uncompressed metal.

Throughout the rolling and forging due care was taken to subject the two ingots to the same heat and cooling treatments. A study of the results of the analysis of the ingots stated in the following paragraphs on segregation, gave conclusive evidence of the fact that the effect of the process is to hasten the transition of the steel from the liquid to the solid state. This, together with the forging effect, accounts for the finer "grain" of the compressed ingot.

3. Lessening of segregation in the case of the compressed ingot was shown by a thorough and complete analysis of the two ingots from samples taken in the following manner:—One of the faces, exposed by splitting the ingot into two equal parts, as already mentioned, was mapped

POURING 3-TON INGOTS

POURING 6-TON INGOTS, SYDNEY

Y.DNEY MINES

out by a series of punch marks, from which samples were taken by means of a half-inch drill. These drill holes formed a complete network over the surface which passed through the central longitudinal axis of the ingot.

AVERAGE ANALYSIS OF INGOTS.

Carbon . . .	0.39	Phos. . .	0.041
Manganese	0.60	Sulphur	0.021

The chemical results obtained showed the following maximum variations from the average assay of the chief constituents of each ingot :—

COMPARISON OF SEGREGATION FOUND IN FLUID COMPRESSED AND ORDINARY INGOTS OF THE SAME HEAT.

Percent. of variation in Carbon Contents:

Compressed.	Uncompressed.
10	50

Percent. of variation in Phosphorus Contents:

Compressed.	Uncompressed.
10	110

Percent. of variation in Sulphur Contents:

Compressed.	Uncompressed.
10	90

When plotted on the plan of the ingot, the analysis showed a

striking uniformity of composition in the compressed ingot. It is plain, while not entirely prevented, segregation is so much lessened in the case of the compressed ingot that it may be considered of no practical importance, while the segregation shown in the ordinary ingot proves it to be of unequal composition chemically, and possessed of physical qualities which fluctuate greatly.

4. A thorough examination of the surfaces after sawing ingots in two failed to show any indication of pipe or interior cavities in the compressed ingot.

5. Photomicrographs, both of the compressed ingot itself and of the rolled or forged steel produced from the compressed ingot, revealed a more uniform structure than in the same class of product of ordinary steel. This condition accounts for the greater tensile strength shown in the case of the steel treated by the Harmet process.

Test pieces made from fluid compressed steel and ordinary

POURING A 30-TON INGOT

FLUID STEEL COMPRESSION PLA

ON PLANT

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

steel — both being taken from the same heat and subjected to the same heating, cooling and mechanical treatment—when carefully tested, showed the ultimate strength of the compressed steel to be on an average 10 per cent. higher than that of the ordinary steel.

There was also a similar increase in the elastic limit; the increase in this case, however, usually showed in favor of the compressed material.

When subjected to the tensile test, the same degree of superiority of the compressed over the uncompressed steel was again demonstrated in a most conclusive manner.

In practice, it is found that test pieces of forgings made from the ordinary fluid compressed ingots of the same heat have, in the case of the fluid compressed metal, given markedly uniform results, while those of the uncompressed steel gave wide fluctuations—just what would be expected from the results mentioned above.

6. After the evidence submitted in the foregoing paragraphs has been studied, the almost absolute homogeneity of composition of the compressed ingot cannot be denied.

A TYPICAL CASE OF THE EFFECT OF UNHOMOGENEITY IN STEEL AS FOUND IN PRACTICE.

It has been shown that steel, if allowed to cool undisturbed in ingot molds, contains defects, one of the most important of which is the porous structure along its central axis.

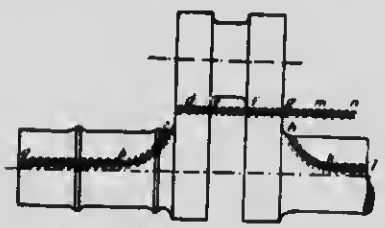
This unhomogeneity is a very important matter, particularly in the case when the metal is used for forgings, and especially those forgings of a certain kind. For instance, a crank shaft, of all the parts of a machine, is that which requires the greatest degree of reliability. The effect of using ordinary steel in the manufacture of this important member is shown in the accompanying drawing of a crank shaft for the driving

LIQUID STEEL FLU

STEEL FLUID COMPRESSION OPEN-HEARTH BUILDING, SYDNEY MINES

STEEL INGOTS—NO. 3 FLUID COMPRESSED, OTHERS UNC

wheels of a locomotive. The shape assumed by the porous core of the ingot after forging is the same relative to the surface of the finished shaft as to that of the ingot after pouring, and may be mapped out, as has been done for the case under consideration, and shown in the sketch. When the two webs are forged direct to an angle of 90 degrees, the core follows approximately the line a, b, c, d, e, f, g, h, k, l; if the two webs are forged in line and afterwards bent to 90 degrees, the core follows approximately the line a, b, c, d, e, f, g, m, n.



The first method is apparently the less desirable, but both show the existence of the weak planes at points where the great stresses occur. The examination of numerous fractures of crank shafts

OTHERS UNCOMPRESSED

showed that such fractures generally start from points c, e, f, h, and everything tended to prove that they were attributable to weakness of the metal at these points.

All sources of weakness and unreliability, due to the lack of homogeneity in forgings, is obviated by the use of Harmet compressed steel.

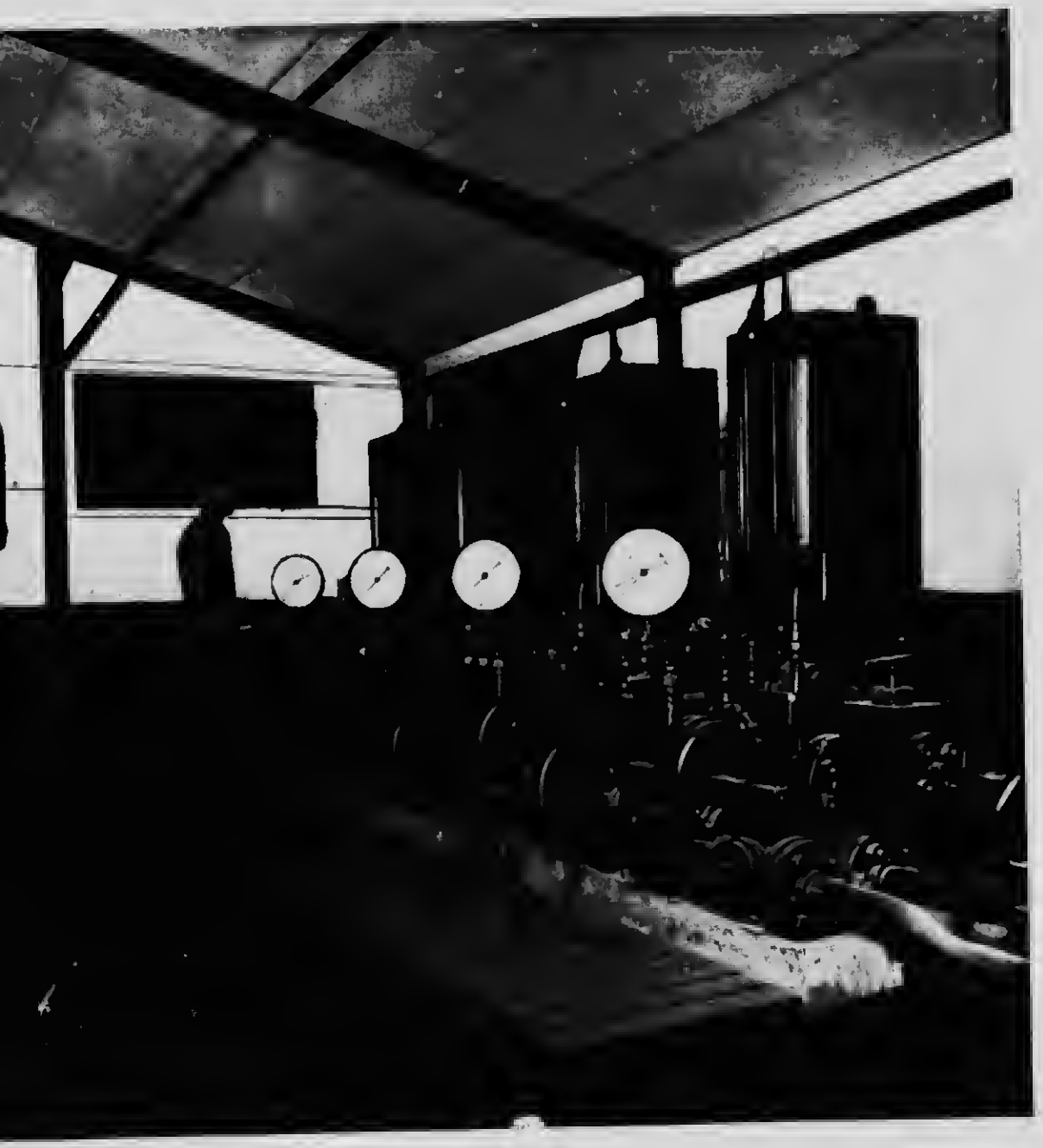
THE NEW GLASGOW WORKS

At New Glasgow, the home of the Nova Scotia Steel industry, are located the rolling mills, forges and other departments where a great variety of finished steel products are manufactured.

This plant is housed in a group of modern steel and concrete buildings, extending over 25 acres, and the various departments are all equipped with the latest and most modern machinery. To-day it stands unrivalled among similar works in the Dominion, and is unexcelled for efficiency by any other plant in the world.

The rolling mills consist of a 28-inch cogging mill on which

FLUID STEEL COMP



TEEL COMPRESSION ROOM—MAN OPERATING AIR COMPRESSION LEVERS

SIX-TON INGOTS, SYDNEY MIN

EY MINES

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

steel ingots, weighing 6,600 pounds, are reduced to billets of the various sizes required by the finishing mills ; one 20-inch three high plate mill, one 18-inch, and two 9-inch three high bar mills.

The plate mill produces all sizes and thicknesses of steel plates and sheets up to fifty inches wide, also mine rails up to 45 lbs. per yard. In connection with the bar mill, there are cold twisting bar machines, capable of twisting bars up to $2\frac{1}{2}$ inches square for use in cement construction of buildings, bridges and all structural work. The eighteen inch bar mill produces rounds up to five inches in diameter, squares up to four inches square and flats up to fifteen inches wide. The nine-inch bar mill produces smaller sizes of rounds squares and flats of all sizes and shapes.

The spike, rivet, bolt and nut, polished shafting, tie and fish plate, reeled machinery steel and other finishing departments are located in two steel and concrete buildings, which cover $2\frac{1}{2}$ acres

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

of floor space, and are equipped with all the latest machinery.

Some idea of the magnitude of the operations carried on here can be gathered from the fact that over 700 varieties of bars, plates, angles, etc., are annually turned out from these mills and their attendant finishing departments.

It was by making forgings that "Scotia" entered the steel industry. The old trip hammer gave way in turn to the 3-ton steam hammer, and this in turn to the steam hydraulic plant, and it is fitting and appropriate that the new steam hydraulic plant, recently installed, should be the first of the kind adopted in Canada and perhaps the most efficient in America. This equipment comprises one 4,000-ton press, handling ingots weighing up to 50 tons and one 600-ton press for smaller work.

These presses enable the Company to finish forgings from fluid compressed steel equal in quality and dimensions to any produced abroad.

SHIPPIN

SHIPPING 3-TON INGOTS IN INGOT YARD

LOADING STEEL INGOTS

GOTS

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

The desirable thing in making a large forging is for the pressure to reach the interior of it. A kneading action secures this result, and at the same time produces a fine crystallization, coupled with a uniform toughness and ductility, which are in marked contrast to the irregularity due to differences in compression and variation in internal strain which follows the use of the steam hammer. In the new hydraulic forging machine the blow is struck with the " tup " as in a hammer, and then the blow is followed up by applying hydraulic pressure and thoroughly kneading the piece of metal, as if it were in a regular press.

In this apparatus, steam pressure actuates the " tup " or striking piece, which thus moves with the speed and force of a steam hammer, while constant hydraulic pressure of high intensity may be applied at any stage of the stroke by a large water cylinder. The high pressure water is intensified and delivered from a separate part

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

of the apparatus called an "intensifier." In the most modern type, of which the new installation at the New Glasgow works of the Nova Scotia Steel and Coal Co. is an example, this feature enables larger work and a greater range of work to be performed with the same machine.

This portion of the plant of the Nova Scotia Steel and Coal Co. consists of two presses, complete with all the necessary accessories, such as accumulators, furnaces, etc., housed in a steel, brick and concrete building 240 feet by 72 feet. Two electric cranes of 50 and 30 tons capacity serve the entire building. One press is rated at a capacity of 4,000 tons, and the other at 600 tons. The larger press is 128 by 64 inches between the supporting columns, has a total stroke of 80 inches, weighs 740,000 lb., and is capable of handling forgings up to 75 tons in weight.

The New Glasgow manufacturing establishment occupies an exceptionally favorable position

LOADING 3½-

ING 3½-TON STEEL INGOTS FOR COGGING MILLS

POWER PLANT INTERIOR, SHOWING STEAM TURBINE ELECTR

INE ELECTRIC GENERATORS

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

on the banks of the East River, Pictou. This river, when deepened, will have a depth of 24 feet at low tide. There is a four-feet rise and fall of tide, so that there will be sufficient depth for quite large sea-going vessels, which will pass into the Atlantic through Northumberland Straits. Cheapness and facility of transport are of essential importance for a large trade, when goods are of the bulk and weight of those constituting "Scotia's" specialties.

The hydraulic forging plant at New Glasgow is one of the exclusive features of the equipment of the Nova Scotia Steel & Coal Co., being the only one of its kind in Canada. Special attention is given to ship forging, such as rudders, rudder forms, stern forms, tail and shaft planks and other varieties of ship forging of every description. The steel ingots are made by the fluid compressed process and are made to any specification desired, such as Lloyd's, British Board of Trade, and all other standards. Inspec-

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

tors representing the above boards are available at the works at all times, thus ensuring prompt completion of orders. The Company at the present time is producing and shipping large marine forgings of all descriptions to the largest shipbuilding plants on the Clyde and in other parts of Great Britain.

The Company's machine shop is equipped with lathes, planers, etc., of sufficient capacity to handle any forgings turned out by the plant, and is producing finished shafts of any sizes required. There is a steadily growing demand for "Scotia" products of this nature, by such exacting buyers as Lloyds', the British Admiralty and the British Board of Trade, a considerable portion of the output being made under the supervision of their inspectors.

The railway car axle shop is one of the most up-to-date departments in the plant, containing, it is claimed, the best railway car axle manufacturing equipment extant. This department produces a greater daily and monthly out-

SHIPPING PIER FROM WATER FRONT

N. S. SHIPPING PIER, FROM ELEVATED

ELEVATED TRACKS

put than any other works in the British Empire, and there are no shops on the European continent with an equal output.

The Axle Department of the Eastern Car Company, Limited, is one of the largest in the world. The axles which are now produced are forged in the new compression press by the new fluid compressed steel process; thus the standard of excellence for both freight and passenger cars. Axles are now being manufactured here at the rate of over 5000 per month.

ORDNANCE DEPARTMENT.

Shortly after the opening of the European war, a demand arose for shells. To supply this demand the Company started at once the manufacture of steel suitable for shells, made the blanks and the rough-forged shell cases, which were shipped to the different manufacturers in Canada who were in a position to finish the shells ready for loading.

The first shell made from steel produced in Canada was made

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

from "Scotia" steel on the 22nd September, 1914. Since then the Company has installed a complete equipment for finishing shells, and has been turning out daily large quantities of the finished product.

PLATING FOR ARMORED CARS.

Special high-grade steel suitable for plating armored motor cars is being produced, and a large order for plates, rolled, heat-treated and finished ready for fitting on the cars, is being filled by the Company.

This department is also supplying special steel for entrenching tools, etc., and is now engaged in manufacturing a quantity of the combination shield and entrenching shovel adopted by the Canadian Militia Department.

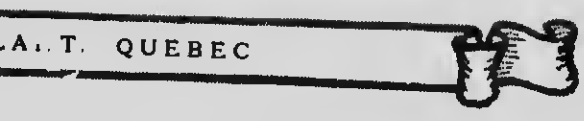
SPIKE, BOLT AND RIVET DEPARTMENT

This department is the most modern and up to date in Canada, consisting of four fully equipped spike machines with a daily capac-

UNLOADING

LOADING IRON ORE FROM WABANA SHIPPING PIER

COAL DISCHARGING PLA..T. Q

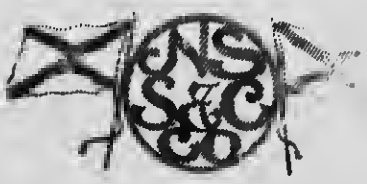


NOVA SCOTIA STEEL & COAL COMPANY LIMITED

ity of one hundred tons of finished spikes. Each machine is capable of turning out railway and mine spikes of all sizes and shapes: thousands of tons are made and supplied to the Canadian Pacific Railway, Grand Trunk Railway, Canadian Northern Railway, and Canadian Government Railways and other railway systems.

The Bolt and Nut Department is equally modern and up to date, capable of producing fifty tons of finished material daily. All sizes of railway and structural bolts and nuts are made, thousands of tons being supplied to the Canadian railways and the larger contracting firms throughout Canada.

The Rivet Department is equipped for a daily production of fifty tons of rivets of all sizes and styles required for structural work, and car and boiler building. A specialty of this department is the making of rivets to Lloyd's prints and specifications, a representative of the above firm being on hand at all times.



NOVA SCOTIA STEEL & COAL COMPANY LIMITED

OTHER DEPARTMENTS

There are extensive carpentry, pattern, structural and woodworking shops as adjuncts to the steel works.

The shipping and store room is of ample size to care for all finished products, being 850 feet long and 75 feet in width. This department, as well as all the others, is equipped with powerful electric cranes sufficient to handle the various weights required.

The plant is situated on the Intercolonial Railway of Canada, giving it direct connection by rail to all parts of Canada and the United States. Railway sidings extend into the various departments. The plant is also ideally situated for water shipment, as the Government Railway Docks are at present but 6 miles from the works, and extensive harbor and river improvements are practically completed. This will allow the largest freight steamers to load and discharge at the Company's works.

MONTREAL DISCHARGING PLANT

GENERAL OFFICE, EASTERN CAR COMPA

COMPANY, LIMITED

NOVA SCOTIA STEEL & COAL COMPANY LIMITED

THE EASTERN CAR COMPANY, LIMITED

The enormous work of railway construction which has taken place in Canada and is still progressing, not only as to the main trunk lines of the three transcontinentals but also as to their double trackings and the intricate network of branch lines, which is now altering the face of the whole Dominion, necessitates a very large amount of rolling stock material.

The opening-up of new territory and the consequent increase of trade and population has created a brisk demand for rolling stock, which the Canadian car-building companies were formerly unable to cope with.

The directors of "Scotia" recognized that Canada's demand for railway equipment was increasing faster than its car-building capacity, and as keen business men they also saw that a car-building company in close alliance with them could not fail to prove a good customer for their Sydney


INTERCOL ONIAL
CANADA
81141

GENERAL VIEW, EASTERN CAR COMPA

COMPANY, LIMITED

THE EASTERN CAR COMPANY LIMITED

Mines ingots and for the products of their New Glasgow forges. The existing Eastern Car Company was the result.

A splendid site for it, of 65 acres, on the east bank of the East River, Pictou, was first secured. This property is within a few miles of all the collieries of the Pictou coal field, thus insuring a supply of cheap fuel, and it possesses the further advantage of adjoining the northern boundary of the property of the Nova Scotia Steel and Coal Co., upon which the latter's forges, rolling mills, finishing mills and engineering shops are situated. By means of the tidal waters of the East River, heavy materials, such as southern pine timber and pig iron, will be delivered directly to the Car Company's plant by ocean-going steamers.

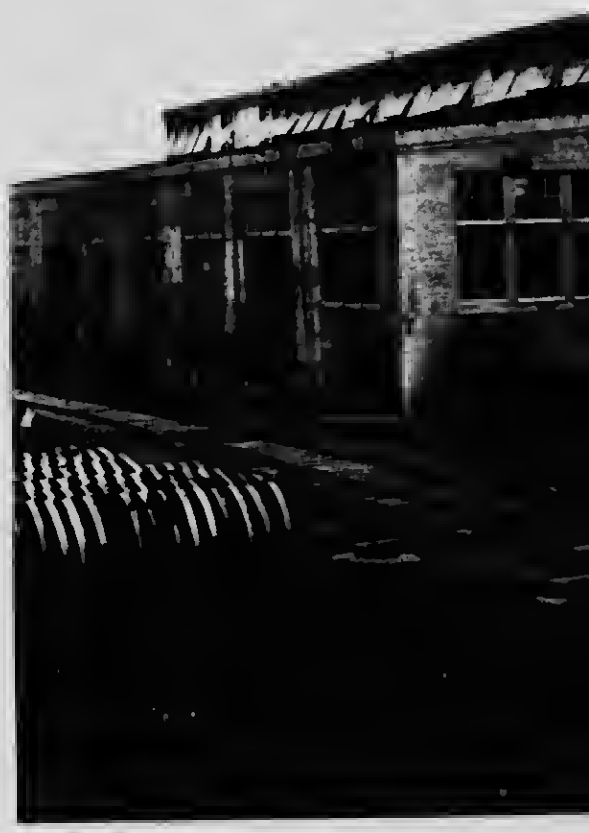
The Eastern Car Company, Limited, began operations in September, 1913, and has since that time developed a system of manufacturing capable of producing thirty cars daily. There is a

THE EASTERN CAR COMPANY LIMITED

market for these cars capable of absorbing the entire output. All types of freight cars of wood or steel as shown by the illustrations on pages 89 to 100 are being manufactured here.

The shops in which the cars are built are the last word in industrial construction as to light, air warmth and convenience of arrangement. They consist of four parallel buildings, each 1,100 ft. long and 90 ft. wide, all of steel, with concrete foundations and reinforced concrete walls, and are so arranged as to permit of progressive construction, so that the raw material enters at one end of the range and leaves it a completely finished car at the other end.

The first building contains air brakes, forge, bolt and rivet machine and truck departments. In the next two buildings all the steel is prepared for the enframing of cars. The machinery consists principally of punchers, shears, riveters and hydraulic presses. The railway tracks upon which the



GENERAL VIEW OF WHEEL FOUNDRY

SECTION OF WOOD CAR DEPARTM

DEPARTMENT

THE EASTERN CAR COMPANY LIMITED

cars are built are located here, and in connection with each track there is an overhead crane runway. On each of these runways are located twelve 5-ton hoists, or two hoists for each successive position reached by every car as it approaches completion. The fourth shop is used exclusively for wood-working machinery. The floors of each of the three last-mentioned buildings are controlled throughout the whole length by two 10-ton cranes. The central power house provides current for the electrically-driven machines throughout the plant, also water for the presses at a pressure of 1,500 lbs., and compressed air of 200 lbs.

All the shops are equipped throughout with the most modern car-building machinery, each piece being fitted with individual drive, thus doing away with all line shafting and belting. In order to handle material between the different shops, two outside crane-runways, running across the end of the four buildings, have been

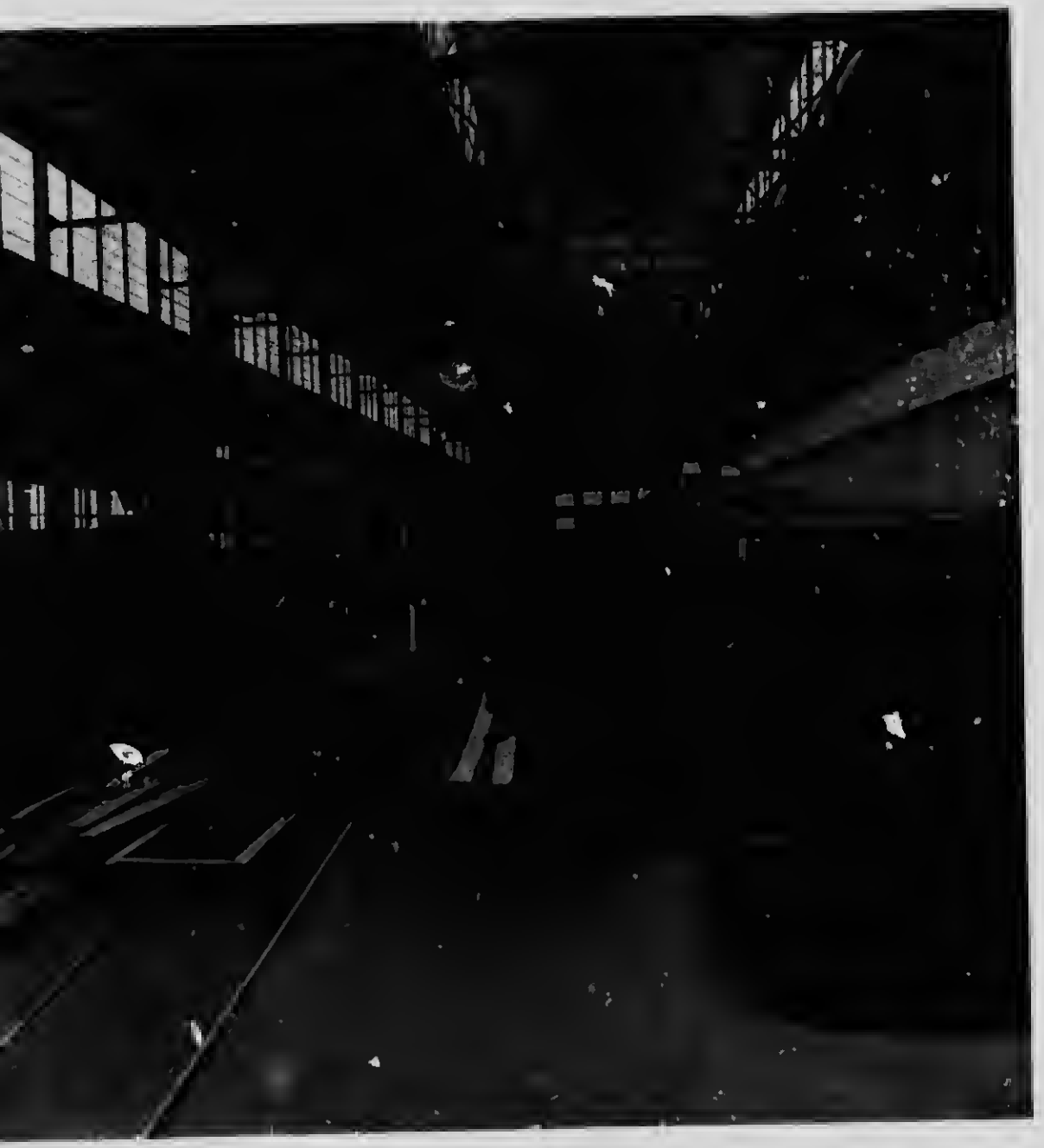
THE EASTERN CAR COMPANY LIMITED

provided and equipped. The paint shop to the north of the main building is 1,100 ft. long by 150 ft. wide. It is not only used by the paint department, but also as a storage for cars; it has room for about 250 cars. In addition to the travelling cranes, each of the buildings has a system of narrow-gauge tracks, with turn-tables at intersections, thus giving a very flexible transportation service.

The foundry department consists of two buildings, one containing the wheel foundry and the other the steel and gray iron foundry, with floor areas of 60,000 and 30,000 square feet respectively. The capacity of the iron foundry is 400 wheels per day.

The power house is 113 ft. by 120 ft., and it is divided into two rooms, the boiler room and the engine room proper. The boiler room contains five modern water-tube boilers of a combined capacity of 3,000 h.p. The boilers are equipped with super-heaters and chain grate stokers, the coal for which is supplied from overhead

PLANING MILL



NG MILL. SHOWING UNDER BODIES IN FOREGROUND

GENERAL INTERIOR VIEW OF ERECTIN

ERECTING SHOP

THE EASTERN CAR COMPANY LIMITED

bins through chutes, the ashes being removed by chain and bucket carriers, all mechanically operated. These boilers are also equipped so that they will burn the refuse from the wood-working shops of the car plant.

The engine room proper contains two 750 k.w. mixed-pressure steam turbines, one mixed-pressure turbine 300 k.w. generator, and one 200 k.w. motor generator, supplied with necessary exciters, etc. Besides these there are two 300-gallon pumps operated at a pressure of 1,500 lbs., and one 3,000 feet capacity Corliss steam-driven air compressor. The above machinery is laid out and piping arranged so that the exhaust steam from the air compressors and pumps may either be utilized by running through the mixed-pressure turbines or through low pressure exhaust steam lines for heating purposes.

All the buildings are warmed thoroughly by these pipes of the low pressure exhaust steam, which are also carried from the power

THE EASTERN CAR COMPANY LIMITED

house through tunnels to the various buildings. Alternating current is used throughout the shops for constant-speed machine tools; direct current for crane service and variable-speed tools. Steam is also supplied direct from the boilers to the drying kilns, in which lumber is dried. Water for ordinary purposes at the power house is pumped from the East River at a distance of 200 yards. Water for boilers and general purposes is supplied free by the town of New Glasgow.

From the power house to the car building there is a subterranean passage large enough for men to walk in, besides sufficient space to carry all the pipes necessary for hydraulic power, compressed air and steam, as well as for the electric cables which are required. These subterranean passages travel the full length as well as the full width of all the buildings.

The wheels come to the car shop in rough casting; here the hub is turned to the measurement re-

EXTER

EXTERIOR VIEW OF DRY KILN BUILDING

STEEL YARD, WITH ELECTRIC CR

TRIC CRANE

THE EASTERN CAR COMPANY LIMITED

quired with the utmost exactitude. The axles are brought in from the foundry also in the rough state. Having been turned down on the lathe to the required size. the wheels are squeezed on to the axles with such overwhelming force by hydraulic power that they become immovably attached one to the other.

The buildings have steel frames with concrete walls. Generous daylight illumination is supplied through the sides by numerous windows and monitors. The monitors also provide for ventilation.

The shops are so arranged that all work moves in a straight line. At the north end of the plant, steel and lumber are unloaded and stored. From this point the raw material moves south through the shops, finally emerging at the north end in the form of finished cars.

The main building is divided into four parts. The first section contains the machine shops, air brake department, bolt and rivet

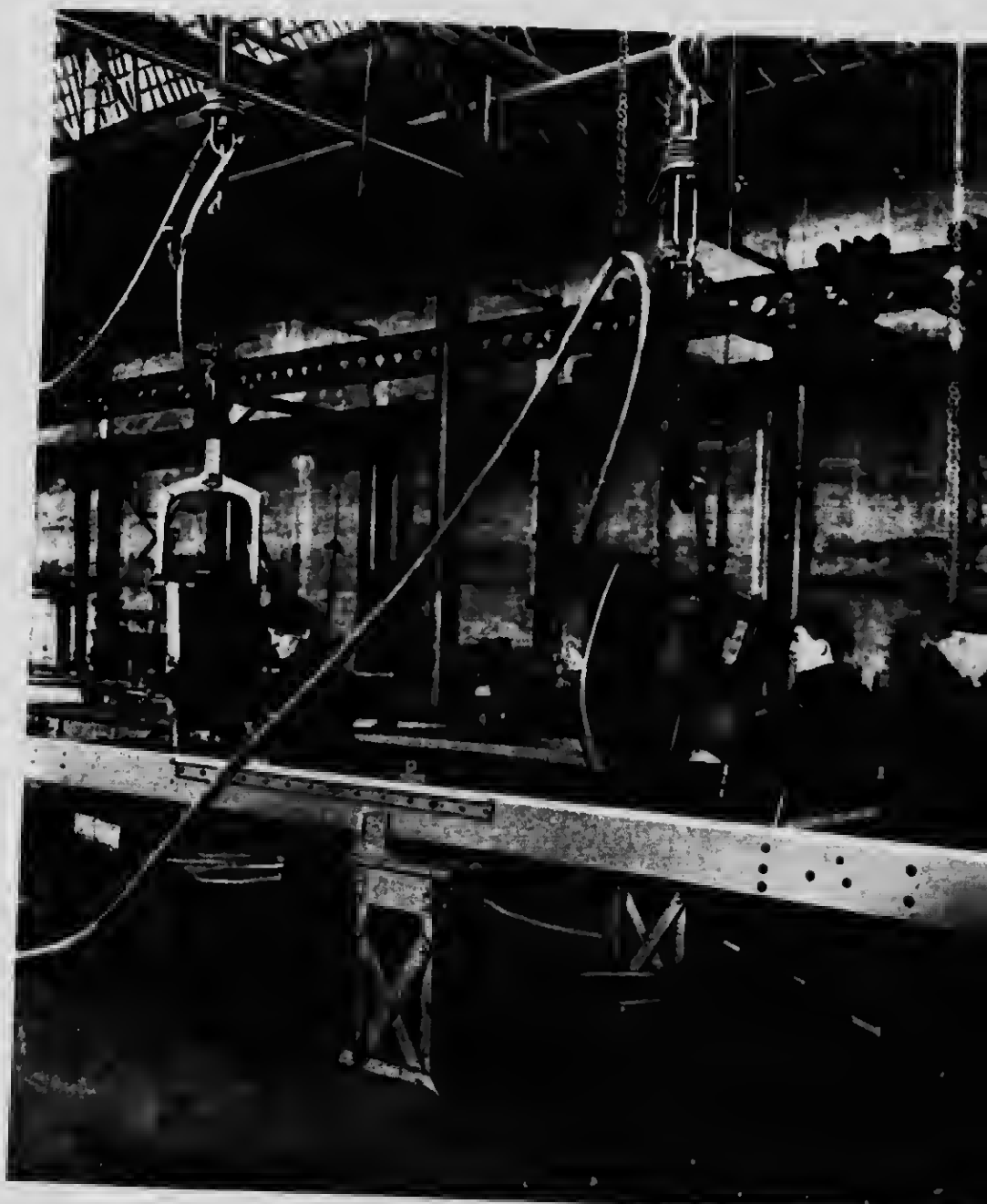
THE EASTERN CAR COMPANY LIMITED

storage, truck shops and forge departments. The second division is devoted entirely to the steel car department, the material being successively sheared, punched, pressed, riveted and erected. At the point where the erecting trucks begin they are intersected by a cross track upon which the trucks from the shop are transferred directly to the point where they are needed in the erection shop. In the third division is the wood car department. There are two erecting tracks here.

The fourth section has a mezzanine floor running about one-third of its length, on which are located the pattern and template shop and the foremen's offices. Under the floor is the general stores department. The rest of this span is taken up with woodworking machinery.

All machines, so far as possible, are individual motor driven, electricity being used wherever possible. Very few air hoists are employed, nearly all of this work being done by electricity. Three

ASSEMBLING OF CAR BODIES



PORTABLE AIR BULL RIVETER

RIVETERS

THE EASTERN CAR COMPANY LIMITED

of the four spans are supplied with ten-ton travelling cranes, seven being provided for the three spans. Two of these are in the wooden car shop, three in the steel car shop, and two in the truck and forge shop. These cranes travel the entire length of the building.

One feature of the plant equipment is four large Thomas spacing tables with Williams White punches arranged to handle all classes of car material. The shears are Hilles & Jones heavy type. The two presses already installed were furnished by R. D. Wood & Co. Most of the machine tools were furnished by John Bertram and Sons Company and the Canada Machinery Corporation.

The wheel foundry is housed under a separate roof, and has a capacity of 200 wheels per day. Provision has been made to increase the daily capacity to 400. This foundry is built on the straight floor plan, and has the latest system and equipment for handling both flasks and metal. The wheels can be rolled directly

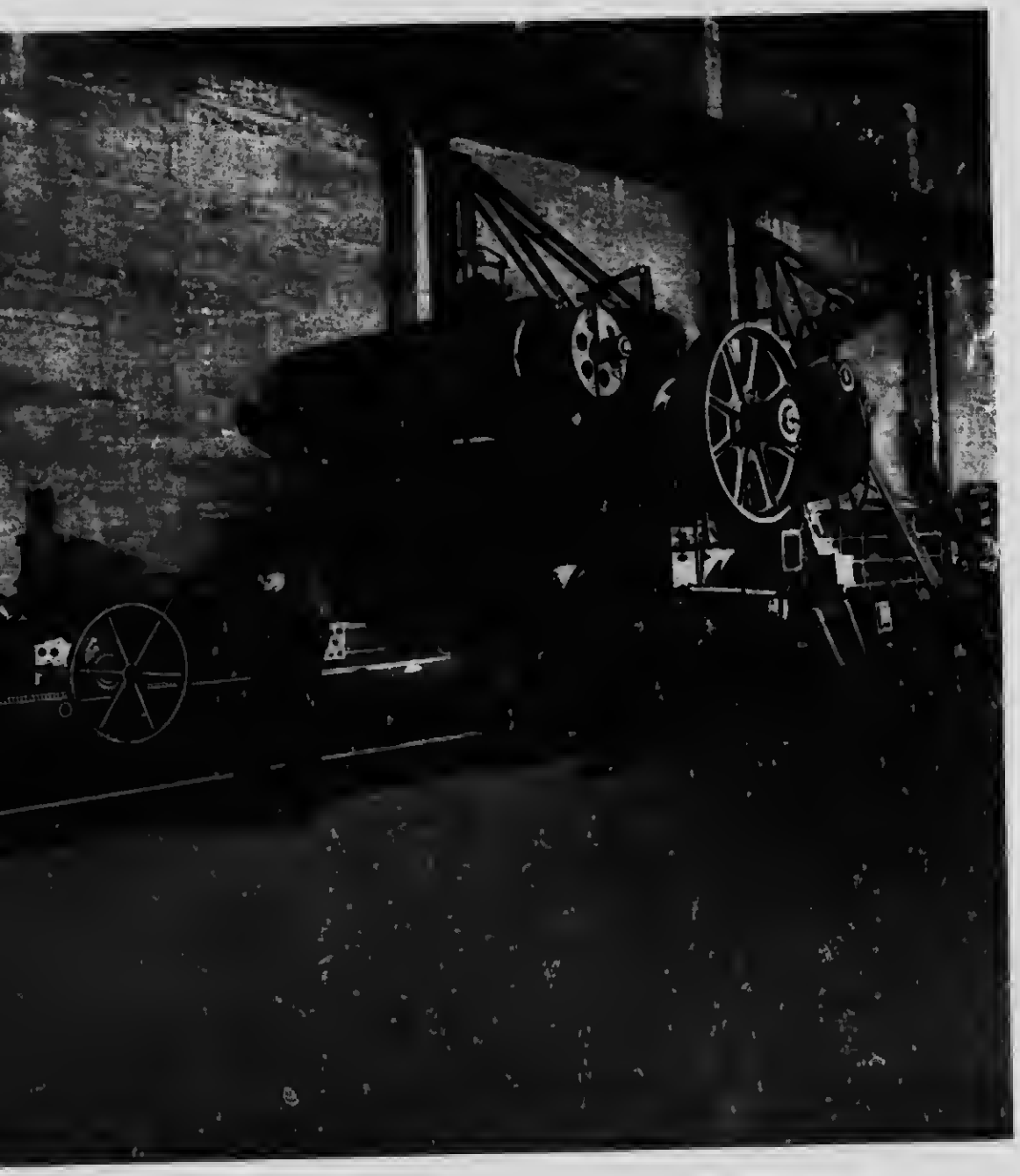
THE EASTERN CAR COMPANY LIMITED

from the wheel foundry to the truck shop, a distance of only 60 feet, thus saving considerable time and effort.

In a short time a large 700-foot shop containing four tracks will be erected to house the painting and finishing department. Among the other accessory buildings which go to make up the plant are the power house, dry kiln, lumber storage, general storeroom, paint and oil storage, locomotive house, general office and a number of minor departments.

The boiler room is laid out for five 600 h.p. Edge Moor water tube boilers, equipped with Green chain grate stokers, making total of 3000 h.p. at nominal rating. The boilers are guaranteed for a continuous overload of 50 per cent. Three of these boilers have been installed and are now in service.

Both direct and alternating current electric power is used. The alternating current is 3-phase at 600 volts, and the direct current, which is used on cranes and variable speed motors, is at 220



AUTOMATIC PUNCHING MACHINE

INTERIOR OF FOUNDRY, SHOWING CA

ING CAR WHEEL FLASKS

THE EASTERN CAR COMPANY LIMITED

volts. The electric power plant consists of two 750 kw. turbines, and there is provision for a third unit of the same size. A turbine of 125 kw. capacity has been installed to take care of overtime loads, such as night and Sunday lighting, etc. A motor generator set provides the direct current, with both steam driven and electric driven exciters.

The main circuits leave the power house in conduits, and the whole system of electric connections in the power house is arranged with ample space to afford ready accessibility. The turbines are provided with synchronizing motors and are also controlled by a Tirrill regulator from the switchboard.

One compound, two-state air compressor of 3,000 cubic feet capacity has been installed and provision made for a second unit of the same size. A hydraulic system has also been provided. One three-cylinder, compound flywheel, high-pressure pump is now in service, and an additional dou-

THE EASTERN CAR COMPANY LIMITED

ble unit is now being installed. Two large accumulators are furnished in the power house to take care of fluctuation in this connection.

Piping systems and main cables are carried in conduits and tunnels from the power house to the various parts of the plant.

The heating of the plant is done largely by exhaust steam, which is carried in mains through these tunnels to four large heating units consisting of large stacks of indirect radiation, about which air is passed by fans and distributed throughout the shop.

The principal lighting of the plant is done by flaming arc lamps, while in the power house and smaller buildings large tungsten lamps are used. The illumination is exceptionally good, affording the workmen plenty of light at all times.

A large modern office building of brick and cement, with hardwood finish, has been erected. Like the other buildings throughout the plant, it is of a specially substantial type. Practically all

CHILLED CAST-I

) CAST-IRON CAR WHEELS WAITING TO BE BORED

EELS

THE EASTERN CAR COMPANY LIMITED

material is stored under cover so that there will be no interruptions by inclement weather.

This plant has been in operation since the latter part of 1913. The first contract was for 2,000 cars for the Grand Trunk Railroad.

The Company has just added three additional hydraulic presses, and is thoroughly equipped for the manufacture of "all-steel cars," in addition to all varieties of freight cars, cabooses and mine cars. At the present time it is engaged in filling an order for "all-steel" coal cars of 100,000 lbs. capacity for the Canadian Government Railway, and has just completed 2,000 75-ton cars for the Russian Imperial Government, and is working on 3,000 Standard cars for the French Government.

River improvements are now completed which allow large ocean vessels to land and unload their cargoes at the Company's docks on East River, and the Pictou branch of the Intercolonial Railway passes along the whole

THE EASTERN CAR COMPANY LIMITED

front of the property. Direct rail connection is thus afforded with all points in Canada and the United States.

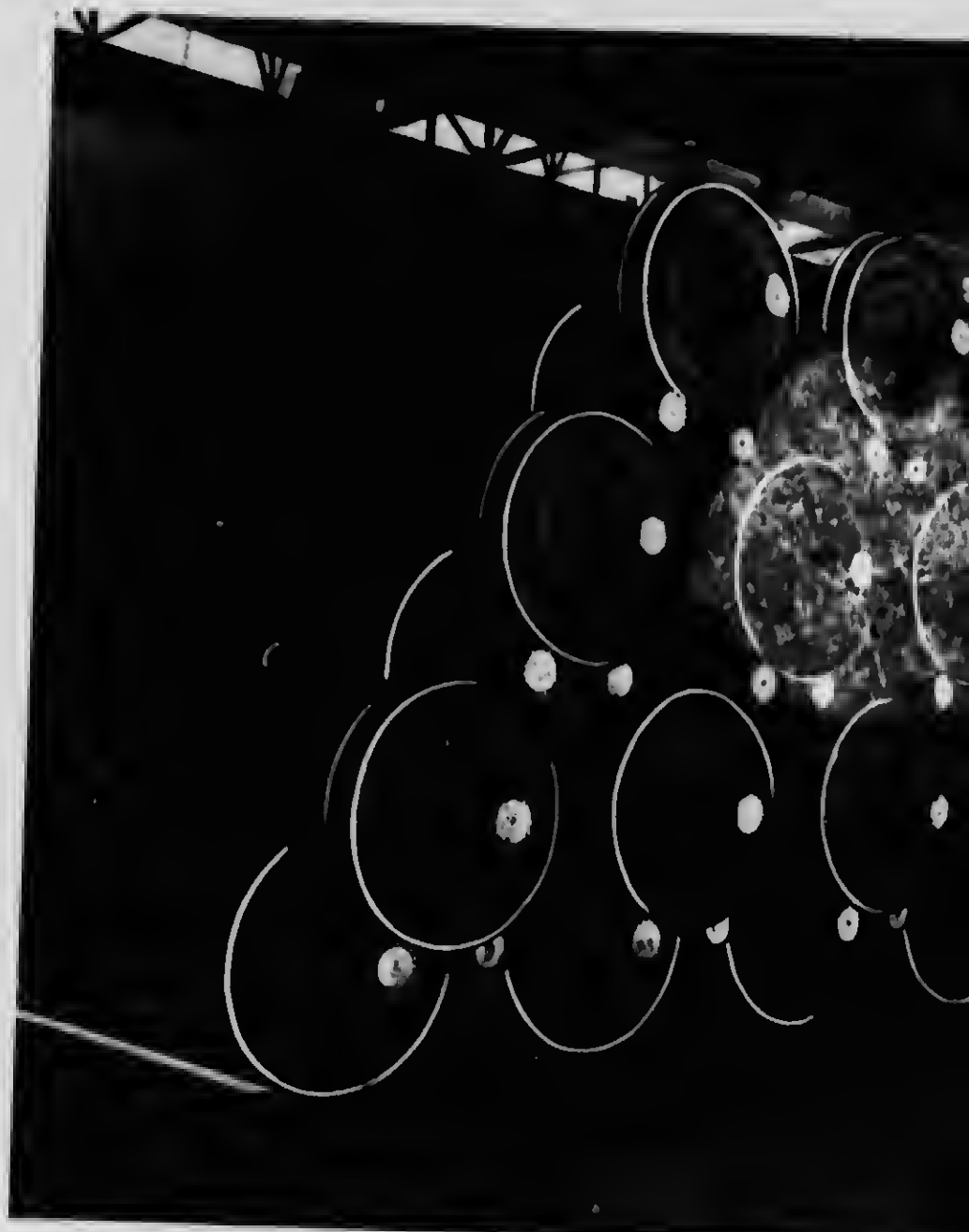
Labor conditions are very good in this section in Canada, and this, together with unexcelled facilities for water and rail shipments, places the Eastern Car Company, Limited, in a foremost position among the world's car-building enterprises. The illustrations on the preceding pages show the buildings and works and the exterior and interior views of the main plants, including the power house.

During the past two years the management of the Eastern Car Co., Limited, has devoted a great deal of attention to the foreign market, and the successful manner in which it has handled the large European orders already secured is a good indication of the position the company is in to take care of future orders from abroad.

In addition to the very large and complete equipment described and illustrated in these pages, the Nova

PRESSING WHEELS

G WHEELS ON CAR AXLES, SHOWING AUTO-PRESSURE RECORDER



CAR WHEELS AND AXLES READY FOR EX

FOR EXPORT SHIPMENT

THE EASTERN CAR COMPANY LIMITED

Scotia Steel & Coal Company, Limited, own and operate a large fleet of ocean steamers for freight carrying purposes, all of which are at the disposal of the Eastern Car Company, Limited, for taking care of their shipments of cars, car parts and equipment to European and other foreign markets.

The Company has developed a system of manufacturing capable of producing forty cars daily. All types of freight cars, of wood or steel, as shown in the illustrations on pages 89 to 100, are being manufactured both for the Canadian and for the foreign market. The first order received was for two thousand standard box cars for the Grand Trunk Railway System, and since the commencement of this order the plant has been kept running at full capacity.

During the early part of 1915 the Russian Government Railways and the French Government were in the market for a large number of cars. After demonstrating the position the Eastern Car Company Limited, was in to deliver cars by

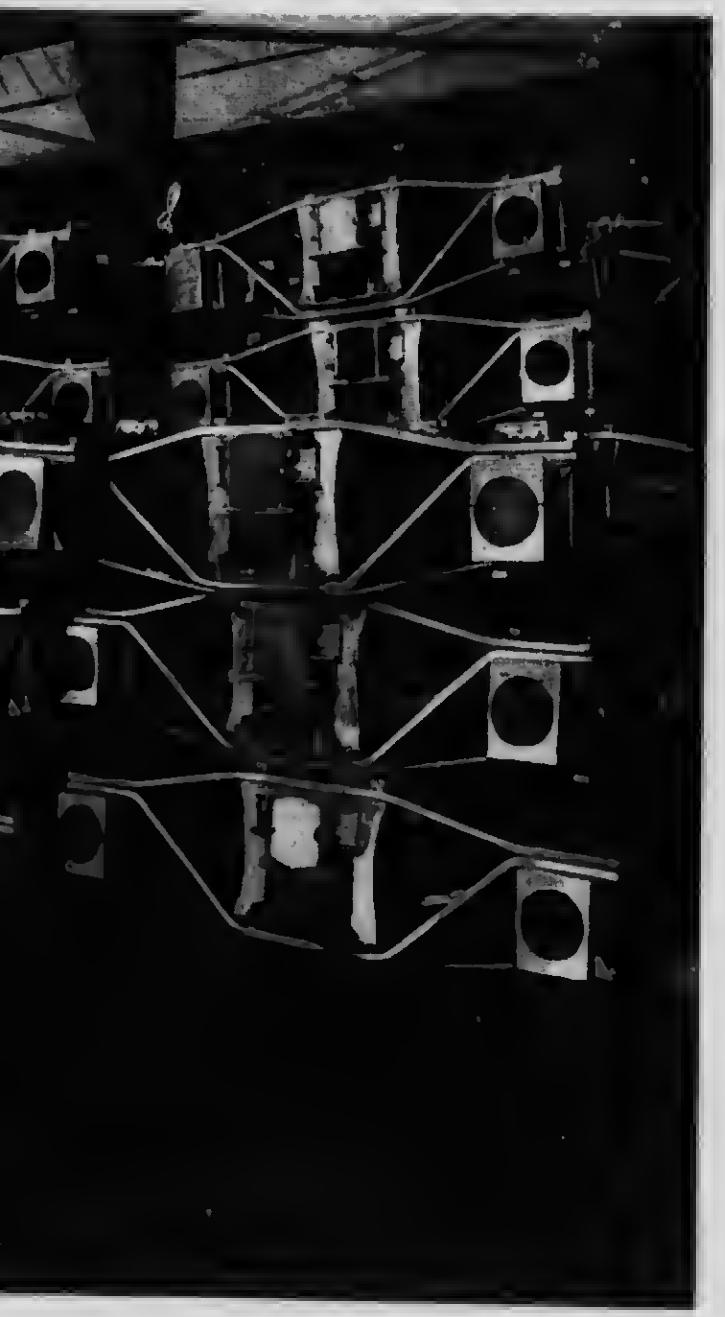
THE EASTERN CAR COMPANY LIMITED

their own steamers to any port desired, the first order was secured from the Russian Government for two thousand forty-ton steel frame box cars.

This type of Russian car is exceptionally large, and in a number of ways it resembles the Canadian Pacific Railway type of box cars. It is unusually long—43 feet—and has a carrying capacity of forty tons of grain. The gauge of track for these cars is 5 feet, which is 3½ inches wider than the standard gauge of Canadian roads. The wheels are cast iron—41⅜ inches in diameter. The roof is made of a design generally used in Russia, consisting of sheet steel on pine boards. There are no holes whatever through the sheets or the lap of the roof, therefore no danger of leakage. The running boards are protected by a railing, thus safeguarding the trainmen, who are not in the habit of walking along the roof of the small two-axle cars common in Russia. In these and other respects these Russian cars are designed specially

ASSEMBLING TRUCK FRAMES

COMPLETED TRUCK FRAMES



FRAMES

THE EASTERN CAR COMPANY LIMITED

to meet the requirements of the Russian State Railways.

When the French Government came in the market for a special type of freight cars, they placed with the Eastern Car Co., Limited, an order for one thousand twenty-ton cars, and followed this later with an order for two thousand more cars of the same type.

Both the Russian and the French Governments are negotiating for further orders for freight cars, and the company is in an exceptionally good position to take care of these and other foreign car orders.

DOCK AND PIERS.

To cope with the hauling and shipping required by the enormous tonnage of the productions of the company, large dock accommodation is required at Sydney, Wahana, Montreal and Quebec.

At North Sydney the coal-loading and ore-discharging piers are all pitch-pine structures. There are two coal-loading piers, high and low level. The high level pier

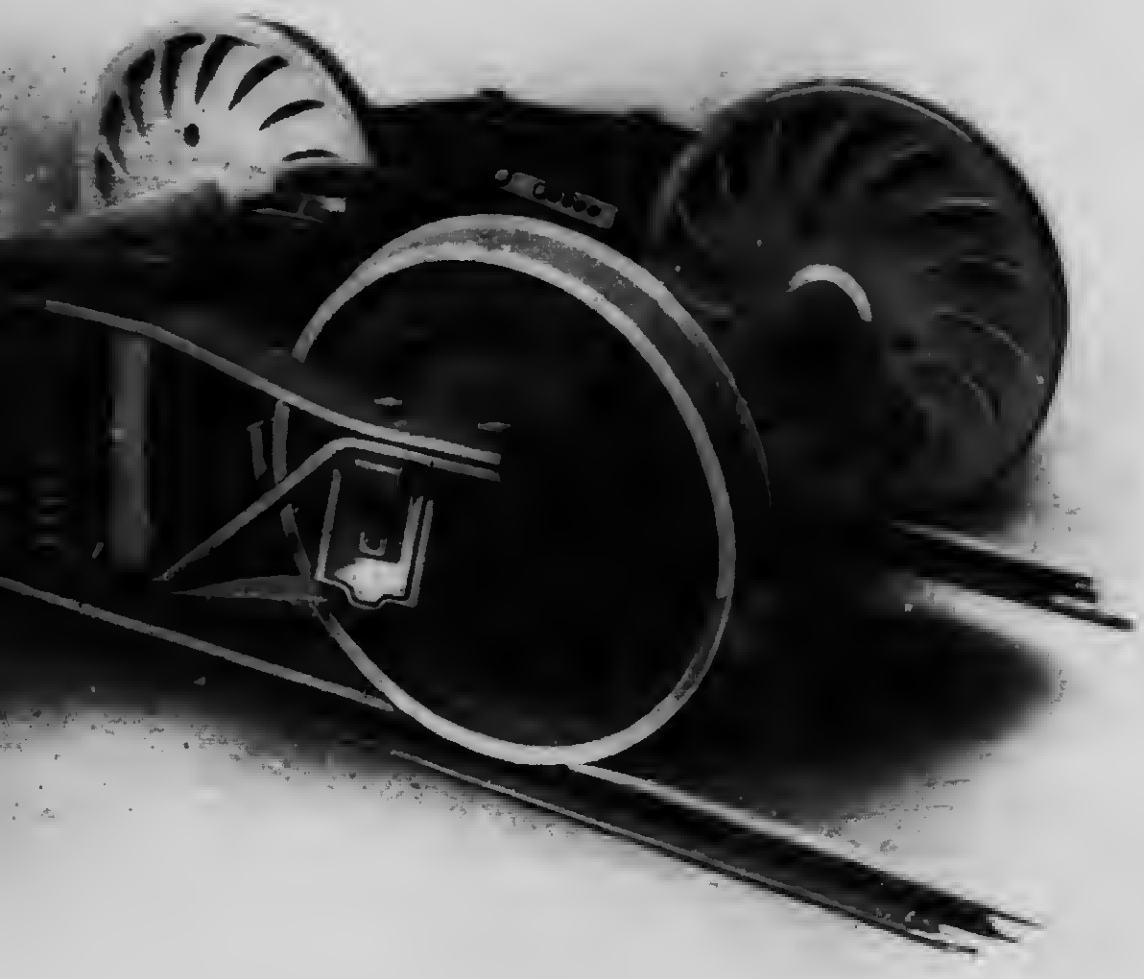
THE EASTERN CAR COMPANY LIMITED

is 60 feet above high-water mark, and, including approach, is 1,900 feet long. It is equipped with bins to hold 5,000 tons, has chutes spaced 15 feet centres, which are operated with Denton hoists; its great capacity and efficiency is shown by the fact that 7,000 tons have been handled over this pier in six hours. The low-level pier is 34 feet above high-water mark, and, including approach, is 1,300 feet long.

The St. Lawrence business of the Company is continuously expanding, and the Company has extensive docks both at Montreal and Quebec. The Montreal plant consists of two quick-acting Brown hoists, with a capacity of 3,000 tons per day, located on a Bickerdike pier on the tracks of the Grand Trunk Railway.

The Quebec plant, situated on the lower basin, consists of two gantry cranes and two smaller hoists, which discharge direct into cars or for local delivery without

SIDE V



SIDE VIEW, TYPE OF ARCH BAR TRUCK

END VIEW. TYPE OF ARCH BAR

RCH BAR TRUCK

THE EASTERN CAR COMPANY LIMITED

further handling. The plant has a capacity of 2,000 tons per day.

LUMBERING DEPARTMENT

The Company controls, in its Newfoundland and Nova Scotia timber areas, 107 square miles of timber land, consisting of spruce, fir, hemlock, birch, beech and maple, from which the average yearly output of lumber is from five million to six million feet board measure.

In Nova Scotia, most of the lumber is sawn by portable mills which are taken into the district being lumbered, and the sawn lumber is hauled to the nearest railway siding.

In Newfoundland, the logs are stream driven down the Gander River, and the sawmill is situated on an arm of Gander Bay, where steamers load for the Ore Mines at Wabana

Practically all of this lumber is used for the Company's requirements at Wabana Mines, Newfoundland; Sydney Mines, C.B.; and Trenton, N.S

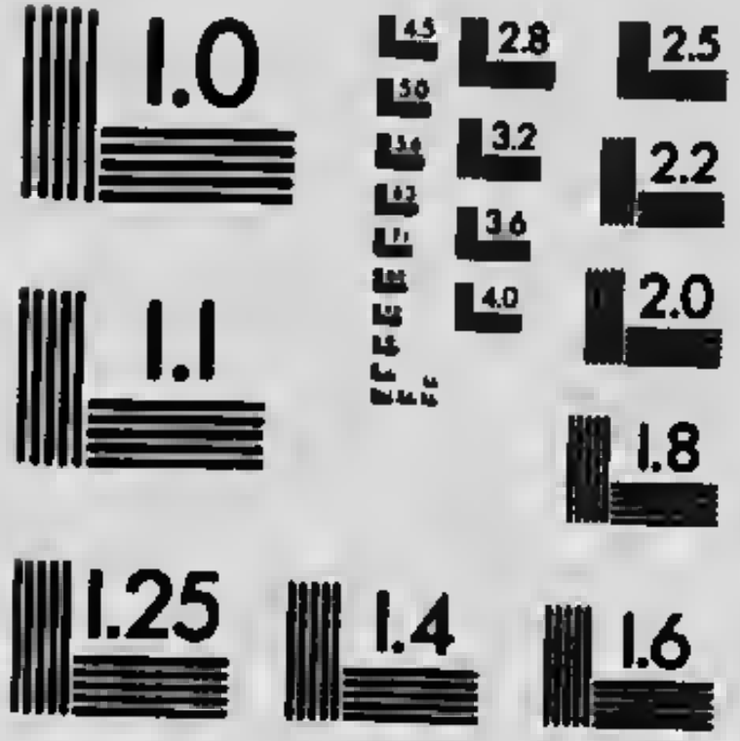

INTER COLONIAL
CANADA
50002


TML
100152


RCO
LON AL
DA
INSIDE DIMENSIONS
LENGTH 35FT.5IN
WIDTH 9FT.6IN.
HEIGHT 8FT.0IN.

MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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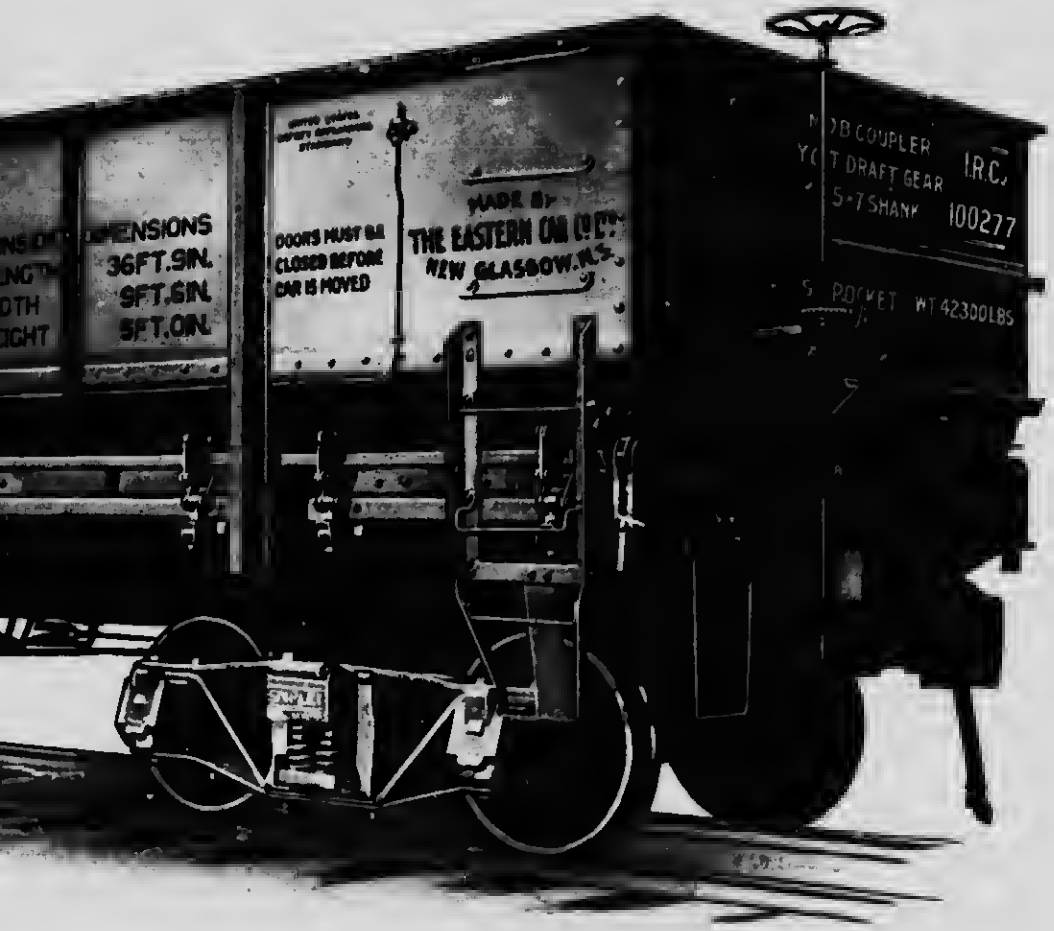

DOORS MUST BE CLOSED BEFORE CAR IS MOVED
MADE BY
THE EASTERN CAR LTD.
NEW GLASGOW, N.S.
I.R.C.
100277
WT 42300 LBS

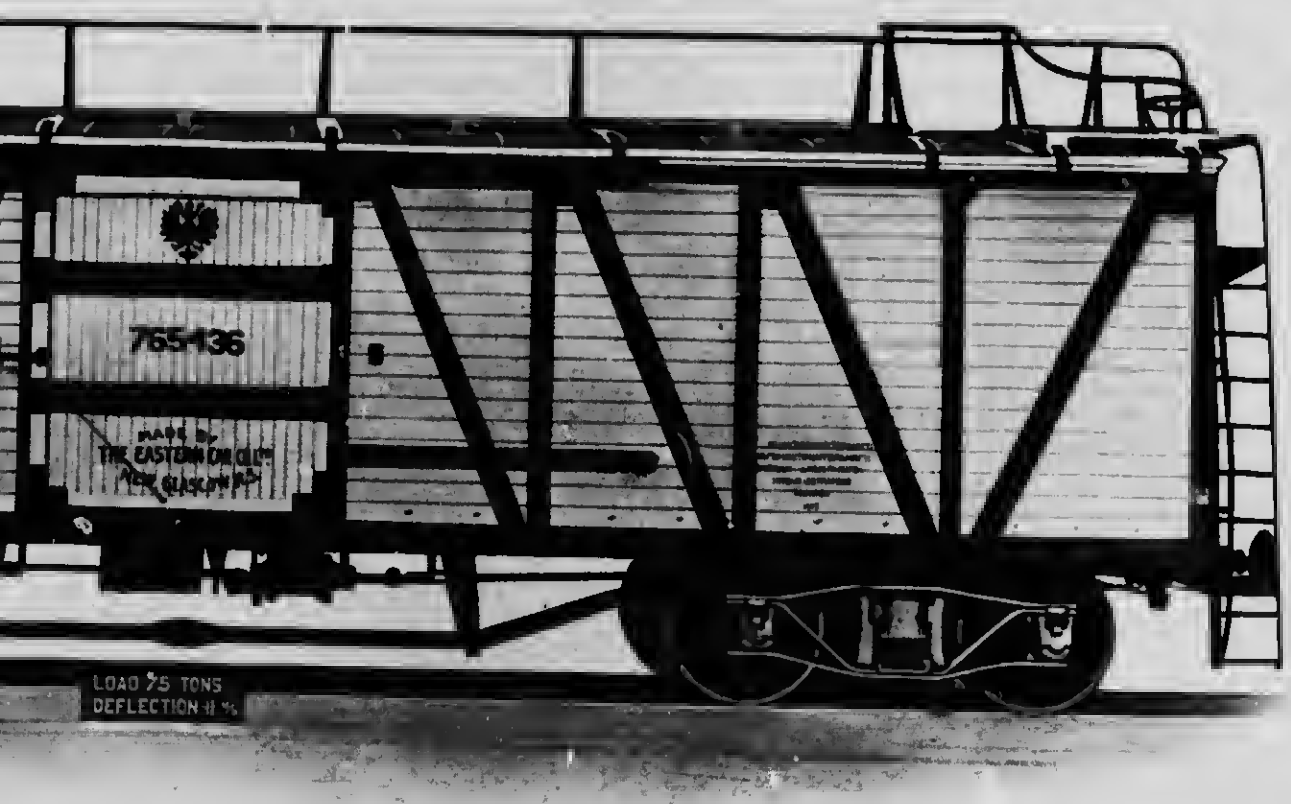

C. C. L. No. 1


C.F. Co. Ltd. No. 1.


GRAND TRUNK
105000


RAND RUNK
105 00
BUILT BY
EASTERN CAR CO. LTD
NEW GLASGOW, N.S.


Ник.Ж.Д.
765436
Тара 1285 пуд.
Грузъ 2400п.


765136
LOAD 75 TONS

ОСМ.ВЛАДИ-
ВОСТОКЪ
25СНТБР.15

THE EASTERN CAR COMPANY LIMITED

SPECIAL FEATURES & ADVANTAGES

The adoption of steel in the manufacture of small cars for use in mines and industrial plants has been greatly accelerated by the introduction of such equipment as automatic punching machines and steel presses, making it possible to turn out pressed steel car parts formerly impossible to produce. To such an extent is this the case that large firms now find it profitable to give close attention to this field, which was formerly cultivated by the small manufacturers.

The use of larger machines has resulted in a radical change of design in the small cars, making it possible, by the use of formed plates, largely to do away with rivetted angle and plate work, resulting in a stronger design with less weight.

Modern manufacturing and industrial conditions demand such difficult car service in many plants that standard equipment will not

TWENTY-TON STE

TY-TON STEEL FRAME "GONDOLA" FOR FRENCH STATE RAILWAYS

TWENTY-TON STEEL FRAME "GONDOLA"

NDOLA" (REAR VIEW)

THE EASTERN CAR COMPANY LIMITED

meet the exacting conditions. The fifty-ton metal dump car, illustrated a few pages before this, is an example of such special design. It is a type of car built to carry heavy loads of hot steel billets that would warp and twist the ordinary car out of shape after short service.

The all-steel flat car is interesting as an illustration of the present tendency towards the adoption of a few massive members rather than the numerous beams, tie rods and multiplicity of parts of older types of cars.

The general service car is a type becoming more and more popular with Canadian and American railways. In addition to the pleasing appearance of the car, its strong design and adaptability to the general service conditions met with on the average railroad, make it a most desirable piece of rolling stock, as a dumping car for service on docks. As can be seen from the illustration, it is a self-clearing car. When closed, it is most convenient for carrying lum-

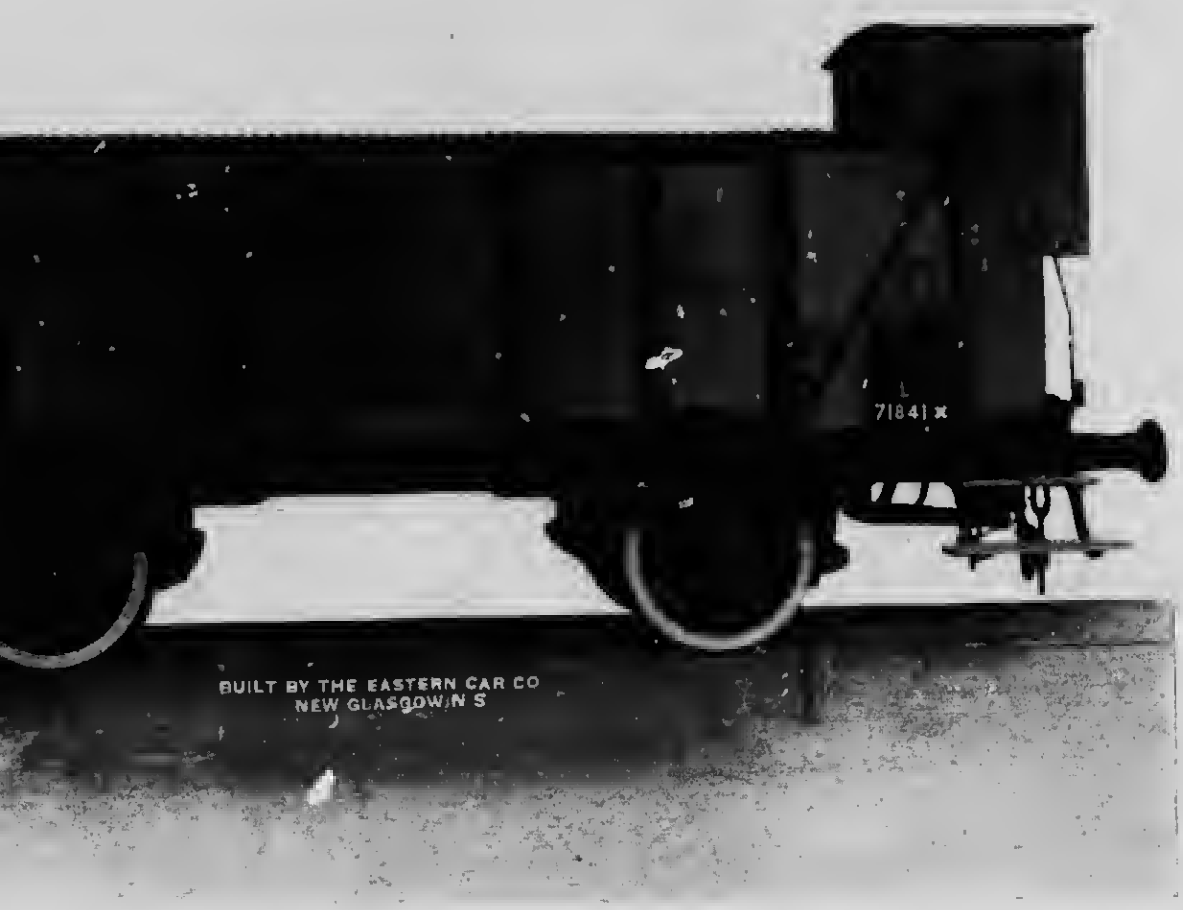
brick, or other similar material on intermittent or return service.

The construction of this massive gondola car, with its few but heavy parts, is in direct contrast to the type built for the French State Railways, the one being built of parts that involve little or no machine work and the other, for apparently the same service, involving a detail of finish that is seldom attempted in American car building practice.

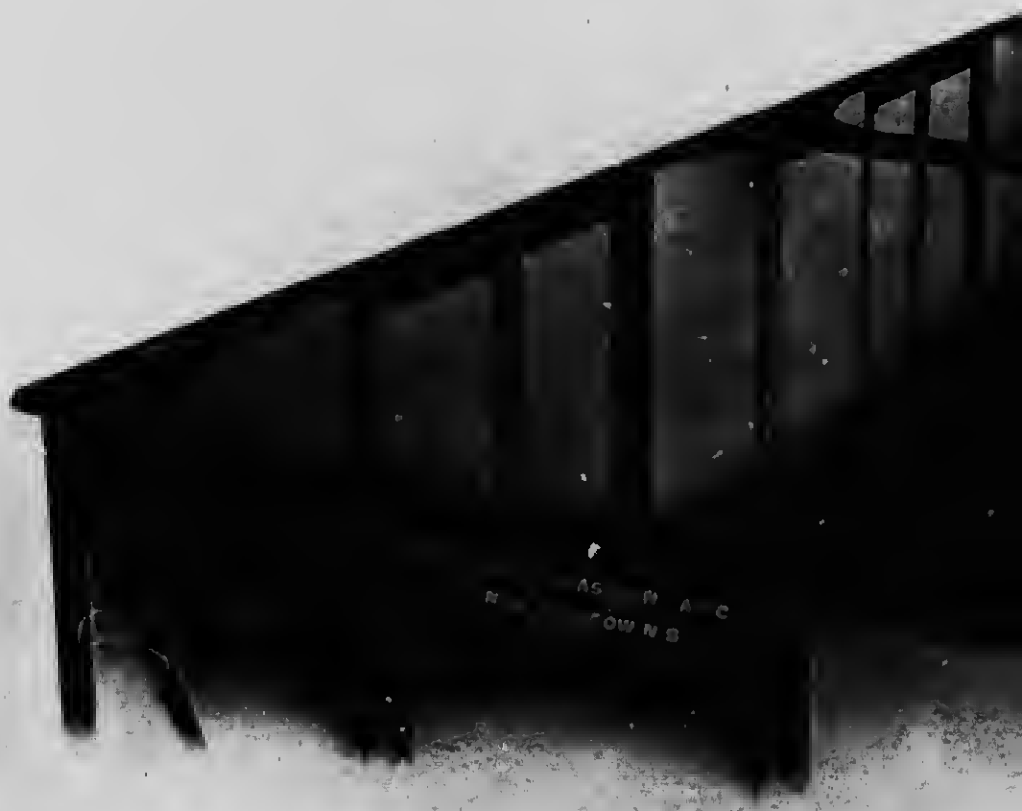
A casual inspection of the different car illustrations reveals the marked tendency of the European designer to consider more carefully the comfort and protection of the train crew.

The Russian type of car seems to exceed even the large American cars in carrying capacity and at the same time approaches the French car in detail and finish. Also the European cars, both French and Russian, are hauled by the buffer draft gear, which, while not as quickly connected as the American, has the advantage of permitting close adjustment of

TWENTY-TON



TY-TON STEEL FRAME "GONDOLA" (SIDE VIEW)



TWENTY-TON STEEL FRAME "GONDOLA," SHOWING INSIDE

ING INSIDE CONSTRUCTION

THE EASTERN CAR COMPANY LIMITED

the car couplings for the purpose of eliminating the slack between cars, so that for haulage over railroads of good gradients and easy curves, couplings can be tightened up so as to completely eliminate shock, and for poor roadbeds can be left looser to permit easy starting of heavy trains. This adjustment is not provided for on the American cars.

The various types of cars featured on these and preceding pages illustrate the versatility of the Eastern Car Company's plant, and its ability to produce, at comparatively short notice, widely differing types of cars to meet entirely different conditions and requirements. This feature of the company's equipment is of especial importance to railway systems, whose requirements cannot be met by less completely equipped car building plants.

THE EASTERN CAR COMPANY LIMITED

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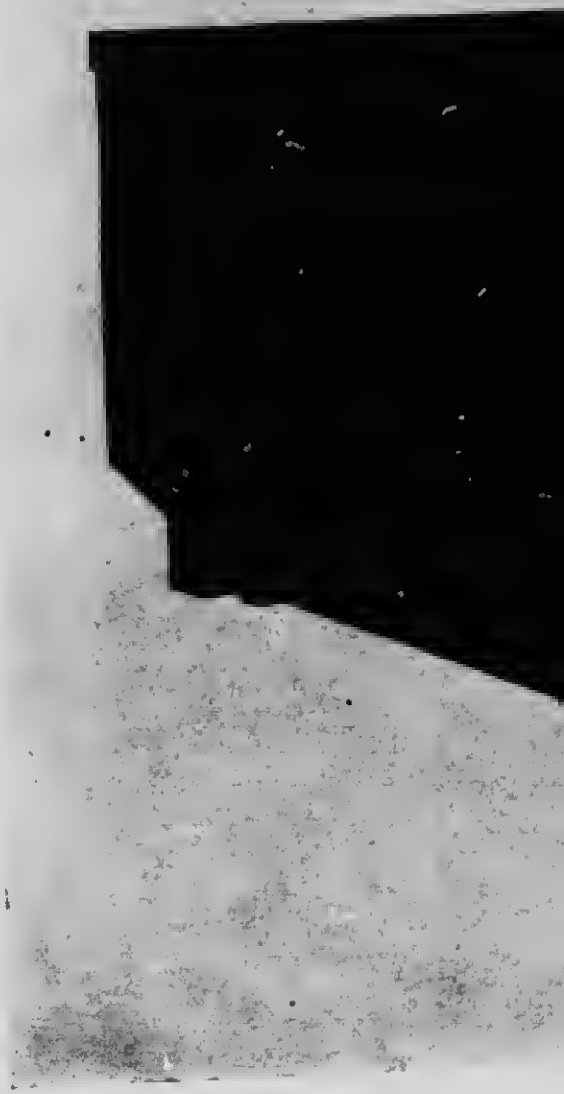
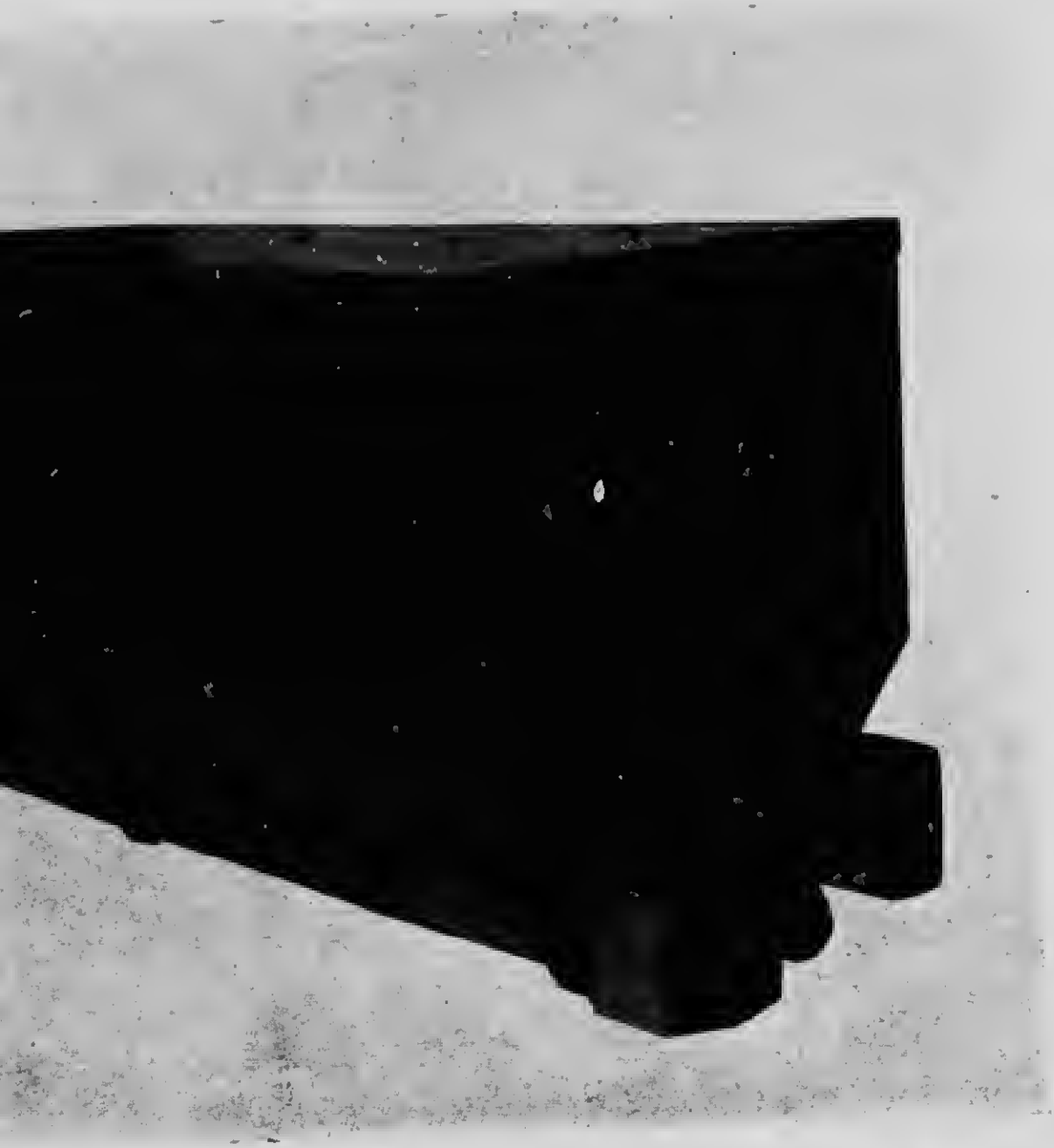




STANDARD MINE CAR

INTERIOR OF POWER HOUSE, SHOWING ELECTRIC TURBINE A

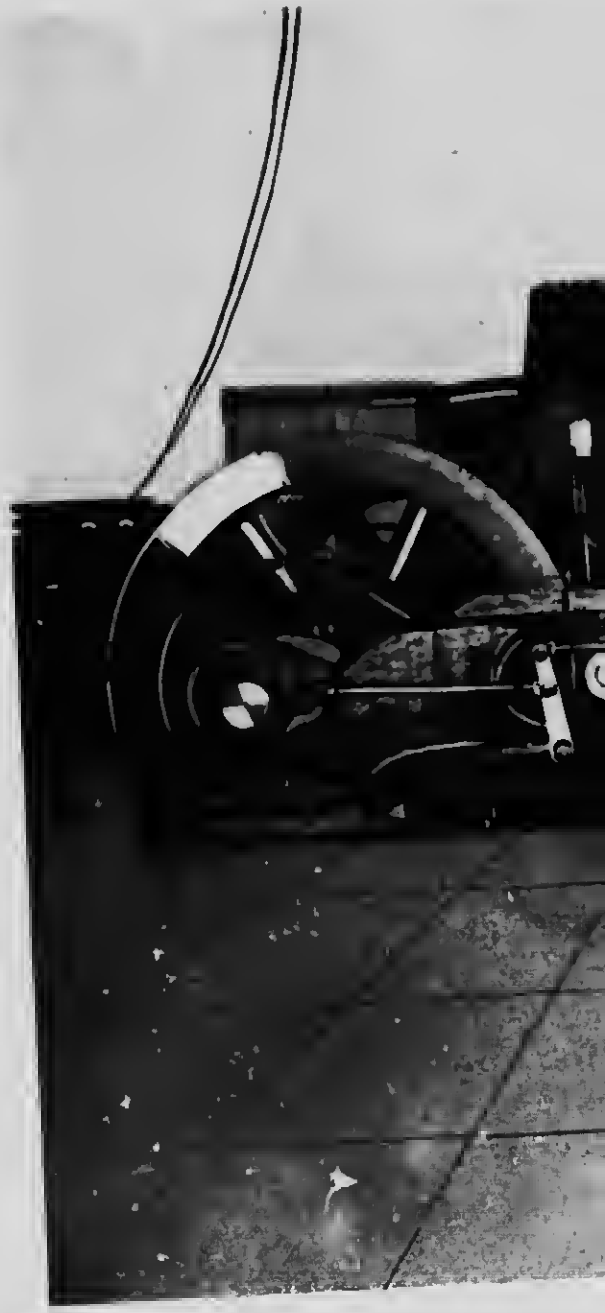
TURBINE AND SWITCHBOARD

THE EASTERN CAR COMPANY LIMITED

INDEX—Continued

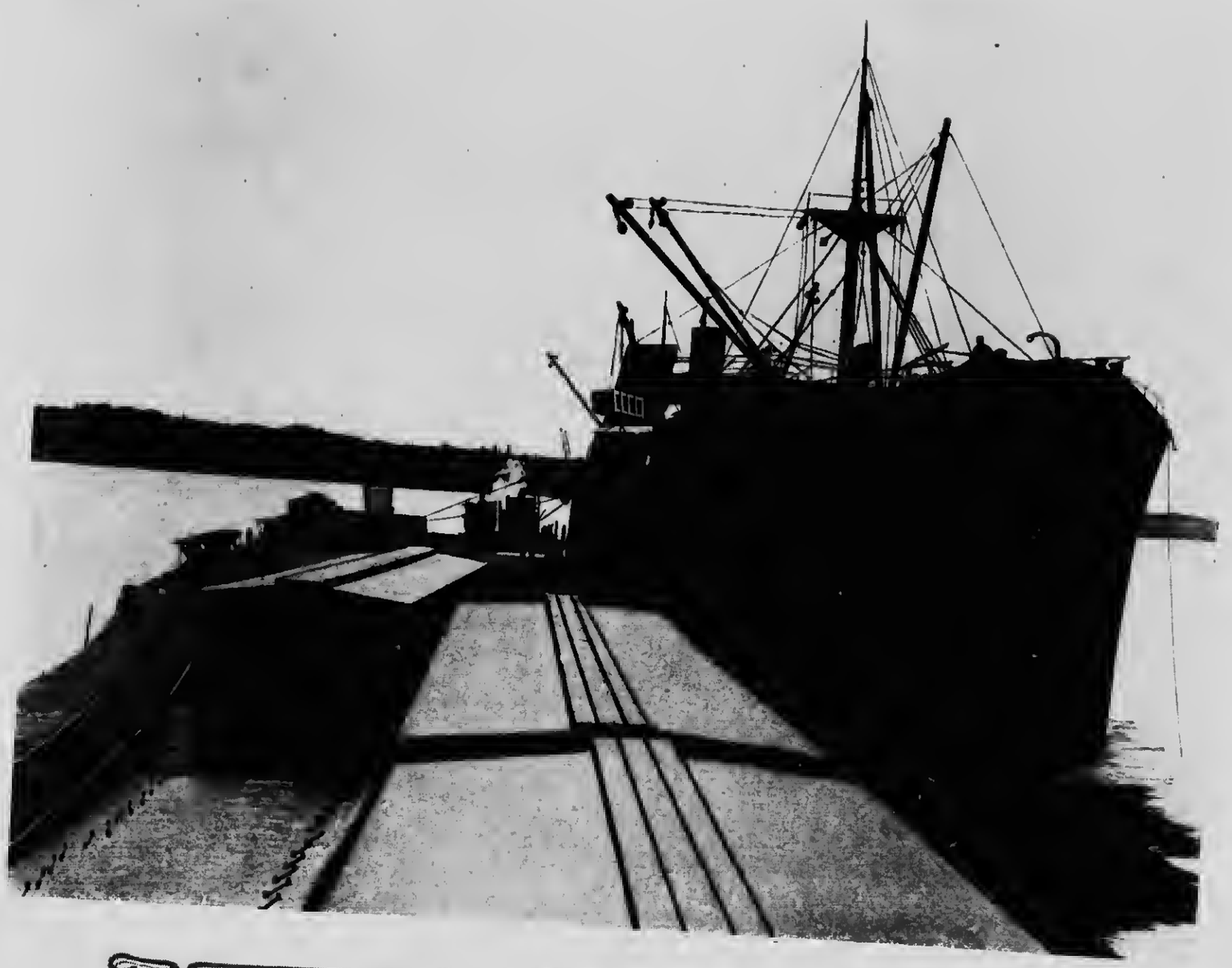
THE EASTERN CAR COMPANY LIMITED

INDEX – Continued



HYDRAULI

YDRAULIC PUMP FOR PRESSES AND PUNCHES



LOADING RUSSIAN CARS

INDEX— Continued

THE EASTERN CAR COMPANY LIMITED

INDEX—Continued

LOADING RUSSIAN CAR PARTS AT PICTOU LANDING

LOADING RUSSIAN CAR PARTS AT PICT

AT PICTOU LANDING

THE EASTERN CAR COMPANY LIMITED

INDEX– Continued

THE EASTERN CAR COMPANY LIMITED

INDEX – Continued

ORE LOADING

OADING DOCK AND COAL DISCHARGING PIER, WABANA

WABANA MINES, LOOKING EAST
FROM NO. 1 MINE

NO. 1 MINE AND STOCK PILE
AT WABANA