

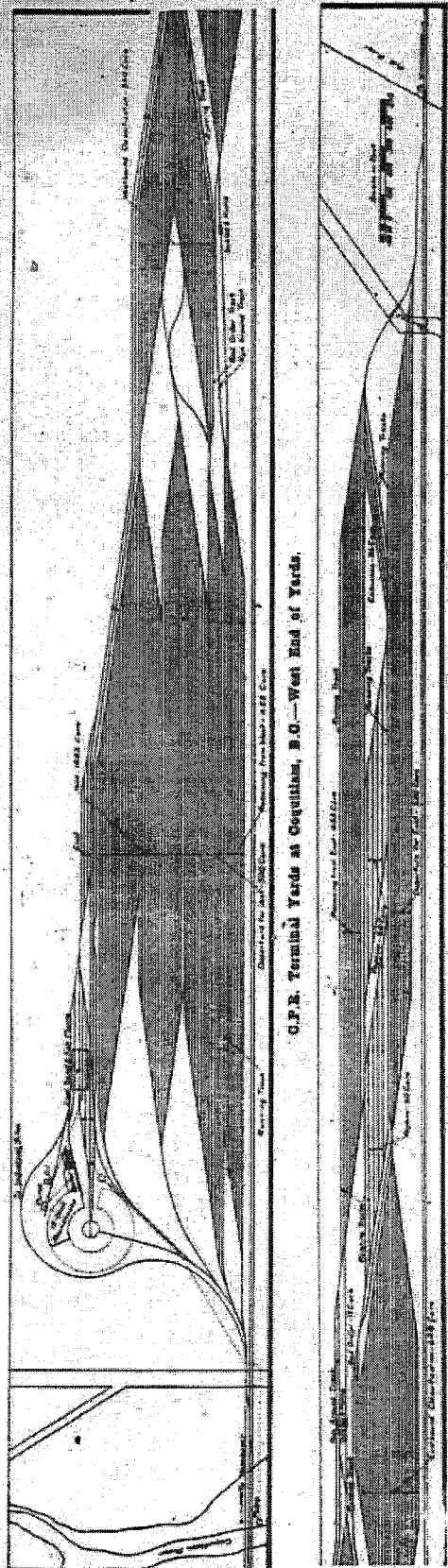
CANADIAN
PACIFIC
RAILWAY

CANADIAN
PACIFIC
RAILWAY

COQUITLAM
TERMINAL

C H RIFF

Canadian Pacific Railway Terminal Yards at Coquitlam, B.C.



C.P.R. Terminal Yards at Coquitlam, B.C.—West End of Yards.

C.P.R. Terminal Yards at Coquitlam, B.C.—East End of Yards.

The C.P.R., as noted in previous issues of Canadian Railway and Marine World, has under construction at Coquitlam, B.C., a large terminal yard for the handling of freight originating in and directed towards Vancouver. It is of the double hump type, and has a total capacity in excess of 5,000 cars. The general layout of the yards is shown in the accompanying plan.

Coquitlam is to be made the big terminal point on the Pacific coast for the arrangement and distribution of the freight traffic in and out of Vancouver, from which it is distant about 18 miles on the main line. In consequence of the big demand which will undoubtedly be made on it immediately on completion from the constantly increasing traffic, the terminal had of necessity to be made of large proportions. Between the two approaches, the distance is something over two miles, a good estimate of the extent of the project.

The terminal yards may roughly be divided into eight different systems of track, each receiving from the east, departure for the east, repair yards, eastbound classification, westbound classification, receiving from the west, departure for the west, and holding yards.

The main line along this section of the C.P.R. is double tracked. From the east, the westbound traffic is diverted to a siding just after crossing the Pitt river, which is having a heavy double track bridge constructed across it as a part of the terminal

scheme. From a ladder track, the incoming traffic from the east is received into the northerly yard at the east end of the terminal, which contains seven tracks 2,500 ft. long, with a capacity of 455 cars.

From this receiving yard, the cars are drawn off through a similar ladder track to that on the other end to the westbound hump, which conforms to the American Railway Association's standard; the hump for traffic in the reverse direction is similar to it. Both humps have a run-around track for solid through trains that have not to be broken up for classification at the hump. The westbound classification yard, into which the cars descend from the hump, has a double ladder approach, and contains 27 tracks 1,000 ft. long, with a capacity of 540 cars.

The bulk of the traffic is westbound, and in consequence, a large storage capacity for Pacific coast freight is required. The westbound classification yard thus has two outlets, the one from the south into the westbound departure yard, and the other into the storage or holding yard. A track leading out at about the centre of the classification yard discharging ladder makes approach for all tracks to the south of that outlet equally open to the westbound departure and the holding yards.

The westbound departure tracks are nine in number, each 2,050 ft. long, with a capacity of 691 cars. The holding yard has 37 tracks, each about 2,500 ft. long, with the

large holding capacity of 1,925 cars. To the latter yard, there are two entry tracks, with double ladders to each, and at the opposite end, there are also two departure tracks, one with a double ladder and the other with a single. These departure tracks converge to a siding on the main line, of sufficient length to hold 65 cars clear of switches, freeing the yard of trains ready to depart but awaiting orders.

The westbound traffic is received into a yard containing seven tracks, each 2,500 ft. long, like the reverse direction yard, with a capacity of 455 cars. From here, the trains are drawn off to the westbound hump, located directly south of the westbound classification yard, which is similar to the reverse direction hump.

The eastbound classification yard contains 30 tracks, with a capacity of 649 cars, the length of the yard being 2,301 ft. overall, approached at either end by a double ladder.

The eastbound departure track holds 630 cars on eight tracks, each 2,050 ft. long, both ends having a single ladder approach, leading off to the siding which runs on to the main line.

The repair track capacity of the terminal is for 120 cars in two yards, each containing four tracks, each 850 ft. long. These repair yards are located between the westbound receiving yard and the eastbound departure yard. These yards are approached by freight moving in either direction, for

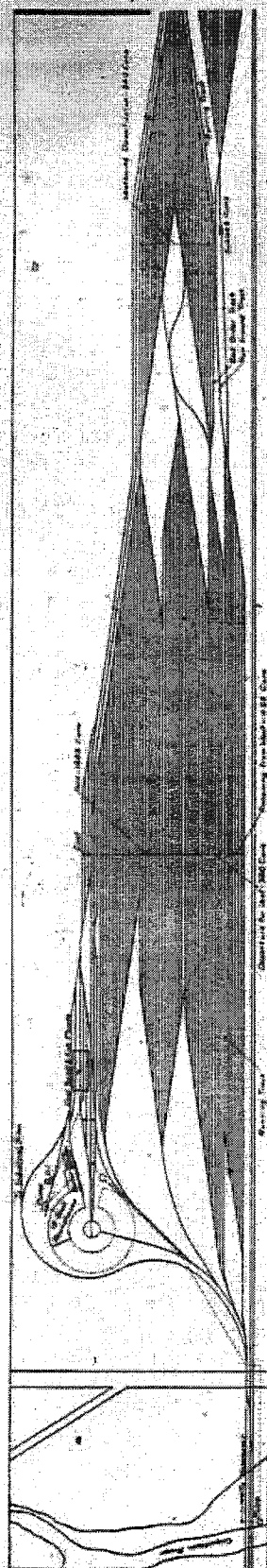
both of which they are equally convenient. In addition to these two repair yards, there is a bad order track adjoining each of the yards, to which the cars requiring repairs can be shunted awaiting removal to the repair yards.

Four trucks, with a total capacity of 30 cars are run from the westerly end of the westbound receiving yard to the running track along the north side of the eastbound departure yard, for the reception of cabooses. These are removed from the trains as they arrive from the west, shunted to these tracks, and are in a position to be easily shunted to the rear end of the eastbound departure yard, along the running track. No provision for cabooses is made at the west end of the terminal, as the traffic from that point into Vancouver does not require the use of a way car.

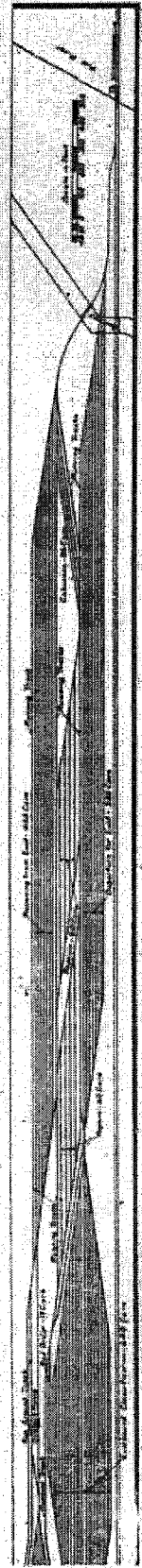
At the northwest corner of the terminal yards a 12 stall roundhouse is under construction to be equipped with the usual divisional shop facilities. Provision is being made for the extension of the roundhouse to 48 stalls, when the demand arises. The roundhouse and the ash and sand plants are situated north of the holding yard, directly east of the roundhouse, which is to be approached from the east. Coal cars for the coal yard are accommodated on the four tracks to the east of the coal yard.

Incoming locomotives from the east, after dropping their trains in the incoming yard,

Canadian Pacific Railway Terminal Yards at Coquitlam, B.C.



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The westbound departure tracks are nine in number, each 2,030 ft. long, with a capacity of 391 cars. The holding yard has 37 tracks, each about 2,240 ft. long, with the

large holding capacity of 1,925 cars. To the latter yard, there are two entry tracks, with double ladders to each, and at the opposite end, there are also two departure tracks, one with a double ladder and the other with a single. These departure tracks converge to a siding on the main line, of sufficient length to hold 65 cars clear of switches, freeing the yard of trains ready to depart, but awaiting orders.

The westbound traffic is received into a yard containing seven tracks, each 2,000 ft. long, like the reverse direction yard, with a capacity of 455 cars. From here, the trains are drawn off to the westbound hump, located directly south of the westbound classification yard, which is similar to the reverse direction hump.

The eastbound classification yard contains 30 tracks, with a capacity of 640 cars. The length of the yard being 2,300 ft. overall, approached at either end by a double ladder.

The eastbound departure track holds 820 cars on eight tracks, each 2,950 ft. long, both ends having a single ladder approach, leading off to the siding which runs on to the main line.

The repair track capacity of the terminal is for 120 cars in two yards, each yard containing four tracks, each 800 ft. long. These repair yards are located between the westbound receiving yard and the eastbound departure yard. These yards are approached by freight moving in either direction, for

both of which they are equally convenient. In addition to these two repair yards, there is a bad order track adjoining each of the yards, to which the cars requiring repairs can be shunted awaiting removal to the repair yards.

Four trucks, with a total capacity of 30 cars are run from the westerly end of the westbound receiving yard to the running track along the north side of the eastbound departure yard, for the reception of cabooses. These are removed from the trains as they arrive from the west, shunted to these tracks, and are in a position to be easily shunted to the rear end of the eastbound departure yard, along the running track. No provision for cabooses is made at the west end of the terminal, as the traffic from that point into Vancouver does not require the use of a way car.

At the northwest corner of the terminal yards a 13 stall roundhouse is under construction, to be equipped with the usual divisional shop facilities. Provision is being made for the extension of the roundhouse to 48 stalls, when the demand arises. The roundhouse station and the ash and sand plants are situated north of the holding yard, directly east of the roundhouse, which is to be approached from the east. Coal cars for the coaling dock are accumulated on the four tracks to the east of the coaling dock.

Incoming locomotives from the east, after dropping their trains in the morning yard,

C.P. R.
VANCOUVER
TERMINAL

C H RIFF

CANADIAN
PACIFIC
OGDEN
SHOPS

CALGARY
ALBERTA

June, 1913.]

The Canadian Pacific Railway's Ogden Shops.

The C.P.R. has recently put in operation near Calgary, Alta., a large shop plant of more than ordinary interest by reason of its size, its complete and modern character, and the speed with which it was created. The shop location is at Ogden (named after the company's Vice President, I. G. Ogden), 4.6 miles east of Calgary and 234.7 miles from Montreal. A preliminary description of the plant appeared in Canadian Railway and Marine World for Feb., 1912.

Its distance from those sections of the country where the greater part of the construction materials, machinery and equipment were produced, constituted the first and one of the most important problems. A second important problem arose on account of the construction season being extremely short, owing to the high latitude, frost remaining in the ground until about April 1, and returning with snow as early as Oct. 1. A third very important problem was the comparative scarcity of labor in the Canadian Northwest, this condition being greatly aggravated during the late summer months when harvesting

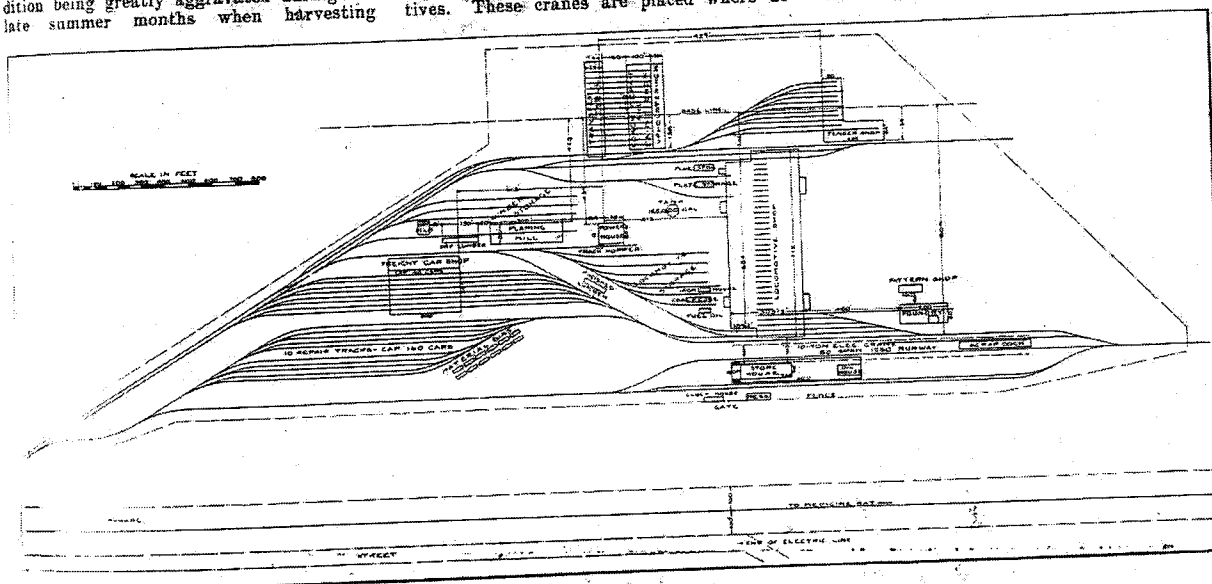
chine shop, blacksmith shop, and boiler shop.

The erecting shop is of the transverse lift over type, contains 35 bays, each 22 ft. between centres, and is 778 by 75 ft. The entire area is served by two travelling electric cranes, carried on two levels. A 120 ton crane, furnished with two 60 ton trolleys, is carried on the upper level, and is used for transferring, wheeling and un-wheeling locomotives and handling parts. One of the trolleys on this crane is equipped with a 10 ton auxiliary hoist for handling light material at a high hoisting speed. Another 10 ton travelling electric crane operates at high speed and serves the entire area of the erecting shop, for handling material in that shop and transferring same to the blacksmith shop and machine shop. The machine shop and the boiler shop are located in adjacent bays on either side of the erecting shop.

Provision is made on the crane columns in the erecting shop for attaching portable jib cranes for use in dismantling and erecting material on the front ends of locomotives. These cranes are placed where de-

by the travelling electric yard crane which travels across the end and outside of the locomotive shop. Space for the lighter machine tools is provided in a shop 60 1/2 ft. wide parallel with and alongside of the heavy machine shop and of the same length as that shop. An overhead trolley beam is provided on the bottom board of the roof truss to permit of using a travelling electric trolley for handling material longitudinally in this shop. Provision has been made for a foreman's office elevated above the floor and having liberal glass surface in the walls so as to give the best possible view of the shop.

The blacksmith shop is located alongside of and parallel with the erecting shop on the opposite side from the machine shop. This building consists of two bays each 332 ft. long, 60 1/2 and 50 ft. wide, respectively. Space is provided for heavy forging work, steam hammers, etc., in the building immediately adjoining the erecting shop. The blacksmith shop will not be served by a travelling crane, but provision has been made for jib cranes to handle the material from steam hammers, forg-



General Location Plan, C.P.R. Ogden Shops.

begins and all labor markets are practically drained of men. Plans had, therefore, to be drawn, materials ordered, deliveries made and complete field organization perfected so that the shops could be closed in between April 1 and Dec. 1, and sufficiently heated so that inside work could be continued after cold weather had set in. How this was done will be seen by the progress diagram on page 267.

The shops consist in general of main locomotive shop (including erecting, machine, blacksmith and boiler shops); tender and wheel shop; pattern shop and pattern storage; foundry; storehouse and office building; material platforms and scrap dock; oil house; coach repair and paint shop; freight car repair shop; planing mill; boiler and compressor house; 1,260 ft. yard crane; miscellaneous structures, including transfer table and pit for coach shop, mess hall, driven wells and water tower, all service system, such as drainage, sewage, fire protection, water supply, etc.

THE MAIN LOCOMOTIVE SHOP is designed to contain the erecting shop, ma-

sired by means of the overhead travelling electric cranes. Entrance for locomotives to the erecting shop is provided through four doors, located in the west side of the shop, two of these doors being located at either end. For providing additional means for entrance of locomotives, six door openings are provided in the east wall of the machine shop, two of these being at the north end and four at the south end. All of these entrance tracks are connected up with the erecting pits of the several stalls where they enter the building, to permit of the locomotives moving into and out of the shop through these entrances should this movement become desirable or necessary.

The machine shop to contain heavy machine tools is located parallel with and adjoining the erecting shop on one side, and is 60 1/2 ft. wide, and the same length as the erecting shop. A high speed travelling crane of 10 ton capacity covers the entire area of this shop. Material can be brought into the shop through a door provided in the end of the building, the material being brought up to the end of the machine shop

ings, etc. In a building of lower cross section alongside are located the furnaces, bolt headers and other blacksmith shop machinery. This portion of the shop is served by a trolley its full length, to facilitate the longitudinal movement of material through the shop.

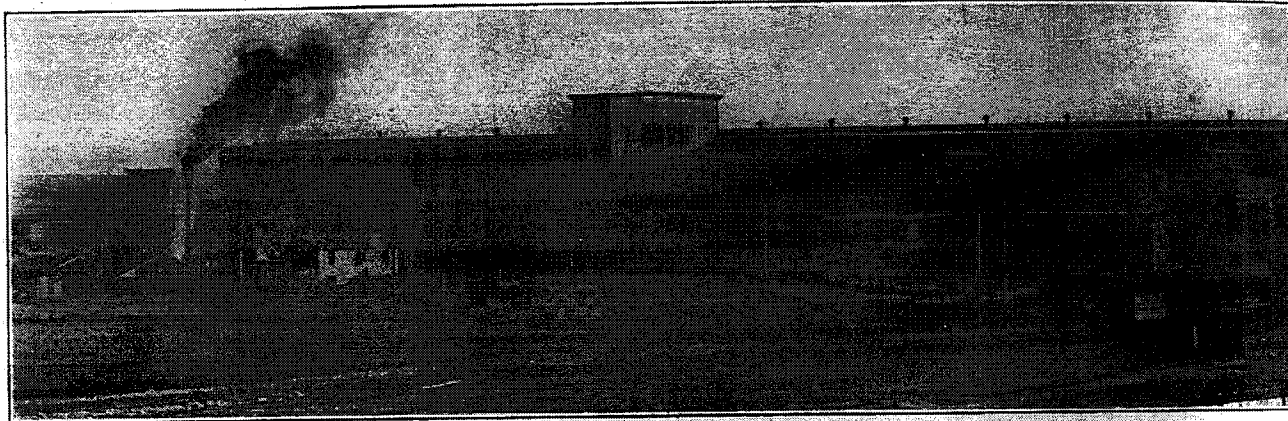
The space for the boiler shop is provided in a two bay building, alongside of and parallel with the erecting shop at the end of the blacksmith shop, 352 ft. long and the same width as the latter shop. The part of the boiler shop immediately adjoining the erecting shop is provided with a 40 ton travelling electric crane, equipped with two 20 ton trolleys, serving the entire area of the boiler shop, for handling the boilers and other material. The riveting tower is located between two of the roof trusses in the end of the boiler shop, with a 25 ton crane for serving the hydraulic riveter. In the outer of the two bays of the boiler shop, space is provided for a fine shop and boiler shop tools. The entire length of this space is served by a 3 ton overhead travelling trolley for handling material through the shop. Space for a fine rattler is pro-

vided immediately outside of and adjacent to the low bay of the boiler shop. An entrance track is provided through the outside wall of the boiler shop, on which boilers or other equipment going to this department can be delivered on cars under the travelling crane, for unloading, or may be loaded out for shipment in the same way. This facilitates the handling of boilers from steam shovels, pile drivers, ligger-woods, etc. Jib cranes are provided for serving the individual machines in the boiler shop where such service may be

voltage delivered by the power company, viz., 2,200 volts, to a sub station located adjacent to and immediately outside of the low machine bay, the transformers for stepping down to 440 volts being located in the sub station in which are also two motor generator sets for supplying direct current. The switchboard is also located in this sub station for controlling the power and lighting circuits in the machine shop, and for the tender shop and foundry. As far as possible distributing feeders are carried in conduit beneath the shop floor,

roof water proofing is four ply tarred felt, pitch and gravel, with copper flashing. Suitable drain leaders are provided and connected into underground tiled drains to carry off the water from the roof. The large skylight on the erecting shop bay is of steel bars lead covered with ribbed wired glass.

THE TENDER AND WHEEL SHOP is constructed with structural steel frame and with steel roof trusses, otherwise the general construction of the building is similar to that described for the main



Locomotive, Erecting and Machine Shop, Showing Blacksmith and Boiler Shop Bays, Viewed from the West.

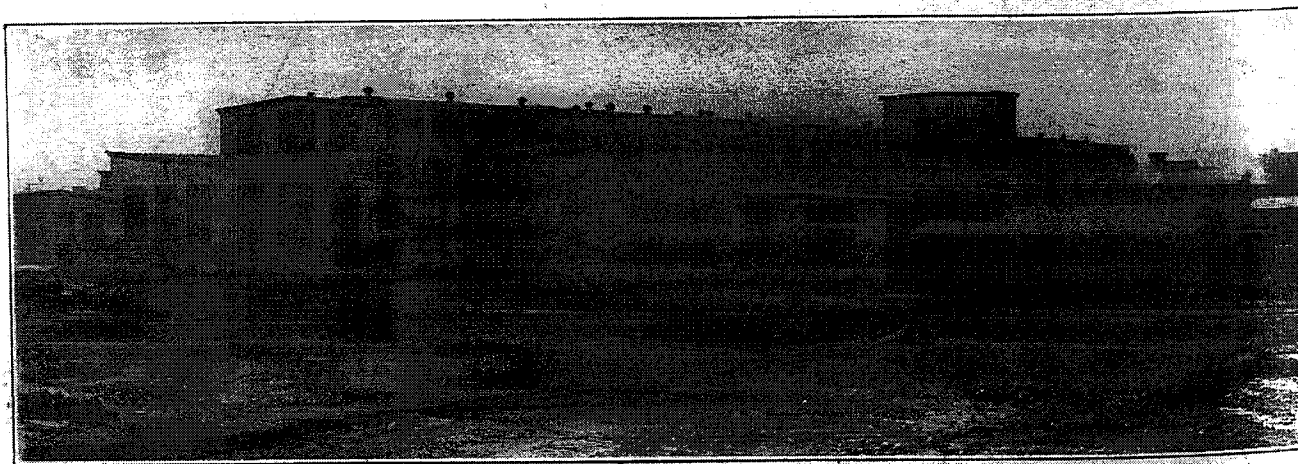
necessary.

The heating throughout is done by indirect fan system. For distributing the heated air, underground concrete and tile ducts are used. The general illumination consists of Cooper-Hewitt lamps, with circuit and plug boxes for extension loop cords. Provision has also been made for incandescent lighting circuits for individual lighting at machine tools where required, and for outlet boxes for connecting extension lamp cords to provide lighting for the interior of the locomotive boilers on the erecting floor. Toilets, lavatories, and

thereby minimizing the amount of exposed wiring in the shops.

The building containing all of the above departments of the locomotive shop is constructed with structural steel frame carried on concrete foundations. The exterior walls up to the window sill line are of concrete, above the window sills of hollow tile plastered. Ample window area is provided in the side walls and in roof monitors and skylights, so as to give sufficient natural lighting. Good ventilation is obtained through ventilators in the monitors and skylights, and by the use of swinging the

locomotive shop. It is an L shaped structure 263 by 80 ft., with L 180 by 80 ft., and affords space for making repairs to locomotive tenders, steam shovels and maintenance of way equipment. The portion of the shop intended to receive the equipment to be repaired is spanned over its entire area by a 20 ton high speed travelling electric crane equipped with two 10 ton trolleys. Longitudinal tracks on 20 foot centres extend to the doors in the building wall. A car puller is installed for moving the equipment into and out of the shop. A sufficient number of tracks



Locomotive, Erecting and Machine Shop, Showing Roof Arrangement, with Special Reference to Lighting, Viewed from the Northwest.

metal lockers are provided in the various departments of this shop. A suitable system of piping is provided for distributing live steam, compressed air, fuel oil and water for fire protection, drinking and hydraulic pressure. Outlets for compressed air are provided in duplicate in the sides of each of the engine pits to supply compressed air for operating pneumatic tools.

In the main locomotive shop the electrical feeders from the power company transmission lines are carried in underground ducts, bringing the current at the

sash in the vertical walls. With the exception of the blacksmith shop and a portion of the boiler shop the floor throughout is constructed with a 1½ in. asphalt mastic wearing surface which is underlaid with a rough concrete slab about 6 ins. thick. In the blacksmith shop and a portion of the boiler shop the floor is of cinders. The roof sheathing is constructed of 2 x 4's, surfaced on one side and one edge, and spiked together on edge, thus affording good fire resistance qualities and materially reducing the heat losses. The

extend through the rear wall of the building to facilitate the movement of material into the shop. In the L portion of the building, of lower cross section, space is provided for steel tire wheel lathes, wheel and axle machinery and such other tools as are required. A depressed track carried along the ends of the wheel storage tracks outside facilitates unloading and loading of wheels and axles. The heating, lighting, and service equipment is similar to that described for the main locomotive shop.

June, 1913.]

CANADIAN RAILWAY AND MARINE WORLD.

PATTERN SHOP AND PATTERN STORAGE.—Space for the pattern shop and pattern storage is provided in a separate building located adjacent to the foundry, a fire wall separating the pattern shop from the pattern storage. The general construction of the building is the same as that of the other buildings—the roof of slow burning mill construction. The structure is 162 by 31 ft. wide, is heated by the direct system and lighted with keyless socket marine type incandescent lamps. A sprinkler system is provided for fire protection.

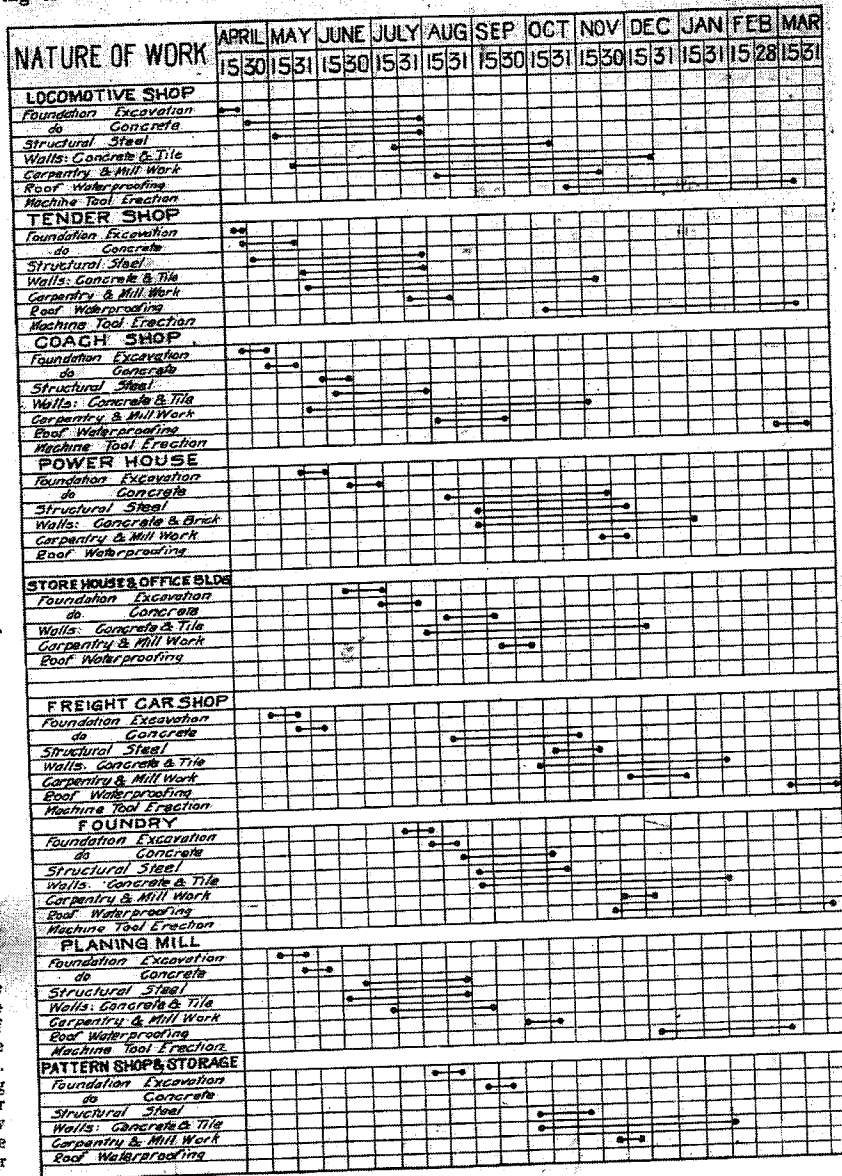
THE GREY IRON FOUNDRY building is 203 by 80 ft. wide, constructed with two bays. The frame is of structural steel carried on concrete footings. The general construction is the same as that described for the other buildings, except that the floor is of the usual clay type used in foundries and the roof over the cupola room is of corrugated asbestos. The bay of higher cross section is served over its entire length by a 10 ton high speed travelling electric crane. Jib cranes, attached to building columns, are provided. These cranes are so arranged that they may be removed from one location to another if desired, being handled by the travelling electric crane. In the side bay of lower cross section, space is provided for core making and shop moulding floor. The charging floor for the cupola is located in the centre of the lower bay. Heating is by the indirect fan system, with underground tile and concrete hot air ducts. For general illumination, flaming arcs are used in the high bay and ordinary arcs in the low bay, with outlet boxes for extension lamp cords. Toilets, lavatories, and conveniences for the men are provided; also steam, air and water service, for fire protection and drinking purposes. The location of this building alongside of and parallel with the travelling electric yard crane enables the unloading of scrap and pig iron to be taken care of by the yard crane. This close proximity of the foundry to the yard crane also reduces to a minimum the handling of the castings from the foundry to storage, to the main shop, or in loading for shipment.

STOREHOUSE AND OFFICE BUILDING.—This building is 252½ by 80 ft. One end of the building for a length of 40 ft. is carried up three stories, and contains offices on the second and third floors and a fire proof vault. The remainder of the building, for storehouse purposes, is two stories high and contains electric elevator platform scales, material bins and shelving. The walls are of hollow tile blocks on concrete foundations. The framing is of heavy timbers, with roof sheathing of 2 by 4's surfaced on one side and on edge, and spiked together on edge. The foundations are carried up to bring the floor of the storeroom to car door height. The necessary toilet and lavatory facilities are provided. The offices are heated by direct radiation, the remainder of the building being heated by the indirect system. The lighting is by incandescent lamps. Fire protection is by automatic sprinklers. The ground floor of the storehouse has a 1½ in. asphalt mastic wearing surface. The other floors throughout the building are of wood. The window arrangement is such as to best accommodate the material bins and shelves without interference with good lighting. The storehouse is located parallel with the main locomotive shop. The space between these two buildings is spanned by a high speed travelling crane which can be utilized to handle all heavy material to and from the cars from the storage space that is

erecting shop. The use of this crane practically eliminates manual handling of heavy material, and permits of handling numerous small parts in quantities when contained in suitable receptacles.

MATERIAL PLATFORMS AND SCRAP DOCKS.—A material platform 90 by 350 ft. abuts one end of the storehouse. This platform is also carried along either side of the storehouse, where it is 15 ft. wide. It is constructed of concrete retaining walls filled in with earth and a top dressing of cinders covers the fill except along

basement. The part of the building used for storing oil in barrels has a cinder floor. The pump room is partitioned off with a brick wall carried up to make a fire wall. Ten oil tanks with measuring pumps are installed and provision is made for conveniently emptying the oil from barrels into the tanks in the basement. The oil house basement is heated by the direct system to the high temperature necessary to render the oil fluid during extreme cold weather; the direct system being also used to heat the rest of the building. The light-



Progress Diagram for the Different Units of the Plant.

side of storehouse, where plank covering is laid. The platform extends to and along the sides of the oil house.

OIL HOUSE.—For storing and distributing oil a separate building is provided convenient to, but located far enough away from the storehouse and other buildings, to eliminate the fire risk. It is constructed with tile walls (plastered on the exterior) on concrete foundations, with a concrete basement at one end, for the tanks which contain the oil for local distribution. The roof is of reinforced concrete slab, as is

ing of the building is with keyless socket marine type incandescent lamps. Fire protection, including sprinklers, is installed.

COACH REPAIR AND PAINT SHOP.—The building containing these departments is 362 by 146 ft., having 15 tracks on 24 ft. centres. It is constructed with hollow building tile carried on concrete foundation. Heavy timber posts support the roof, which is of slow burning mill construction. Otherwise, the construction is the same as that described for the main shop building. Space is provided along one side of the building for varnish room.

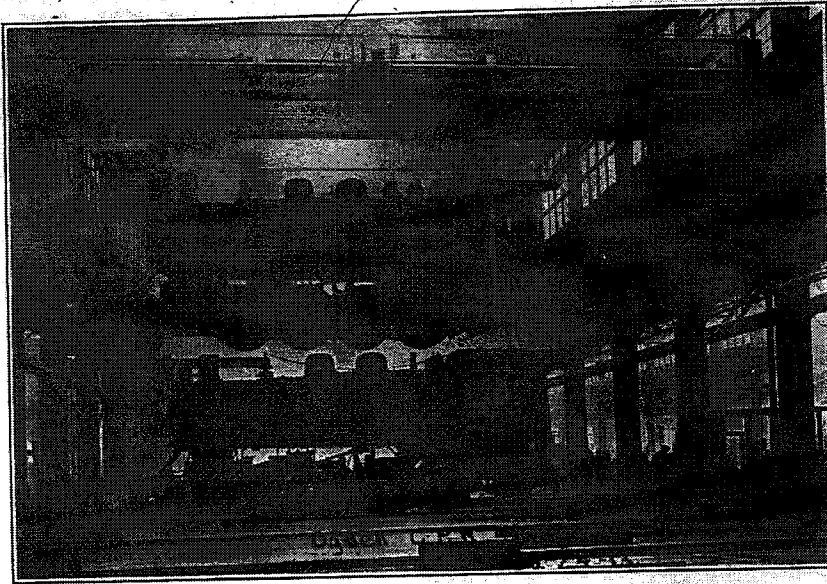
upholstering, office, sub store, paint storage, heating plant and air brake repairs. When necessity arises for increased shop capacity in this department it is proposed to obtain such increase by the erection of another shop on the opposite side of the transfer table. Heating is by the indirect fan system, with underground concrete and tile ducts. Lighting is by incandescent lamps. Compressed air, steam and water service, including fire protection and

are supplied. Heating is with the indirect fan system, with underground concrete and tile ducts. Lighting is by 100 watt-tungsten lamps. The location of this building alongside of the lumber yard permits of handling lumber so that it can be passed through into the shop without rehandling.

THE PLANING MILL is 303 by 80 ft. and contains the wood working machinery. The frame is of structural steel carried on concrete footings. The general construc-

vide steam for heating the shops and for other purposes for which steam is required throughout the shops. The building is constructed with brick walls, carried on concrete foundations, with steel roof trusses and supports for coal bunkers. The chimney is of reinforced concrete, 200 ft. high, with a minimum diameter of 9 ft. The overhead coal bunker for each boiler is divided by a reinforced concrete partition into two compartments to provide for storing and burning two kinds of coal. An overhead storage bin for ashes is provided, from which bin the cinders can be discharged by gravity into cars alongside of the building. A concrete dumping hopper is provided outside for dumping coal from cars. A pivot steel elevator raises and discharges the coal into the overhead bunker. A skip bucket, with electric hoist handles the ashes into the ash bin. The boiler units are 350 h.p. rating and are set in three batteries of two each. Five of the boilers are equipped with chain gratestokers. The sixth boiler has the shaking grates to burn shavings and other planing mill refuse. Space is also provided for three electrically driven air compressors each of a capacity of 1500 cu. ft. of free air per minute. Only two of these compressors are so far installed. Transformers and distributing panel are located in this building for transforming and distributing light and power current to the shop yard, freight car shop, planing mill, and coach repair shop. There is no direct current apparatus in this station. Provision has been made for two incoming 2200 volt lines, one of 2000 k.w. and the second of 1000 k.w. capacity for breakdown service. The steam required for the steam hammers and other shop purposes during the summer can be supplied by one boiler. The boiler capacity provided will afford one spare boiler during the extreme weather conditions when the maximum steam demand occurs.

A YARD CRANE runway, 1260 ft. long, extends from the west line of the locomotive shop and carries a 10 ton high speed traveling electric crane with 80 ft. span, serving the material yard and a portion of the storehouse platform and scrap dock.

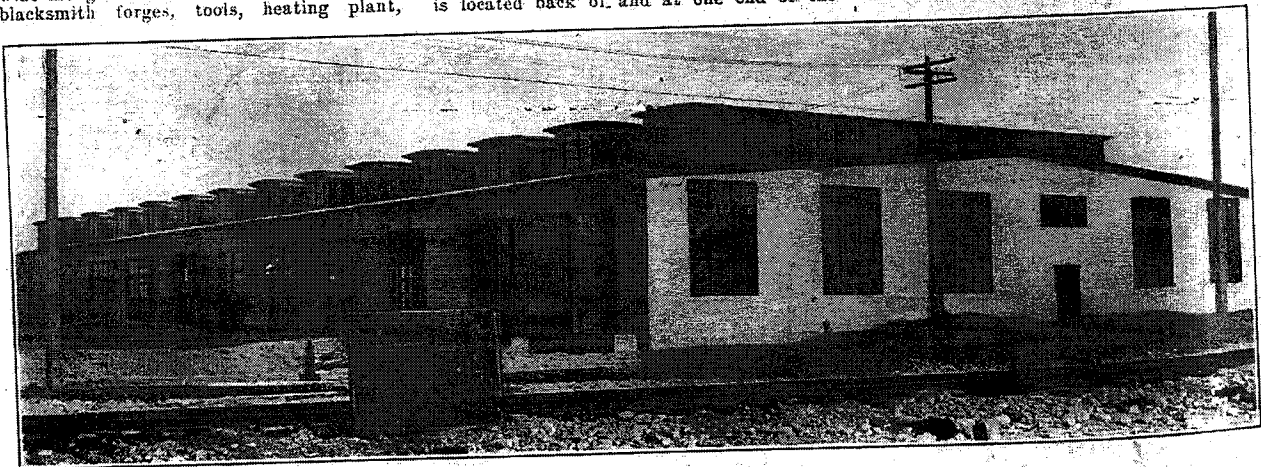


Interior of Locomotive Shops, Showing 120 Ton Locomotive Crane.

automatic sprinklers are provided. Toilets, lavatories, and conveniences for the men are also supplied in this shop.

THE FREIGHT CAR REPAIR SHOP is 231 by 303 ft. and contains eight repair tracks, spaced in pairs, with industrial track between each pair of repair tracks. A tile wall partitions off the shop, 50 ft. wide along one side, which will contain the blacksmith forges, tools, heating plant,

tion of the building is the same as that of other shop buildings. A track extends through the building longitudinally, to permit of movement of material in at one end to the various machines and out through the opposite end with the minimum amount of handling. The building is located so as to be convenient to the passenger car shop and the freight car shop. The lumber yard is located back of and at one end of the



Passenger Car Repair Shops, C.P.R. Ogden Shops.

foreman's office, toilets, and lavatories. The building is of structural steel frame with tile walls, plastered on the outside, with saw-tooth roof construction. The general construction of the building otherwise is the same as that of the other shop buildings. An overhead trolley beam is provided to permit of handling timbers with a trolley into the shop. Compressed air, steam, water, and fire

planing mill. Suitable piping has been provided for distributing compressed air and water. The fire protection system includes automatic sprinklers. Provision is made for toilets, lavatories, and metal lockers for the men employed in this department. Heating is by the indirect fan system with galvanized iron heating ducts. Lighting is by mercury vapor lamps.

THE BOILER HOUSE contains sufficient

One of the storehouse tracks extends through under this crane, resulting in giving ample space for the storage of material alongside of the storehouse, foundry and locomotive shop. By this arrangement heavy material can be unloaded, stored, and rehandled to the shop or loaded out again by the crane for shipment, practically eliminating manual labor in the handling of all heavy material.

MISCELLANEOUS STRUCTURES.—The

June, 1913.]

transfer table for serving the coach shop is 75 ft. long, of 150 tons capacity, equipped with electric motor, with concrete transfer table pit 400 ft. long, extending out far enough at either end of the building, for providing entrance and egress at both ends.

The mess building is 269½ ft. by 31 ft. 10 ins. of wooden frame construction, covered outside with sheathing, building paper and siding and sealed on the inside with metal sheathing. It has a concrete floor, and contains a dining room and lunch room for the workmen, and a dining room for the officials, together with kitchen and pantry. Sixty feet of the length of the building is carried up two stories to provide an apprentice schoolroom and quarters for the help. Heating is by the direct system and lighting with incandescent lamps.

There are also two small buildings located near the freight repair tracks for blacksmith shops and workmen tools, and in one of them is a small toilet and office. Dry kiln, material bins, plate and iron racks, coal and coke sheds, are also provided.

For obtaining water for shop purposes there have been put down two 8 in. wells equipped with electrically operated

The location of the shops is practically on the open prairie and on the beginning of construction arrangements had to be made to house and board on the shop property a considerable quantity of labor. To this end, frame bunk houses were built, with two tiers of bunks on each side of the building, eight bunks long, each house having a capacity of 32 men. Stoves were placed in the centre aisle, and benches along the sides of the lower tier of bunks. On the coming of summer, and as the labor forces were increased, some of the men were housed in standard 12 by 14 wall tents, which accommodated four men each. A large mess room and kitchen and store-room space was also fitted up with a capacity of feeding about 400 men at one time. Great care was exercised throughout the work, in keeping the camp in a sanitary condition. This work was largely under the direction of doctors, who visited the camp each day to take care of possible sickness, and an arrangement was also made whereby those who were employed on the work voluntarily contributed a small amount from their wages for the services of these doctors. This amount also includ-

work is considered, as also its distance from larger centres, it will be appreciated that a record for prompt performance has been established.

The work was designed and built in its entirety by Westinghouse, Church, Kerr & Co., consulting and constructing engineers, of New York and Montreal, working under the direction of J. G. Sullivan, M. Can. Soc. C.E., Chief Engineer, Western Lines C.P.R., and N. E. Brooks, M. Can. Soc. C.E., then Division Engineer, Calgary, now Engineer Maintenance of Way, Western Lines, C.P.R., Winnipeg.

Construction Work on the Canadian Northern Railway Eastern Lines.

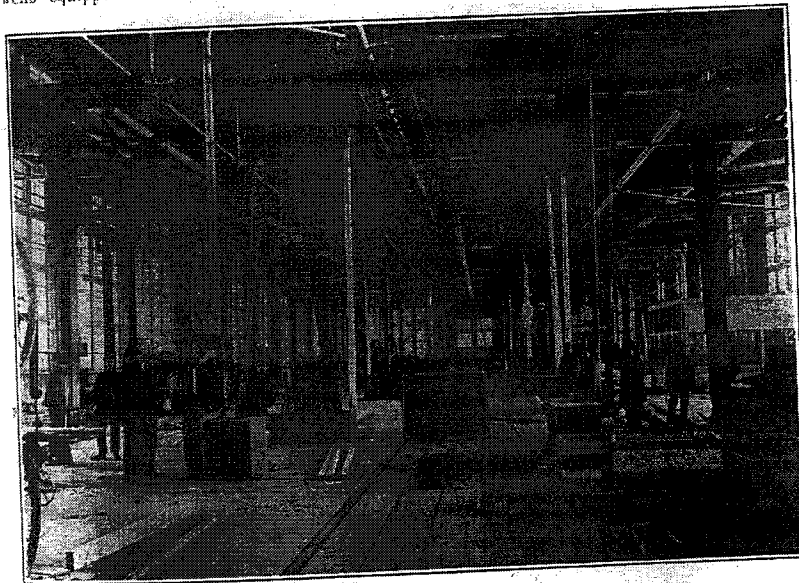
The tremendous amount of railway construction which has been carried on west of Lake Superior for many years past has possibly made many oblivious to the fact that there has also been a lot of work done east of Port Arthur. Only recently we have been given an opportunity of looking into the amount of work done on the Canadian Northern lines in Ontario during 1912.

At the commencement of work in 1912 there was a force of nearly 5,000 men and over 600 horses, which was gradually increased until July, when it reached an average of about 19,500 men and about 1,500 horses. From July to the end of the year the force gradually fell to an average of about 6,500 men and a little over 800 horses, or an average for the 12 months of nearly 7,500 men and over 1,000 horses. It was expected to keep the force up to an average of 8,500 men, but the Balkan war prevented this. The work in Eastern Ontario suffered more from the labor condition than any other part, this being particularly noticeable on the Ottawa-Sydenham line, which at no time was fully manned. The total outlay in wages was nearly \$6,000,000, or close on to \$500,000 a week.

The grading and trainfilling statistics show the following averages per mile in cubic yards:—Montreal-Hawkesbury line, 26,000; Ottawa-Capreol line, 28,081; Sudbury-Port Arthur line, 26,473, an average of 25,305 for all lines under construction. The heaviest district on the Montreal-Port Arthur line is between Pembroke and Capreol, which runs about 28,130 cu. yds. per mile. There were over 11,500,000 cu. yds. moved during the year, equivalent to about 447 miles of completed grade, or 1.5 miles of completed grade for every working day in the year.

Up to the end of the year the following grading had been done:—Montreal to Hawkesbury, 30%; Ottawa to Pembroke, 32½%; Pembroke to Capreol, 34%; Sudbury and Port Arthur, 62½%, or 50% of the whole line between Montreal and Port Arthur. The estimated amount of grading to complete the line between Montreal and Port Arthur is about 11,500,000 cu. yds. or a little less than was moved in 1912 on all the Quebec and Ontario lines. With ordinary labor conditions the grading of this line should be completed this year west of Capreol, but at the commencement of the present season's work there was considerably more grading and trainfilling to be done on the Pembroke-Capreol district than any other, and it may not be possible to complete it this year. There is probably over 4,000,000 cu. yards to move, of which over 300,000 is solid rock, this being about double what was moved in 1912.

During 1912 there was used on the eastern lines 6,250,000 ft. of pine lumber, 32,500 ft. of cedar, 36,909 cu. yds. of concrete and 4,290 tons of steel for bridges. There were 246 miles of main line track laid, equal to 0.82 miles per working day.



Interior of Planing Mill.

pumps. To supplement this supply and to provide a main source of supply for fire protection the City of Calgary has laid into the shop site, to a point midway the length of the main shop building on the west side, a 10 in. cast iron water main. The shop service and fire lines are connected on to this main and into a steel tank of 125,000 galls. capacity, which is erected on a 70-ft. steel tower, principally for use in connection with automatic sprinklers in the various buildings where these are installed. A complete fire protection system has been put in, with hydrants distributed about the shop yard.

The sewage system in the shop yard may be divided into the sanitary and storm sewers. The City of Calgary is furnishing the main sanitary sewer, beginning at the east line of the freight car shop and extending to the eastern boundary of the shop property. All the sanitary sewage lines from the various buildings are connected into this sewer. Storm sewers are provided, where necessary to carry off the roof water from the buildings where the roof construction is such that this cannot

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As there were no accommodations for men with families near the shops the C.P.R. put into temporary service a train to carry the men back and forth from Calgary and several hundred men used this train each day. This arrangement helped the situation considerably, especially as the season advanced and all kinds of skilled and unskilled labor became more difficult to obtain. A standing order was placed through several labor agencies in Calgary to send men daily to the job. As the work neared completion the bunk houses and mess houses previously mentioned were turned over to the railway company to take care of its own men who were at that time living in cars on the property. This, of course, released the cars and permitted their use at other points.

The progress schedule will show the prosecution of the work, but it should be pointed out that it was not possible to break ground until April 1, 1912, and by Mar. 17, 1913, the locomotive shop was in

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CANADIAN
NORTHERN
RAILWAY
LOCOMOTIVE
AND
CAR SHOPS
AT
WINNIPEG

Canadian Northern Railway Locomotive and Car Shops at Winnipeg.

By Frederick H. Moody, B.A. Sc.

The last issue of Canadian Railway and Marine World contained a very full description of the C.N.R.'s locomotive department at its Fort Rouge shops, Winnipeg. This present article completes the description of the entire shops:—

CAR DEPARTMENT.

The transfer table running east and west across the shop property forms the divisional line between the locomotive and car departments, and is the means by which the passenger cars are placed on the tracks running into the passenger car shop from the north, the cars coming on the transfer table from either the north or south over

handed, and also from the fact that the greater portion of the work can be handled in the open, more than two thirds of the shop grounds are occupied by the car department, as a survey of fig. 1 will indicate.

THE PASSENGER CAR SHOP, figs. 17 and 18, T. Hammill, Foreman, is the newest building of the group, the present freight car shop having until within a couple of years ago served the double duties of freight and passenger car shop. It is a brick structure, similar in general design to those of the locomotive department, 201 ft. long from north to south, and 154 ft. wide. In

The shop floor is planked throughout, with the surface shinned level with the top of the rail, and resting on 4 by 6 in. sleepers at 4 ft. centres. At a distance of 2½ ft. each side of the rails, there is embedded a 12 by 12 in. cedar jacking beam, centering directly under the side sills of cars for jacking up.

As fig. 18 shows, there is a convenient system of movable platforms attached to posts braced from the shop columns, for convenience in working on the sides of the cars. Every track in the shop has a similar set along each side.

The full width of a bay along the east

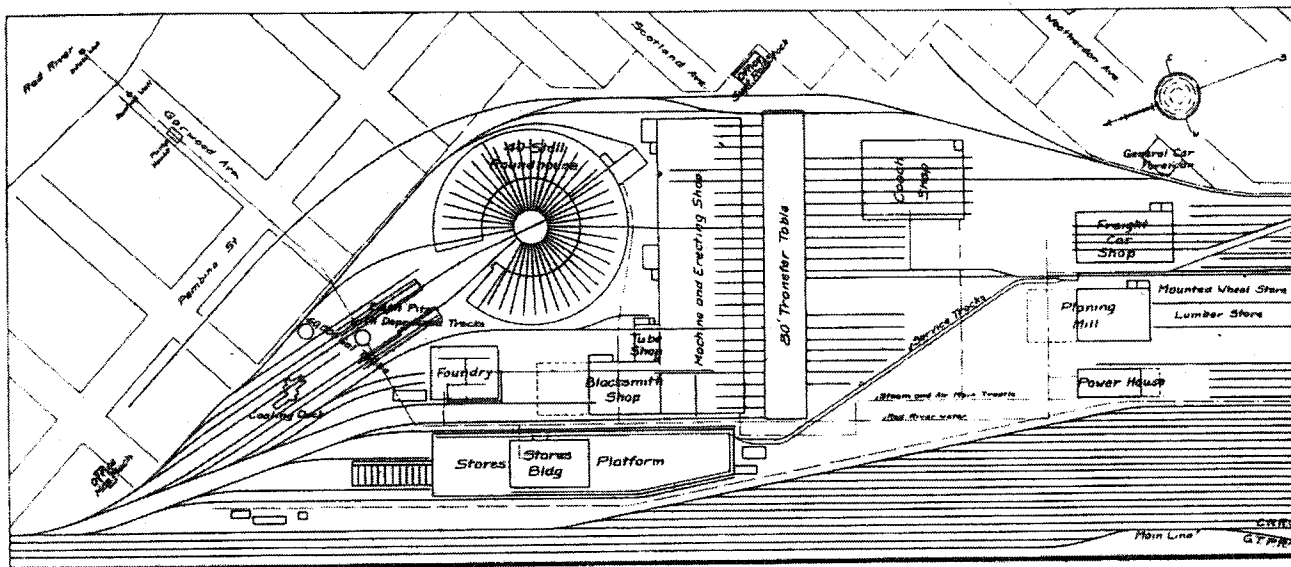


Fig. 1. Section 1.—Layout of C.N.R. Fort Rouge Shops—North End.

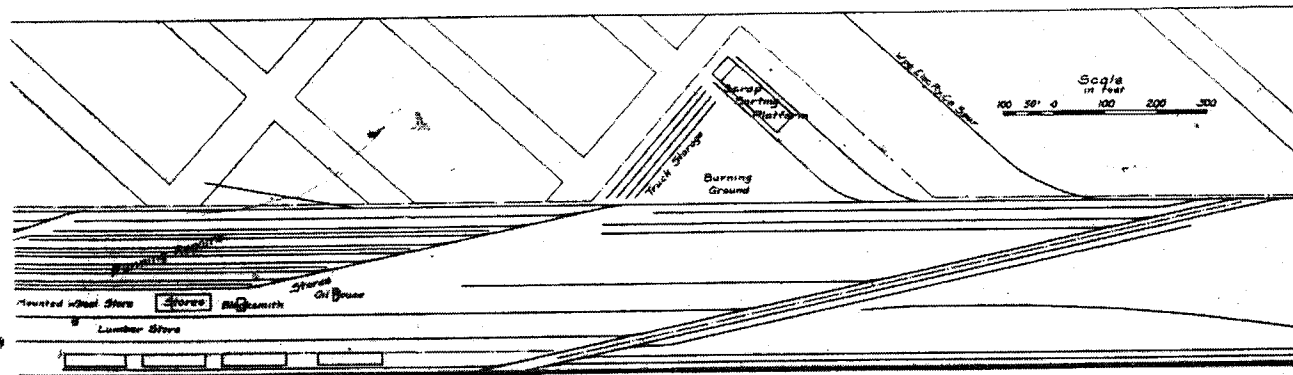


Fig. 1. Section 2.—Layout of C.N.R. Fort Rouge Shops—South End.

the through running track along the east side of the grounds. There are also five approach tracks into the car shop from the south, which allows of cars being placed in shop independent of the transfer table.

The General Car Foreman is A. McCowan, whose office is located in a central position at the foot of the next street south of the Superintendent of Rolling Stock's office, convenient to all parts of the car department buildings and grounds. The build-

ing, there are seven 22 ft. bays, all but the east having a through track. Over all but the outer bays there is a skylight 132 by 12 ft., located centrally over the roof, which slopes from the centre, north and south, from a clear height inside of 27 ft., to one of 20 ft. at the end walls. There are five rows of steel columns down the length of the building, built up of two 8 in. channels and two 10 by ¼ in. plates supporting 9 in. cross I beams, between which are 20 in. I beams carrying the roof string-

side of the shop, there has just been completed a gallery at a height of about 10 ft., carried on 12 in. I beams from column to column, and across from the columns to the east wall. The gallery is approached from either end by stairs.

Commencing from the south, along the east wall of the shop, there is first a walled in room for the lavatory. Along the outside of the north wall of this room, one of the gallery stairs is located, and backing against these stairs is a sash rack, with a

JANUARY 1913

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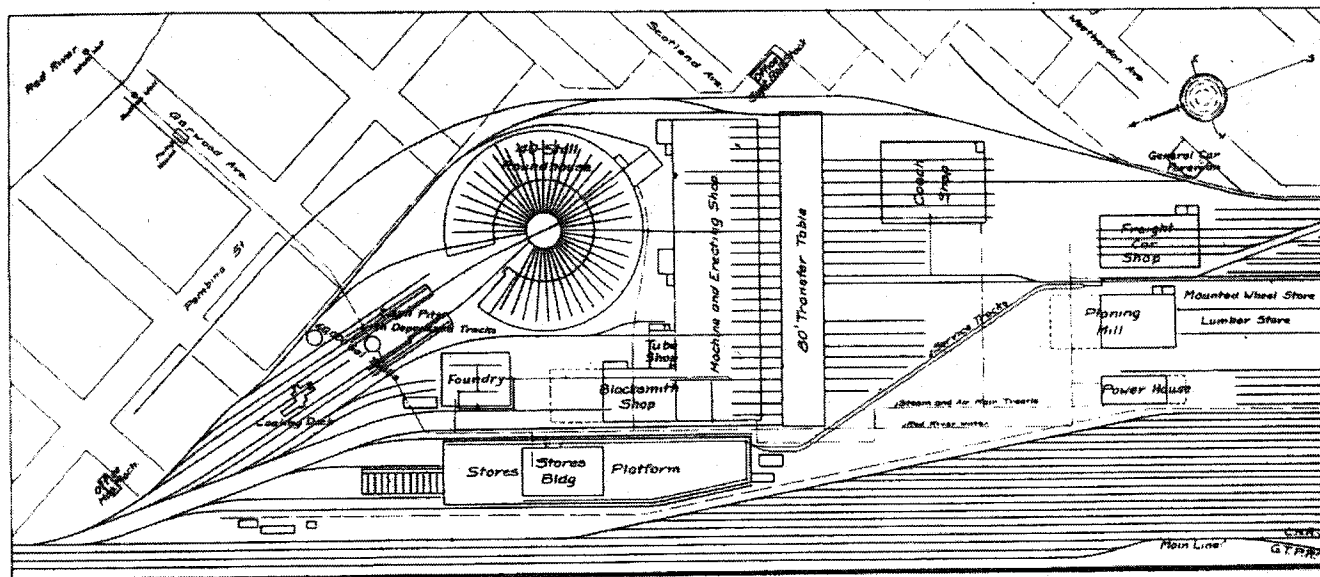


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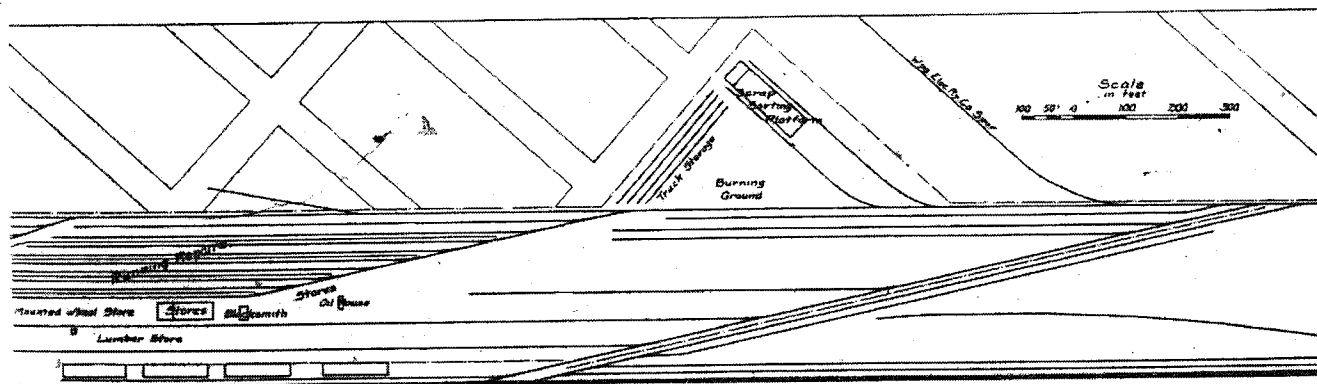


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The General Car Foreman is A. McCowan, whose office is located in a central position at the foot of the next street south of the Superintendent of Rolling Stock's office, convenient to all parts of the car department buildings and grounds. The buildings in the car department group comprise the passenger car shop, freight car shop and planing mill, in addition to the several small buildings at the south end of the grounds, made use of by those working on the freight car repair tracks. From the nature and greater volume of the work

width, there are seven 22 ft. bays, all but the east having a through track. Over all but the outer bays there is a skylight 132 by 12 ft., located centrally over the roof, which slopes from the centre, north and south, from a clear height inside of 27 ft., to one of 20 ft. at the end walls. There are five rows of steel columns down the length of the building, built up of two 8 in. channels and two 10 by 1/4 in. plates supporting 9 in. cross I beams, between which are 20 in. I beams carrying the roof stringers. The steel columns are carried on step concrete footings, 6 1/2 ft. deep and 5 ft. square at the base, the wall abutments at the corresponding points extending to the same depth, with a width at base of 4 ft. 5 ins., and a length of 10 ft. 2 ins.

side of the shop, there has just been completed a gallery at a height of about 10 ft., carried on 12 in. I beams from column to column, and across from the columns to the east wall. The gallery is approached from either end by stairs.

Commencing from the south, along the east wall of the shop, there is first a walled in room for the lavatory. Along the outside of the north wall of this room, one of the gallery stairs is located, and backing against these stairs is a sash rack, with a similar rack parallel to it a few feet further along. Between these two sash racks are five benches for finishing work, such as pumice stoning and varnishing the sashes, which on completion are slipped into the racks mentioned. This section of the shop

along to the side door has a cement floor, with a moulded gutter along the wall for draining off the cleaning water.

North of the sash finishing section is the glaziers' department, provided with a 20 compartment glass rack, carrying all sizes of standard glass. One end of the glass rack forms a trimming table. Along towards the door against the wall there is a double 8 by 3½ ft. vat for washing and

for carpenter and pipe work, and in addition there are several movable benches, which can be moved about to the most convenient point with regard to the work. A service track runs across the shop at the centre from the side door, over which the material from the stock piles and stores department can be brought into the shop.

The upholstering department occupies the greater portion of the new gallery along

tions; 5 by 3 ft. lye vat; 20 gal. acid jar; and a 30 gal. potash jar. There are also work benches and a deep storage rack for finished and unfinished work.

The heating system of the whole shop corresponds to that of the other shops, there being 16 coils of 1½ in. pipe, banked along all sides between the doors and windows. Live steam is brought to the passenger car shop through a 6 in. main, paralleling that to the locomotive shop, part of the way, and branching off at right angles to the passenger car shop as shown in fig. 1, coming into the latter at the southwest corner of the building. The condensation from the building heating system drains into a vacuum pump in a pit at the northeast corner of the building, the water being elevated thereby to a storage tank in a skylight, from which it is drawn off as desired for the washing and scouring requirements. Air is supplied the shop through a 2 in. main from the power house, paralleling the steam main.

The possibility of passenger car shop expansion is well shown by an inspection of the grounds plan, fig. 1. An extension to three times its present size is possible by knocking out the west wall and extending in that direction. Such a course is at present in contemplation.

THE FREIGHT CAR SHOP. T. A. Nelson, Foreman, to the south of the passenger car shop, as will be noted in the plan, fig. 1, is 192 by 100 ft., similar in design in most particulars to the passenger car shop, the freight car shop having served as the passenger car shop before the latter was constructed, as previously noted. Fig. 20 is a plan of the shop, and figs. 21 and 22, views along the south and east walls respectively, from the cab department in the southeast corner of the building.

There are three longitudinal bays in the shop, each 33 ft. 4 ins. wide, down the central one of which there are two tracks leading in from the north of the building, and one in each of the side bays, alongside the bay dividing walls, leaving a clear space along the side walls of the building for the machinery and work benches.

The walls and columns are carried on step footings at a depth of 6 ft., the bottom step of those at the wall being 4 ft. 8 ins. wide, and for the columns, 5 ft.

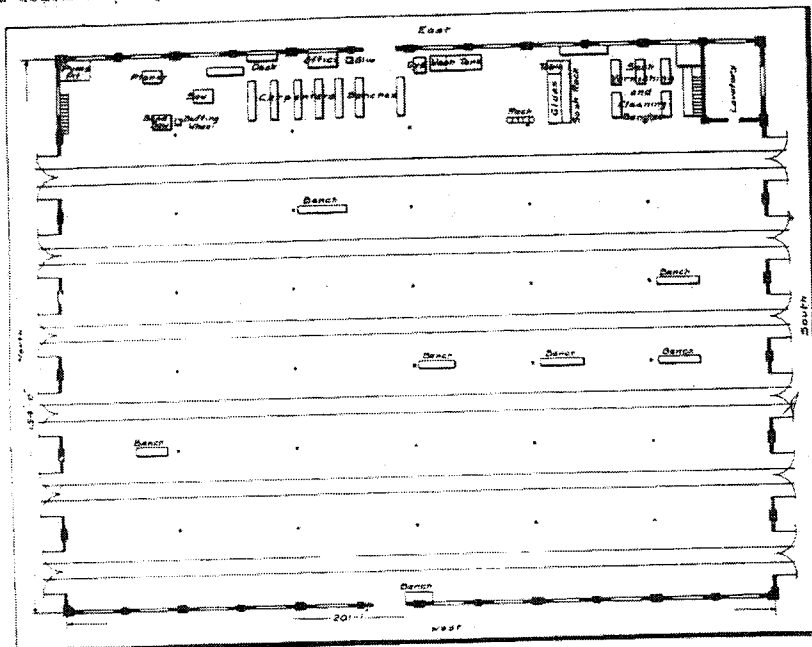


Fig. 17 - Interior Layout and Machine Distribution in Passenger Car Shop.

scouring window sashes, doors, etc., preparatory to pumice stoning and varnishing. This vat has steam and water connections for providing warm scouring water. The vat adjoining, beside the door, is a tank 2½ by 3½ ft. and is used for dyeing cushions, covers, and such other material that requires renovating. This vat is also provided with hot and cold water connections.

On the east side, this department having been recently moved from a smaller gallery in a corner of the freight car shop, which, as previously mentioned, was formerly the passenger car shop. The new location provides much needed additional space. The department is provided with all the usual car upholstering shop equipment, and is located in a good position for the convenient handling of the work.

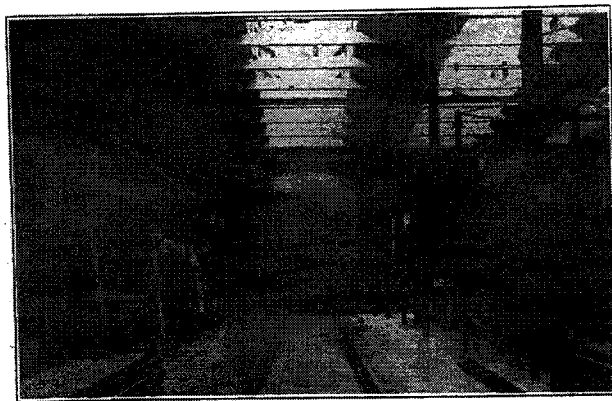


Fig. 18 - Arrangement of Track in Passenger Car Shop.

The foreman's office adjoins the side door of the building, and opposite this office is a row of seven carpenters' benches for car work. The passenger car shop woodworking department is at the north end, and contains a circular saw, planer, bandsaw, and buffing wheel, all operated from shaft-

The north end of the gallery, with a separate stairway leading thereto, houses the dipping department. Owing to the nature of the work, that portion is provided with a cement floor, which will hold the drippings. This department has a steam heated lacquer oven 6 ft. long, 2½ ft. deep, and

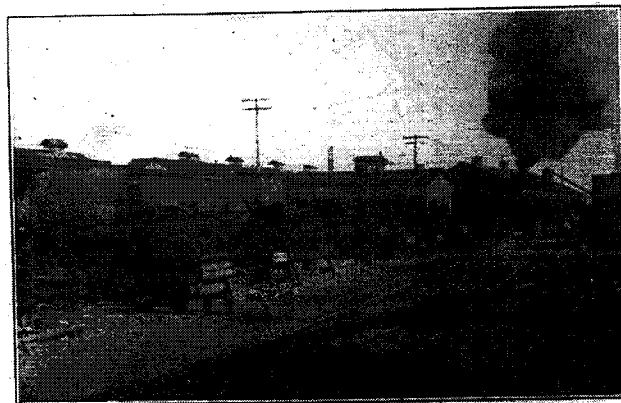


Fig. 19 - Freight Car Repair Track Buildings and Stores.

square, of concrete. The brick walls are 16 ins. thick, and contain windows of ample proportions to give a well lighted interior, in conjunction with six cross skylights in size, 48 by 12 ft., located at 24 ft. centres, centrally in each of the 8 sections into which the shop is divided, excepting the end

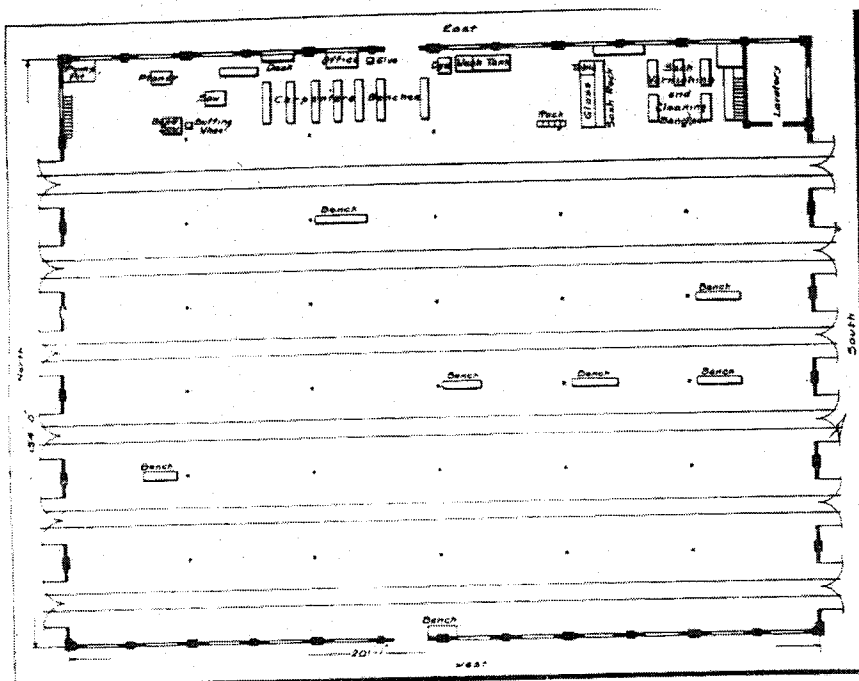


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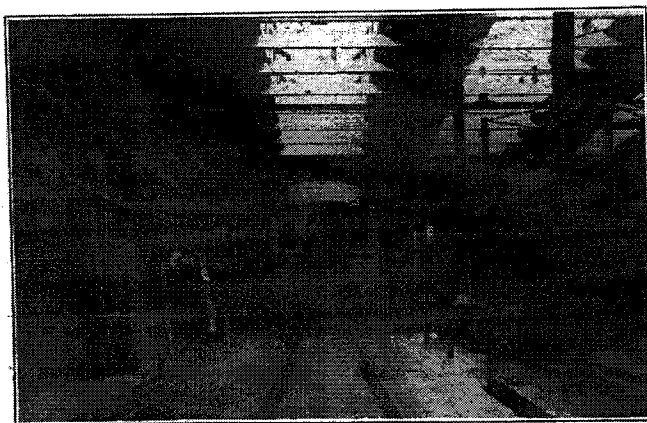


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The foreman's office adjoins the side door of the building, and opposite this office is a row of seven carpenters' benches for car work. The passenger car shop woodworking department is at the north end, and contains a circular saw, planer, bandsaw, and buffing wheel, all operated from shafting below the floor, driven by a 15 h.p. motor, which is also under the floor.

At different points in the shop, between the tracks, there are permanent benches

The north end of the gallery, with a separate stairway leading thereto, houses the dipping department. Owing to the nature of the work, that portion is provided with a cement floor, which will hold the drippings. This department has a steam heated lacquer oven 6 ft. long, $2\frac{1}{2}$ ft. deep, and 4 ft. high; an oxidizing barrel; a 20 gal. jar of spent acid for preliminary pickling of new brass; three compartment washing tank, fitted with steam and water connec-

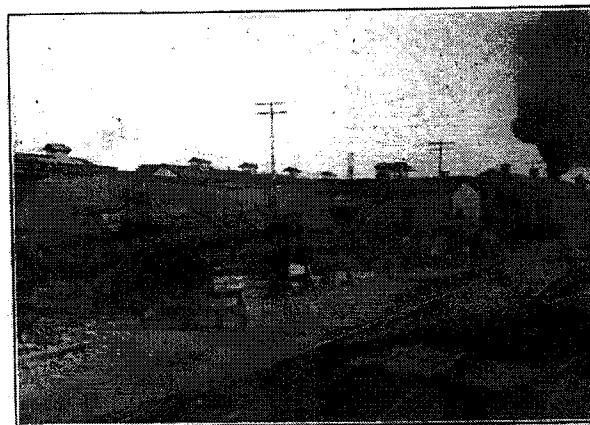


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passenger car shop as shown in fig. 1, and into the latter at the southwest corner of the building. The condensation of the building heating system drains in vacuum pump in a pit at the north corner of the building, the water being vated thereby to a storage tank in a light, from which it is drawn off as sired for the washing and scouring requirements. Air is supplied the shop thru a 2 in. main from the power house, passing the steam main.

The possibility of passenger car shop expansion is well shown by an inspection of the grounds plan, fig. 1. An extension three times its present size is possible knocking out the west wall and extending in that direction. Such a course is at present in contemplation.

THE FREIGHT CAR SHOP. T. A. Foreman, to the south of the passenger car shop, as will be noted in the plan, is 192 by 100 ft., similar in design in particulars to the passenger car shop freight car shop having served as the passenger car shop before the latter was constructed, as previously noted. Fig. 2 plan of the shop, and figs. 21 and 22, along the south and east walls respectively from the cab department in the southeast corner of the building.

There are three longitudinal bays in the shop, each 33 ft. 4 ins. wide, down the central one of which there are two tracks running in from the north of the building one in each of the side bays, alongside bay dividing walls, leaving a clear aisle along the side walls of the building for machinery and work benches.

The walls and columns are carried on step footings at a depth of 6 ft., the bottom step of those at the wall being 8 ins. wide, and for the columns,

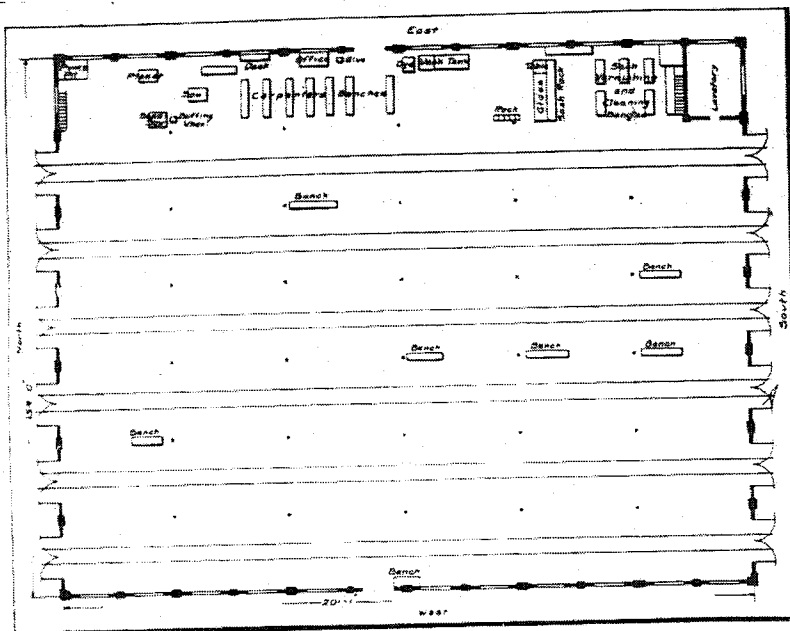


Fig. 17—Interior Layout and Machine Distribution in Passenger Car Shop.

scouring window sashes, doors, etc., preparatory to pumice stoning and varnishing. This vat has steam and water connections for providing warm scouring water. The vat adjoining, beside the door, is a tank $2\frac{1}{2}$ by $3\frac{1}{2}$ ft., and is used for dyeing cushions, covers, and such other material that requires renovating. This vat is also provided with hot and cold water connections.

On the east side, this department having been recently moved from a smaller gallery in a corner of the freight car shop, which, as previously mentioned, was formerly the passenger car shop. The new location provides much needed additional space. The department is provided with all the usual car upholstering shop equipment, and is located in a good position for the convenient handling of the work.



Fig. 18—Arrangement of Track in Passenger Car Shop.

The foreman's office adjoins the side door of the building, and opposite this office is a row of seven carpenters' benches for car work. The passenger car shop woodworking department is at the north end, and contains a circular saw, planer, bandsaw, and buffing wheel, all operated from shafting below the floor, driven by a 15 h.p. motor, which is also under the floor.

At different points in the shop, between the tracks, there are permanent benches

The north end of the gallery, with a separate stairway leading thereto, houses the dipping department. Owing to the nature of the work, that portion is provided with a cement floor, which will hold the drippings. This department has a steam heated lacquer oven 6 ft. long, $2\frac{1}{2}$ ft. deep, and 4 ft. high; an oxidizing barrel; a 20 gal. jar of spent acid for preliminary pickling of new brass; three compartment washing tank, fitted with steam and water connec-

and branching off at right angles to the passenger car shop as shown in fig. 1, coming into the latter at the southwest corner of the building. The condensation from the building heating system drains into a vacuum pump in a pit at the northeast corner of the building, the water being elevated thereby to a storage tank in a skylight, from which it is drawn off as desired for the washing and scouring requirements. Air is supplied the shop through a 2 in. main from the power house, paralleling the steam main.

The possibility of passenger car shop expansion is well shown by an inspection of the grounds plan, fig. 1. An extension to three times its present size is possible by knocking out the west wall and extending in that direction. Such a course is at present in contemplation.

THE FREIGHT CAR SHOP. T. A. Nelson, Foreman, to the south of the passenger car shop, as will be noted in the plan, fig. 1, is 192 by 100 ft., similar in design in most particulars to the passenger car shop, the freight car shop having served as the passenger car shop before the latter was constructed, as previously noted. Fig. 20 is a plan of the shop, and figs. 21 and 22, views along the south and east walls respectively, from the cab department in the southeast corner of the building.

There are three longitudinal bays in the shop, each 33 ft. 4 ins. wide, down the central one of which there are two tracks leading in from the north of the building, and one in each of the side bays, alongside the bay dividing walls, leaving a clear space along the side walls of the building for the machinery and work benches.

The walls and columns are carried on step footings at a depth of 6 ft., the bottom step of those at the wall being 4 ft. 8 ins. wide, and for the columns, 5 ft.

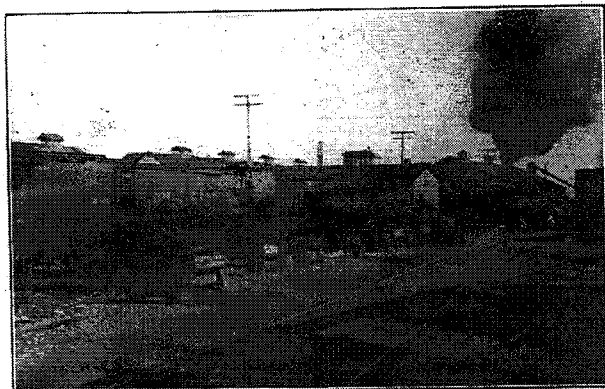


Fig. 19.—Freight Car Repair Track Buildings and Stores.

square, of concrete. The brick walls are 16 ins. thick, and contain windows of ample proportions to give a well lighted interior, in conjunction with six cross skylights in size, 48 by 12 ft., located at 24 ft. centres, centrally in each of the 8 sections into which the shop is divided, excepting the end ones.

The roof columns are of steel, built up of two 8 in. channels and two 10 by $\frac{1}{4}$ in. plates, the clear height under the centre

may cross beams being 22 ft., the side bay beams sloping off to a height of 20 ft. The cross beams are 20 in. channels, on which rest the roof stringers. The slope of the roof is uniform, from the centre over the middle bay to the outer edge of the building.

The store room for the car department is in the small building adjoining the shop, at the southeast corner, the structure having originally been intended for the fan room, when the original intention had been to have the shops air heated. Adjoining

ground being for the storage of sash, etc., while undergoing refinishing by the cabinet makers. The work is brought from the passenger car shop and returned on completion.

Further along the east wall of the shop, in the northeast corner of the building, is the tinmith shop, where all the tinwork for both the car and locomotive departments is handled. The larger tools here found include shears and sheet bender, and on the edges of the hexagonal table shown are the smaller tinworking tools to be found

shop, as shown in fig. 20 and the background of fig. 21. To the north of the entry door in the west wall there is an axle lathe, and on the other side of the doorway an hydraulic wheel press. Next to this is an emery wheel, and in the corner a car wheel boring mill. This equipment, provided with the two jib cranes, is in a position to handle to good advantage large quantities of wheels, both for repair work and renewals.

The mounted wheel storage tracks, of which there are three, about 300 ft. long, are located to the south of the mill, which is directly to the west of the freight car shop. Wheels from, and to these tracks pass into the freight car shop through the side door, the practice being to keep one track for mounted wheels that need renewal, and the other two for wheels that are ready for shipment or use in the shop. The convenient location of the wheel storage tracks to the freight car shop is apparent. A large part of the wheel renewal work is done directly, without the use of the wheel storage tracks. The car carrying the mounted wheels to the freight car shop from outside points on the system, for renewal, is brought up alongside the freight car side door on the track running down through the yards, where a yard crane, on a track adjoining, lifts them off to the planked space outside the door, and they can then be run into the shop without first placing in the storage space.

The freight car shop, on its four tracks, only has a capacity of about 15 cars, mostly for heavy repairs, rebuilding, and new rolling stock, such as cabooses, which the company builds in its own shops. The majority of the repairs are handled in the running repair, or rip tracks, directly to the south of the freight car shop. Here there are 8 tracks about 1,200 ft. long. These yards are under the charge of P. A. Musgrave, Foreman.

By a system devised by Mr. McGowan, the rip tracks are divided into sections, with different nature of repairs allocated to each. The nature of the repairs is divided into three general groups—heavy, medium and light—the car inspector in the receiving yards looking over the cars as they come into the yards, and labelling them with

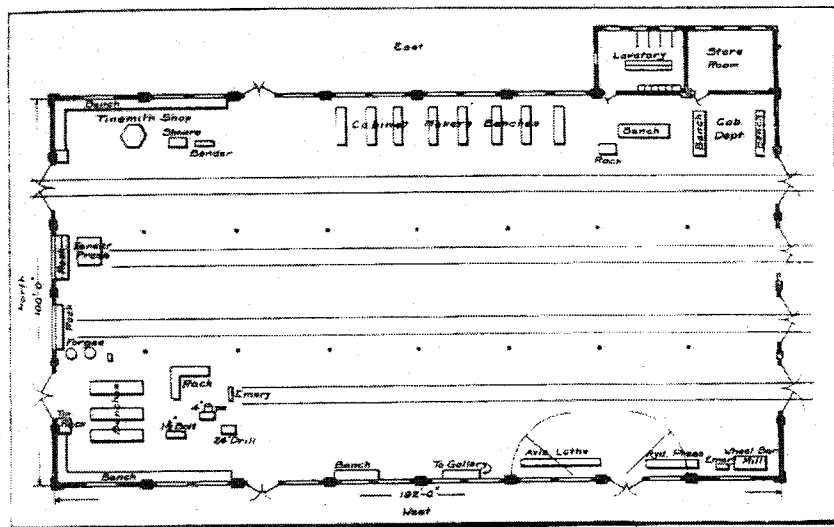


Fig. 20.—Interior Arrangement of Freight Car Shop.

this building, in a room of similar size, is located the lavatory, with the usual conveniences.

The cab department occupies the southeast corner of the building. All the cabs now made on the C.N.R. are standard in design, and the parts, as made up in the mill, are assembled here into the completed cabs, which are stored just outside the shop, along the south boundary fence of the grounds, where they are conveniently located for loading on flat cars on the through

in well equipped shops. All repairs to such parts as headlights, etc., are here handled.

In the northwest corner of the building is the car pipe fitting department, equipped with a 4 in. pipe machine, a 24 in. drill, 1½ in. bolt machine and an emery wheel. On the benches in the department are the various pipe tools required, and the benches are also fitted with pipe vises and ordinary vises. There are also two forge fires and an anvil for light forgings and bent pipe work. The rack, centrally situated in the



Fig. 21.—South Side of Freight Car Shop.

running track, for removal to divisional points. The benches in the cab department are for fitting, one cab at a time being assembled in the space between these two benches.

department, carries the necessary pipe stock. Over this northwest section of the shop there is a small gallery to be seen in the left background in fig. 22, and approached by a stairway along the side of the west



Fig. 22.—East Side of Freight Car Shop.

cards bearing in large red letters, H, M, or L, the yard locomotive switching the cars on their respective tracks at night, everything being in readiness on the commencement of work in the morning.

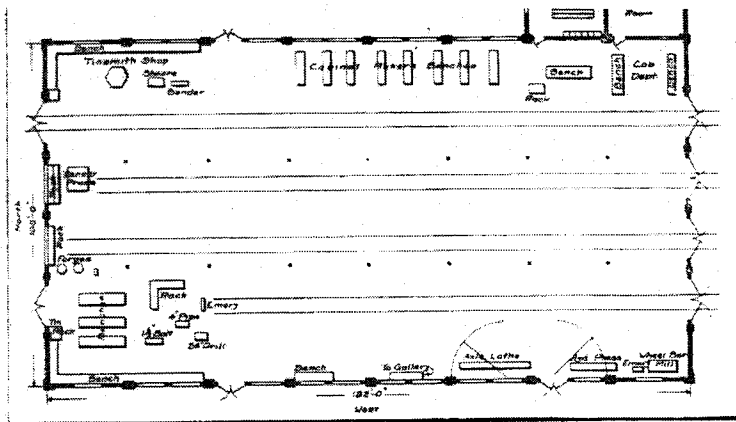


Fig. 20.—Interior Arrangement of Freight Car Shop

this building, in a room of similar size, is located the lavatory, with the usual conveniences.

The cab department occupies the south-east corner of the building. All the cabs now made on the C.N.R. are standard in design, and the parts, as made up in the mill, are assembled here into the completed cabs, which are stored just outside the shop, along the south boundary fence of the grounds, where they are conveniently located for loading on flat cars on the through

in well equipped shops. All repairs to such parts as headlights, etc., are here handled.

In the northwest corner of the building is the car pipe fitting department, equipped with a 4 in. pipe machine, a 24 in. drill, 1½ in. bolt machine and an emery wheel. On the benches in the department are the various pipe tools required, and the benches are also fitted with pipe vises and ordinary vises. There are also two forge fires and an anvil for light forgings and bent pipe work. The rack, centrally situated in the

side door, the practice being to keep one track for mounted wheels that need renewal, and the other two for wheels that are ready for shipment or use in the shop. The convenient location of the wheel storage tracks to the freight car shop is apparent. A large part of the wheel renewal work is done directly, without the use of the wheel storage tracks. The car carrying the mounted wheels to the freight car shop from outside points on the system, for renewal, is brought up alongside the freight car side door on the track running down through the yards, where a yard crane, on a track adjoining, lifts them off to the planked space outside the door, and they can then be run into the shop without first placing in the storage space.

The freight car shop, on its four tracks, only has a capacity of about 15 cars, mostly for heavy repairs, rebuilding, and new rolling stock, such as cabooses, which the company builds in its own shops. The majority of the repairs are handled in the running repair, or rip tracks, directly to the south of the freight car shop. Here there are 8 tracks about 1,200 ft. long. These yards are under the charge of P. A. Musgrave, Foreman.

By a system devised by Mr. McGowan, the rip tracks are divided into sections, with different nature of repairs allocated to each. The nature of the repairs is divided into three general groups—heavy, medium and light—the car inspector in the receiving yards looking over the cars as they come into the yards, and labelling them with

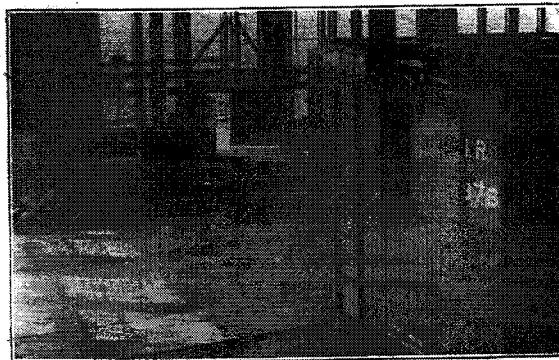


Fig. 21.—South Side of Freight Car Shop.

running track, for removal to divisional points. The benches in the cab department are for fitting, one cab at a time being assembled in the space between these two benches.

As a reminder of the time when the passenger car work was also handled in this shop, there is a row of 8 cabinet makers' benches along the east wall, where all the passenger car cabinet work is still handled, owing to lack of space in the passenger car shop. These benches are shown along the right edge of fig. 22, the rack in the fore-

department, carries the necessary pipe stock.

Over this northwest section of the shop there is a small gallery to be seen in the left background in fig. 22, and approached by a stairway along the side of the west wall. This gallery formerly contained the upholstering department, which has since been moved to the new gallery in the passenger car shop as mentioned before. Its future use will probably be for storage purposes.

The wheel and axle department occupies the whole of the southwest corner of the



Fig. 22.—East Side of Freight Car Shop.

cards bearing in large red letters, H, M, or L, the yard locomotive switching the cars on their respective tracks at night, everything being in readiness on the commencement of work in the morning.

Between every second rip track there is a narrow gauge service track, similar to that in use in the locomotive department. These service tracks lead on to a common ladder at the north end, passing along between the freight car shop and mill, crossing over the yard track between the buildings by means of two small turntables,

the service track being double tracked from that point across the space intervening between the locomotive and car departments, to the stores building, from which all the stores required by the car department are brought across with the least effort, and placed where required in the rip track yard.

Along the south side of the rip track yard are the various buildings belonging to that section of the work. This includes a combined stores and office building, blacksmith shop and oil house, as shown in fig. 19. The stores building carries all the local

term there are spotted several cars on which the different materials are loaded as sorted; each separate material on its own car, simplifying the operation of sorting scrap, and making it unnecessary to re-handle after sorting. In a small building at the north end of the platform are housed a bolt threader and shears for reclaiming bolts and cutting up scrap.

To the west of the platform, on an open piece of ground, is located the burning ground, where wrecked parts of cars are burnt away from iron members which it is desired to separate for the scrap piles.

tion being to the north, as shown in fig. 1. While this addition increases the length 96½ ft., there is still ample room for an increase in length of more than double the new length.

The interior arrangement of the machine tool equipment has been well thought out. It will be observed that the heavier equipment is along the west side of the shop and the lighter along the east side, with the machinery arranged in each case to form a steady forward movement from the south to the north end of the shop. Take, for instance, the path of car sills as they enter from the south; after laying out just inside the south door on the west side, they pass first to the swing cut off saw, from which, on a roller carriage track, they pass to the hollow chisel and the gainer, coming out completed as far as the principal operations are concerned.

Near the entry door there is a resaw, beyond which there is a timber dresser, fed from a standard gauge track leading in from the south end of the shop from the timber storage piles, located to the south of the shop in the position shown in fig. 1. The finished lumber is drawn off on a service track leading out from the north end of the building.

The other machinery in the building is arranged in the best possible manner to give a good layout. The balance of the equipment is as follows: Shaper, cut off saw, mortise machine, veneer cramps, boring machine, pony planer, universal saw, jointer, band saw, lathe, sander, chain mortiser, mortise machine, band saw, jig saw, tenon machine, sash sticker, shaper tenon machine, planer, mortise machine, sticker, circular saw, single head planer, jointer, double planer, circular feed saw, circular saw, general saw, matcher, sticker, boring machine and saw. These are given in the order in which they appear, proceeding along the west side from the south, and thence around the shop. In the southeast corner of the shop is a small building adjoining, where the saws are kept in repair, the room being equipped with various saw sets and filing machines. The pattern shop is arranged in a gallery in the northeast

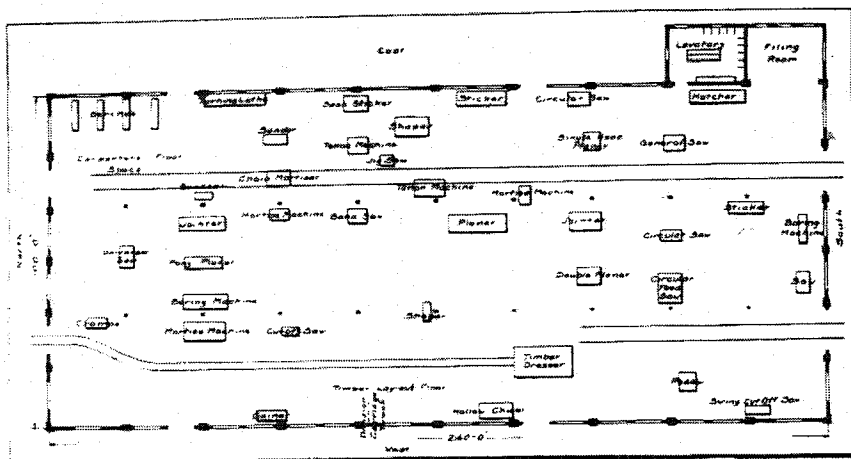


Fig. 23.—Interior Layout and New Machine Distribution in Mill.

stores for the rip tracks, drawing from the main stores. The blacksmith shop is, of course, quite small, and handles only light work, such as repairing bent truss rods, etc. Along the ladder track in front of the oil house, as shown in the foreground in fig. 19, there are racks for carrying the larger car stores, including brake beams, and similar members. Reclaimed parts from the scrap sorting yard are also brought here if they appear to be within easy repair, and put in shape by the local blacksmith.

To the north of this are four tracks, on which are stored the trucks reclaimed from wrecks, the missing members for which are here fitted from less serviceable trucks, a considerable store being accumulated from time to time, which prove of value in car repair work, and in the building of certain new cars, such as cabooses.

THE PLANING MILL. J. E. M. Firby, Foreman, is located in the building directly to the west of the freight car shop, as shown in fig. 1. In common with the other shops of the plant, it has become so over-

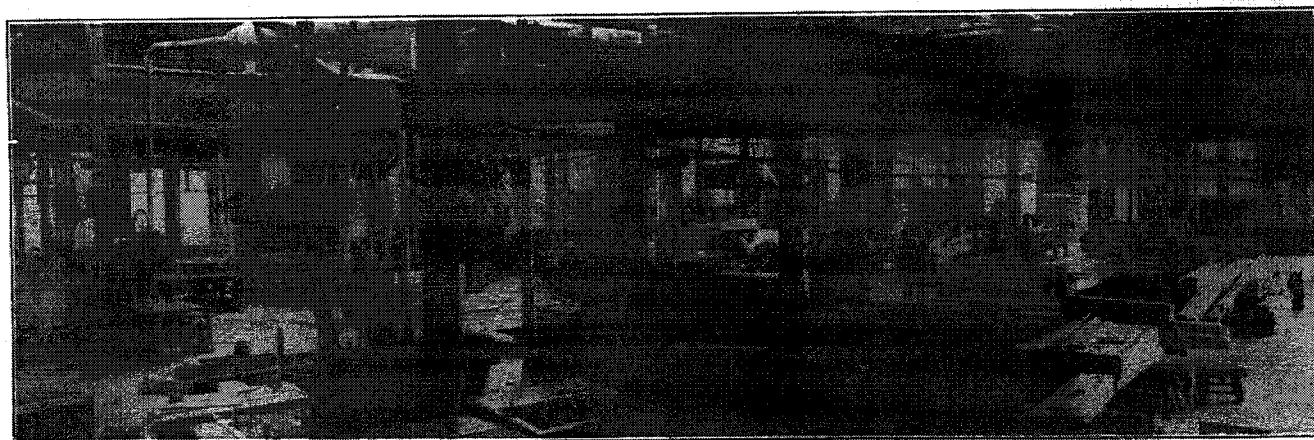


Fig. 24.—Interior of Mill, showing Old Arrangement.

All the wrecked cars and scrap car stock of all kinds, as brought in from the line on flat cars, is sorted over in a special yard at the southerly end of the grounds. Two tracks lead into this section from the easterly running track, on the southern one of which the flat cars carrying the wrecked material are placed. Between the two tracks is a platform at the car level, on which the scrap material is unloaded from the cars, and sorted there, the scrap

crowded that an extensive addition has recently been added. The plan of the shop, as extended with the proposed arrangement of the machine equipment, is shown in fig. 23; the interior arrangement prior to the addition, is to be seen in fig. 24, in which the crowded nature of the interior is shown.

The construction of the shop is identical in all details with the blacksmith shop, and has just had an addition of 35 ft. 2 ins. description of which was given earlier, and added for a further power reserve.

POWER HOUSE.

This is the building directly to the west of the planing mill, and is in charge of J. A. Fraser, Chief Engineer, Power House. It is 162½ ft. by 54 ft. 4 ins., divided into two separate rooms, the front one of which contains the power units, and the other, fig. 25, contains the boilers. This latter room has just had an addition of 35 ft. 2 ins. description of which was given earlier, and added for a further power reserve.

of a brick construction throughout, except that its narrowness makes unnecessary the use of steel columns and the division of the building into bays. The walls are all carried on step footings at a depth of 6 ft., some of which are 4 ft. 11 in. wide, and the others 5 ft. 11 in., the latter for the outer wall abutments, and the other for the dividing wall.

Electrical power is used entirely throughout the plant, and is obtained from the Winnipeg Electric Ry. Co., which generates it at a hydro-electric development at Lac du Bonnet on the Winnipeg river. The power is delivered at 2,200 volt, 60 cycle, 3 phase alternating current to the power house of the railway shops, where it has to be transformed for general use in the shops.

Along the east wall of the power house are three 60 cycle, 150 k.w. transformers, that step the power down to 600 volts for transmission throughout the shops for the group and constant speed machine drives. Adjoining this battery of transformers is a 19 k.w. potential regulator. Along the north wall is a motor generator set, with a capacity of 80 k.w., receiving power in the induction motor end direct from the power line at 2,200 volts a.c., and delivering the same at 250 volts, d.c., for trans-

mission through the shops for the variable speed individual drives. This motor generator set is shortly to be duplicated, as the increased demands on the single set are exceeding the capacity. The electrical equipment is all controlled from the 7 panel switchboard to the rear in fig. 25.

In rear of the motor generator set is located a 20x30x17x28 in. air compressor, handling 2,000 ft. of free air per minute, and delivering it at a pressure of about 110 lbs. This compressor being now overtaxed has made necessary the addition of a similar unit, which will shortly be added in an addition to the north end. The only other equipment in the compressor room, other than the oil tanks, are two small fan engines on a platform along the dividing wall of the building, driving the fans in the boiler room.

The long room to the rear of the compressor room, shown in fig. 25, is the boiler room. In it are six 250 h.p. Canada water tube boilers, and a seventh is being installed in the boiler room addition at the far end of the room, which it will be noticed in fig. 25, has only a temporary wall. Each boiler connects through a looped 7 in. pipe from the top of the boiler to a 15 in. header near the top front of the boiler, as in fig. 25, which leads into the compressor room, the connections to the other buildings leading out along the elevated trestle, work before mentioned, except the one to

be seen to the rear in fig. 25. The coal storage for the boilers is in the bins shown on the left in fig. 25, coal being brought to the building on the track along its east side, as shown in fig. 1, being thrown into the covered bins along the inside of the building, in no way exposing the interior to the cold of the outside. The bins are about 10 ft. deep and are 6 ft. high, holding about 100 tons. In fig. 24, it will be noticed that there are the usual suction pipes for drawing off the shavings from the various machines. These pipes all lead to a suction fan on the power house side of the mill, the pipe from there slanting up at an angle of about 45 degrees to a point over the coal bins, where the shavings drop into a suspended bin, from which they are fired into the first two boilers in the boiler room. These two boilers are equipped for firing both the shavings and coal.

Forced draft is employed, with two 12 ft. fans on a platform at the north end of the boiler room, driven by the two fan engines mentioned before, discharging through a short 6 ft. smoke jack through the roof over top. Back of the boilers, and above the common smoke header, there are two Green fuel economizers with a combined capacity of about 1,000 h.p., so ar-

range that they can be by passed from the smoke header, causing the smoke draft to pass through at will.

There are two supplies of water—city and Red river. The Red river supply is obtained from a pumping station, shown in fig. 1, at the foot of Garwood avenue on the edge of the Red river. This station is to be increased by the addition of two 100 h.p. suction gas pumps, with a 24 hr. capacity each of 1,000,000 gals. Both supplies are connected together at the power house to the water system, but with drainage joints to prevent contamination of the city water by the impure Red river water.

The boiler feed water passes through a 1,000 h.p. Cochrane feed water heater, and is forced into the boiler by two 6 x 6 x 12 in. feed pumps. There are two auxiliary pumps of similar size for fire purposes, but so connected that in the event of necessity they can be connected for boiler feeding.

The exhaust from the compressor has two paths—one straight out to the atmosphere, and the other through the feed water heater. Under normal conditions, the feed is heated to a temperature of about 180 degs.

The drainage from the heating system of the freight car shop and the mill, returns to the power house, where it is handled by a 6 x 6 x 12 in. pump, and emptied into the feed water heater for delivery to the boiler. Steam traps all deliver to this

pump for the same purpose.

STORES DEPARTMENT.

The general stores department for all the company's lines west of Port Arthur, Ont., is located in the Port Rouge shop grounds, northwest of the machine and erecting shop. The General Storekeeper is A. E. Cox. The building is of brick, 150 by 100 ft., and has two stories and basement. It stands in the centre of a long, narrow platform, 575 by 175 ft., at car level, the main floor of the building being at the same level. At the southerly end of the building are the stores department offices, behind which on the main floor is a system of shelving for the storage of the medium weight stores, the upper story being similarly arranged for light material, and the basement for heavy stock that must be kept under cover, both reached by a freight elevator. The interior arrangement of the building is well planned for convenience. Down the centre and along the sides are main alleys from end to end; at right angles to these main channels are side alleys, on each side of which have been built up tiers of bins, which contain the stores, each in its separate compartment, as shown in fig. 26.

Rough stores are kept on the long platform to the north and south of the build-



Fig. 25—Interior of Boiler Room.

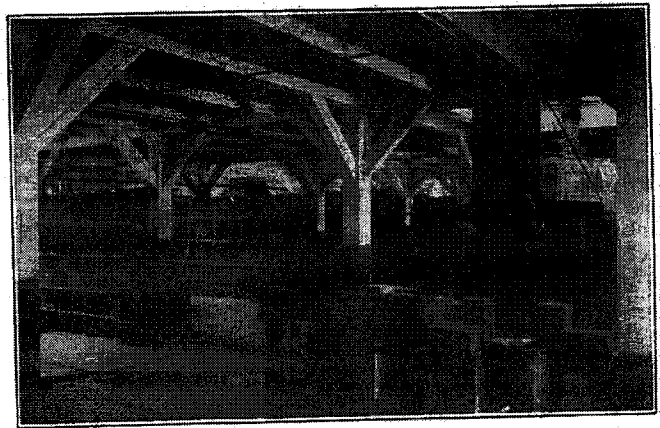


Fig. 26—Interior of Stores Building.

ing; the platform being divided off into streets, crosswise and lengthwise, by white painted marking lines. The rough stores are thus as easily located and arranged as those in the building. Along both edges and the ends of the platform are service tracks, connecting the building with all parts of the platform, and with a double track line running from the platform diagonally across the grounds to the car department buildings. Along both sides of the platform there are also yard tracks, over which the stores are brought in cars, from the point of manufacture or assembly in the grounds, or from outside points. On the track to the west of the platform is usually spotted the stores supply car, which is to be taken out on the system for the replenishing of local stores at division points.

LOCOMOTIVE HOUSE.

To the north of the machine and erecting shop there is a 40 stall roundhouse, which handles all the motive power in and out of Winnipeg, taxing it to the limit. This is shortly to be relieved by the building of another, across the Red river in the new east yards. The Roundhouse Foreman is J. H. McAlpine. The roundhouse is of a brick construction, and is divided into four sections, with 10 stalls in each. The stall at the northwesterly end is partitioned off for the office of the roundhouse foreman, the enginemen's room, oil room and machine shop. The machine shop only con-

Winnipeg Electric Ry. Co., which generates it at a hydro-electric development at Lac du Bonnet on the Winnipeg river. The power is delivered at 2,200 volt, 60 cycle, 3 phase alternating current to the power house of the railway shops, where it has to be transformed for general use in the shops.

Along the east wall of the power house are three 60 cycle, 150 k.w. transformers, that step the power down to 600 volts for transmission throughout the shops for the group and constant speed machine drives. Adjoining this battery of transformers is a 19 k.w. potential regulator. Along the north wall is a motor generator set, with a capacity of 80 k.w., receiving power in the induction motor end direct from the power line at 2,200 volts a.c., and delivering the same at 250 volts, d.c., for trans-

suction pipes for drawing on the shavings from the various machines. These pipes all lead to a suction fan on the power house side of the mill, the pipe from there slanting up at an angle of about 45 degrees to a point over the coal bins, where the shavings drop into a suspended bin, from which they are fired into the first two boilers, in the boiler room. These two boilers are equipped for firing both the shavings and coal.

Forced draft is employed, with two 12 ft. fans on a platform at the north end of the boiler room, driven by the two fan engines mentioned before, discharging through a short 6 ft. smoke jack through the roof over top. Back of the boilers, and above the common smoke header, there are two Green fuel economizers with a combined capacity of about 1,000 h.p., so ar-

at the same level. At the southerly end of the building are the stores department offices, behind which on the main floor is a system of shelving for the storage of the medium weight stores, the upper story being similarly arranged for light material, and the basement for heavy stock that must be kept under cover, both reached by a freight elevator. The interior arrangement of the building is well planned for convenience. Down the centre and along the sides are main alleys from end to end, at right angles to these main channels are side alleys, on each side of which have been built up tiers of bins, which contain the stores, each in its separate compartment, as shown in fig. 26.

Rough stores are kept on the long platform to the north and south of the build-



Fig. 25—Interior of Boiler Room.

mission through the shops for the variable speed individual drives. This motor generator set is shortly to be duplicated, as the increased demands on the single set are exceeding the capacity. The electrical equipment is all controlled from the 7 panel switchboard to the rear in fig. 25.

In rear of the motor generator set is located a 20x30x17x26x28 in. air compressor, handling 2,000 ft. of free air per minute, and delivering it at a pressure of about 110 lbs. This compressor being now overtaxed has made necessary the addition of a similar unit, which will shortly be added in an addition to the north end. The only other equipment in the compressor room, other than the oil tanks, are two small fan engines on a platform along the dividing wall of the building, driving the fans in the boiler room.

The long room to the rear of the compressor room, shown in fig. 25, is the boiler room. In it are six 250 h.p. Canada water tube boilers, and a seventh is being installed in the boiler room addition at the far end of the room, which it will be noticed in fig. 25, has only a temporary wall. Each boiler connects through a looped 7 in. pipe from the top of the boiler to a 15 in. header near the top front of the boiler, as in fig. 25, which leads into the compressor room, the connections to the other buildings leading out along the elevated trestle, work before mentioned, except the one to the mill and freight car shop, which is to

be passed from the smoke header, causing the smoke draft to pass through at will.

There are two supplies of water—city and Red river. The Red river supply is obtained from a pumping station, shown in fig. 1, at the foot of Garwood avenue on the edge of the Red river. This station is to be increased by the addition of two 100 h.p. suction gas pumps, with a 24 hr. capacity each of 1,000,000 gals. Both supplies are connected together at the power house to the water system, but with drainage joints to prevent contamination of the city water by the impure Red river water.

The boiler feed water passes through a 1,000 h.p. Cochrane feed water heater, and is forced into the boiler by two 6 x 6 x 12 in. feed pumps. There are two auxiliary pumps of similar size for fire purposes, but so connected that in the event of necessity they can be connected for boiler feeding.

The exhaust from the compressor has two paths—one straight out to the atmosphere, and the other through the feed water heater. Under normal conditions, the feed is heated to a temperature of about 180 degs.

The drainage from the heating system of the freight car shop and the mill, returns to the power house, where it is handled by a 6 x 6 x 12 in. pump, and emptied into the feed water heater for delivery to the boiler. Steam traps all deliver to this



Fig. 26—Interior of Stores Building.

ing, the platform being divided off into streets, crosswise and lengthwise, by white painted marking lines. The rough stores are thus as easily located and arranged as those in the building. Along both edges and the ends of the platform are service tracks, connecting the building with all parts of the platform, and with a double track line running from the platform diagonally across the grounds to the car department buildings. Along both sides of the platform there are also yard tracks, over which the stores are brought in cars, from the point of manufacture or assembly in the grounds, or from outside points. On the track to the west of the platform is usually spotted the stores supply car, which is to be taken out on the system for the replenishing of local stores at division points.

LOCOMOTIVE HOUSE.

To the north of the machine and erecting shop there is a 40 stall roundhouse, which handles all the motive power in and out of Winnipeg, taxing it to the limit. This is shortly to be relieved by the building of another across the Red river in the new east yards. The Roundhouse Foreman is J. H. McAlpine. The roundhouse is of a brick construction, and is divided into four sections, with 10 stalls in each. The stall at the northwesterly end is partitioned off for the office of the roundhouse foreman, the enginemen's room, oil room and machine shop. The machine shop only con-

GRAND TRUNK
WESTERN
BATTLE CREEK
MICHIGAN
SHOPS

C. H. RIFF

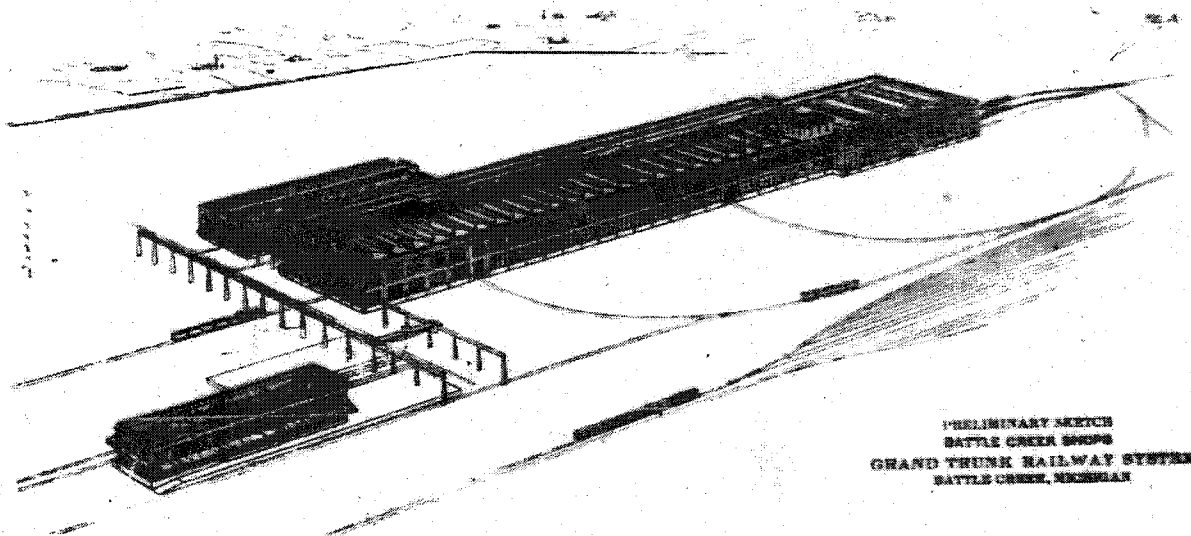
Quebec and Lake St. John Ry.

This line, the control of which has been secured by Mackenzie, Mann & Co., was opened from Quebec to Gossford, 25.5 miles, in 1871, that section being laid with wooden rails. In 1880 it was reconstructed and extended to St. Raymond, 36 miles from Quebec. From 1884 to 1888 a further extension was built to Roberval, and in 1898 the eastern extension was completed to Chicoutimi. A branch is under construction from Jeanette to La Tuque, about 40 miles, on which 16.75 miles of rails were laid in 1906. A branch of a mile to Roberval wharf and the Gossford branch of 1.50 miles were also built in 1906. The bonded debt on Dec. 31, 1905, was as follows: £350,000 prior lien 4% 20 year £100 coupon bonds due April 21, 1921; £442,000 1st mortgage 5% £50 and £100 bonds due Dec. 31, 1924, ranking after prior lien bonds; £840,000 6% £50 and £100 income bonds due Dec. 31, 1924, interest payable if earned. The interest on the 1st mortgage bonds, payable Jan. 1 and July 1, was at the rate of 4% a year till July, 1905. The statistics of operation for the year

G.T.R. Shops at Battle Creek, Mich.

The G.T.R. is building at Battle Creek general locomotive shops for the lines west of the St. Clair and Detroit rivers, which include about 1,000 miles of line and 300 locomotives, and as the present small shops are unable to handle the large power, improved facilities are imperative. The new shops are about two miles from the business district of the city, and half a mile from the present street railway terminus. They are placed on a tract of 188 acres adjacent to the present freight yard and main line tracks. The plans given herewith show only the locomotive department, but the requirements and relation of a future car department have been carefully considered, and the complete general shop layout is characterized by the following features: A midway crane of 70 ft. span, at right angles to the base line tracks, travelling through the centre of the group of buildings of both departments, will handle all the cross-yard traffic and be supplemented by a network of industrial tracks and turn-tables of standard gauge. A system of through tracks parallel to the main line will serve all depart-

ments. The Locomotive Shop includes both the locomotive machine and erecting shop, as well as the boiler and tank shop, and the machine department of the latter. In order to prevent the length of the building from becoming excessive when the future extension is added, a departure from the usual proceeding has been made in placing the boiler and tank shop at right angles to the main part of the building. The building is a self-supporting steel frame structure, with brick walls and a concrete roof. The overall length is about 533 ft., and the maximum width about 185 ft. The boiler and tank shop is separated from the machine and erecting shop by a brick curtain wall, which will in a great measure prevent noises from the former shop reaching the main building. An opening is provided in this wall large enough to pass a boiler. The erecting bay is 70 ft. wide and contains 25 pits on 24 ft. centers. Locomotives will enter and leave the building from the west side and, until future extension is made, the use of turn-tables has been avoided. Each pit will be provided with compressed air, water, steam and electrical connections, while the entire shop will



ended June 30, 1906, show: Passenger earnings, \$174,420.15; freight earnings, \$340,711.41; mail and express, \$19,097.78; other sources, \$29,628.65; total, \$563,857.99. Expenditure—Maintenance of way and buildings, \$34,454.21; motive power, \$153,167.37; cars, \$17,801.91; general and operating expenses, \$132,638.95; total, \$338,062.44; net earnings, \$175,795.55. Train mileage—passenger trains, 201,820 miles; freight trains, 129,495 miles; mixed trains, 36,624 miles; total, 367,939 miles; engine mileage, 582,363 miles. Passengers carried, 301,729; freight handled, 31,000 tons.

The company owns 23 locomotives, 5 sleeping cars, 1 official car, 9 first-class cars, 9 second-class and immigrant cars, 4 combination passenger and baggage cars, 3 baggage, mail and express cars, 361 cattle and box freight cars, 2 refrigerator cars, 237 platform cars, 69 coal cars, 8 conductors' vans, 2 tool cars, 4 snow plows, 1 flanger, 2 steam shovels, 15 dump cars.

Earnings for Jan. \$35,844, against \$29,330 for Jan., 1906.

The C.P.R. has issued tariff W. 902, superseding W. 351, for the Vancouver and Lulu Island Ry., which is operated by the British Columbia Electric Ry., as agents for the C.P.R. The new tariff became effective Mar. 18.

ments and be connected to the main line at both ends of the shop yard. Provision has been made for 100% increase in all departments without in any way interfering with future yard traffic and without materially increasing the future travel between departments. The buildings are separated from each other by a minimum distance of 50 ft. for fire protection. There is ample yard space tributary to each building, yet the layout is not spread over an unreasonable area. An economical use has been made of the property, and a liberal provision left for the Maintenance of Way, and Bridge and Building Departments at the eastern end of the yard. The power house is centrally located, all large power consuming buildings being within 1,000 ft. It will be adjacent to the future planing mill, which, in addition to being a large power consumer, will produce a vast amount of shavings and refuse, which can easily be disposed of as fuel at a profit in the power house. A feature of the transportation facilities is the provision made for a system of mono-rail electric cranes, which will supplement the ordinary travelling crane service. In this system any or all of the regular cranes become transfer cranes, connecting with I-beam runways extending throughout the shops and yards. These runways will be installed as the plant develops, and as rapidly as the needs require.

be served with a 120-ton crane and an auxiliary crane immediately beneath, of 10 tons capacity. Paralleling this shop is the locomotive department of the machine shop, in two aisles, one with crane service for the large machines and one without crane service containing small belt-driven tools. Above the latter is a gallery for heating fans, lavatories, locker-rooms, the tin shop and the air-brake department. Alternate columns in these two aisles will be provided with compressed air and water service connections, while on every few columns the water service connections will be extended to the roof.

The Boiler Shop is in the first aisle of the part of the building at right angles to the main shop. Stalls are located on 20 ft. centers, with 60 ft. of clear width between columns. Opening from this shop is the riveting tower, situated so as not to interfere with any other department, and, at the same time, conveniently located for direct service from the boiler shop crane. A 30-ton crane serves the boiler shop and a 20-ton crane the riveting tower. The boiler and tank machine shop extends throughout the next aisle and is served with a 10-ton crane, while beyond is the tank shop, of sufficient width to allow room for a tank and its frame on a single rail. A balcony for heating apparatus, lockers and toilet rooms will extend over a portion of this shop; a 20-ton and a 5-ton crane supplying

all the transportation facilities necessary. The entire building will be heated by indirect radiation, steam or hot water being used in the heaters. Fans and heaters will be located on the balconies, the hot air being distributed through a system of underground ducts with openings in the walls and locomotive pits, and through an auxiliary distributing system of galvanized iron ducts extending along the west wall of the building under the balcony. All tools throughout the building will be driven by individual motors when of sufficient size, while smaller tools will be grouped and driven by a single motor or connected with line shafting under the balcony. All wiring will be concealed, a main wiring tunnel extending throughout the building with cross-ducts in each bay. Particularly good natural lighting is obtained from the large windows and from the skylights, and saw-toothed roofs.

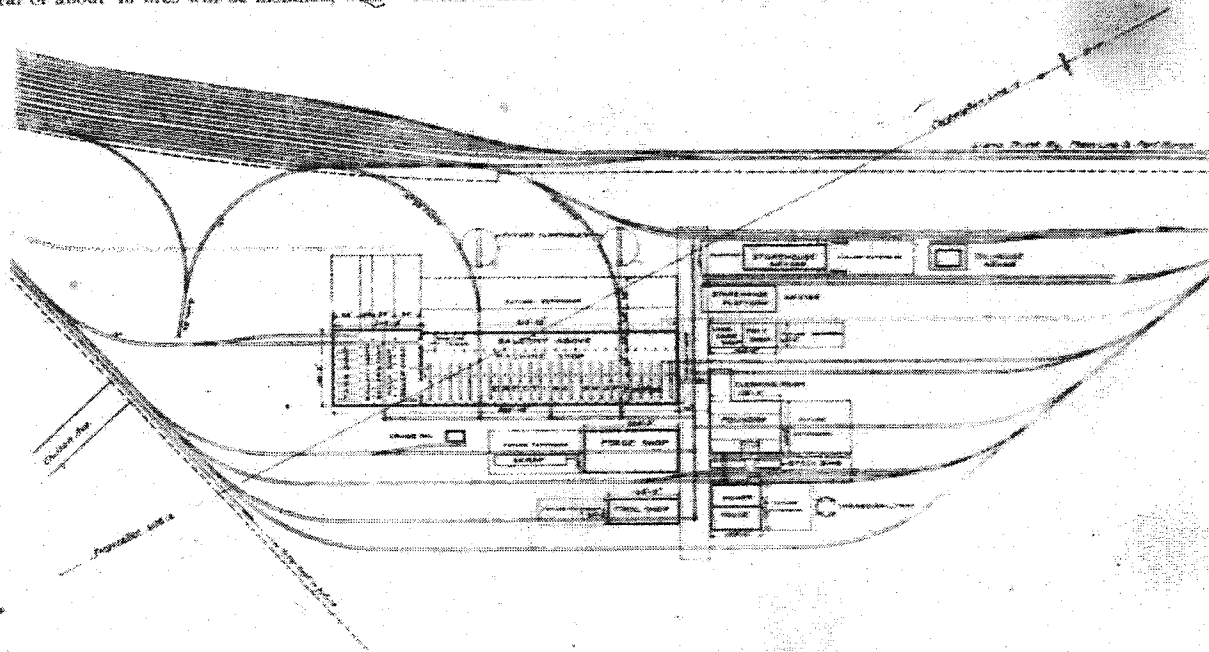
THE BLACKSMITH SHOP is a self-supporting steel frame structure with brick walls, 105 by 225 ft. A jib crane will serve the large fires, furnaces, and the heavy tools. A total of about 40 fires will be installed, with

slag can be transferred to the ash car near the power house. A system of narrow gauge tracks and turn-tables in and about the foundry will supplement the cranes. The brass foundry, 30 by 72 ft., will be located in one side of the foundry building. It will be equipped with one or more furnaces of the converter type and with other modern appliances. The cleaning room of the foundry is contained in a wing 48 by 81 ft., and this portion of the building will be served by a 5-ton crane, which will run into the main part, thus facilitating the transportation of castings to the cleaning room. The building will be a self-supporting steel structure with brick walls, a cement roof, and exceptionally good lighting. The floor will consist of a fill of molding sand on the natural soil. The equipment will be designed for an output of 20 tons a day.

THE FROG SHOP will also be of brick and steel design, of construction similar to that of the other buildings. It will be 65 by 165 ft. and will be supplied with crane service. All the frogs, switches and crossings required on the Western Division will be built here.

on the tracks at grade level. The upper floor will be surrounded by a concrete platform with inclines to grade. A fire wall will separate a room for waste from the oil service room. Oil will be handled by the most approved methods. Every precaution will be taken to have this building fireproof and its isolated position with regard to the remaining buildings gives additional protection from fire hazards.

THE POWER PLANT is designed with a view of supplying all the power necessary for operating the plant and for heating during winter, and to supply sufficient steam for all steam-driven tools, also for operating an auxiliary generating plant of 200 k.w. capacity, which will be used in emergency in the event of it being decided to purchase power, which question is now under consideration. Should the power be purchased, the necessary transforming apparatus will be installed in the power house, current being received at 5,000 volts and distributed for shop use at 440 and 110 volts alternating current and 220 volts direct current. Alternating current motors operated on the 440 volt circuit will be installed



GRAND TRUNK RAILWAY SHOPS, BATTLE CREEK, MICH.

a full equipment of steam hammers, punches and shears, bolt headers, upsetting machines, etc. The floor will be of cinders laid on tamped clay. Individual motor drive will be used on all tools that require it, while smaller tools will be grouped and driven by motors from line shafting. This building is designed to give good ventilation; a monitor equipped with swinging windows, extending the entire length of the roof. A small amount of heat will be supplied by direct radiation. This will only be used to keep the building warm over night, as the forge fires will give the required amount of heat during working hours.

THE IRON FOUNDRY has been located convenient both to the storehouse and the locomotive shop, the principal consumers of its output. A 20-ton crane reduces the manual handling of ores, ladles, castings and flasks to a minimum, while an outside crane of 5 tons capacity, running between it and the power house, will serve the charging floor. This crane will be of more utility than an elevator, as coke can be unloaded directly from cars either into hoppers or on to the charging platform; pig iron can be easily delivered to the platform and truck loads of

THE PATTERN AND LOCOMOTIVE CARPENTER SHOP will be similar to the others in design and of such construction that the pattern storage rooms will be absolutely fireproof. It will be approximately 65 by 165 ft.

THE STOREHOUSE.—In contrast with the average locomotive repair shop storehouse of semi-fireproof construction, in this case the storehouse will be absolutely fireproof throughout, of concrete construction, with brick walls, occupying 80 by 200 ft. All stores will be kept on the ground floor and the upper story reserved for the storekeeper and master mechanic's offices. The building will be liberally supplied with platform space and track facilities on each side, which will permit easy access for loading and unloading supplies while not impeding traffic between the shops and the store. The platform in front of the building extends under the yard crane, allowing materials to be easily transported.

THE OIL HOUSE will also be of reinforced concrete construction, of similar design to the storehouse, and will have one story and a basement, the latter containing the large tanks used for oil storage. These will be arranged for filling by gravity from tank cars

wherever possible, being used to drive line shafting and individual crane and machine tool motors that do not require excessive variations in speeds. Variable speed motors and a few crane motors will be run on the 220 volt direct current system, and all lights on the 110 volt line. Also if power is obtained from outside sources the capacity of the boiler plant will be governed by the amount of heat required in the various buildings in winter, and in order to heat the buildings during the coldest weather it will be necessary to install approximately 1,800 boiler horse-power. Steam will be taken from these boilers and used in connection with the blower system and distributing ducts in all the larger buildings, and then in the smaller buildings the heating will be obtained through direct radiation.

PUMPING SYSTEMS.—Piping from the power house to the shops will, as far as possible, be carried on the supports of the midway crane. This obviates the necessity for a tunnel, in this case, hard to drain. Air compressors will be located in each building, furnishing the necessary air for that building, different buildings being connected through a small pipe line, which will prevent absolute

NATIONAL
TRANSCONTINTAL
RAILWAY

WINNIPEG
SHOPS

C.H. RIFF

National Transcontinental Railway.

The Commissioners have filed plans and books of reference for extra land required in the County of Portneuf, Que., as follows: For additional station ground at St. Casimir, situated at mileage 45 west from Quebec bridge, and for a diversion of the public road at mileage 19 west from Quebec bridge.

Reports from Abitibi, Ont., state that the bridge being constructed across the river there is 840 ft. long, and 94 ft. above the water level. The construction of the line has been pushed forward to such an extent that it is expected to have track laid from the river crossing, seven miles east of Cochrane, the junction with the Temiskaming and Northern Ontario Ry., and Frederick House, by Christmas.

On the line easterly from St. Boniface, Man., G. A. Wade, Track Inspector, reported, Oct. 8, that the track was finally ballasted to First Broken Head, about 32 miles; two lifts of ballast had been laid on the eight miles thence to Second Broken Head, and one lift between that point and Rennie, an additional 17 miles. Steel was laid from Rennie to Green Lake, 13 miles. A later report stated track had been laid to 25 miles east of Rennie and that it was expected to have a further 30 miles laid by the end of the year. It is also expected to lay track on about 50 miles from Lake Superior Junction westerly by the end of the year.

The contract for the construction of tank, boiler and erecting shops, in Springfield municipality, 6 miles east of Winnipeg, has been awarded to T. Kelly & Sons, Winnipeg. The price is stated to be about \$500,000. On this page we give a map showing the location of the shops and yards, and a ground plan of the shops, with the proposed track layout is given on page 813.

GRAND TRUNK PACIFIC RY.

It is expected that the branch line connecting Fort William with the National Transcontinental Ry., at Lake Superior Junction, Ont., will be completed by Nov. 30. G. Knowlton, Divisional Engineer, stated, Oct. 7, that there were 30 miles of steel to be laid, but as several bridges have to be completed the work of tracklaying is being delayed. The other work on the line is well forward and everything is being pushed with the object of getting the branch finished by the date mentioned. The bridge over the river at Fort William, except for the finishing touches and the approaches, was reported to be completed Oct. 15. The steel work was erected by the Canadian Bridge Co., Walkerville, Ont.

The official returns for the inspection of grain at Winnipeg, issued Oct. 3, credited the G.T.P.R. with having brought 13 carloads of wheat into the city. Previous shipments of grain coming from points on the G.T.P.R. had been brought into Winnipeg over the Canadian Northern Ry. from Portage la Prairie. The service given on the line is three trains a week between Winnipeg and Watrous, Sask., 408 miles, and two trains a week between Watrous and Wainwright, 258 miles. On this stretch of line there are 97 stations. During his recent inspection of the line the President, C. M. Hays, said it was expected that the line would be completely ballasted east of Saskatoon early in Oct. A proposition had been made by the Canadian Northern Ry. for the construction of joint terminals there, but nothing in the way of an agreement had been reached. The construction of the bridge across the Battle River is expected to be completed early in Nov. The bridge has a total length of 2,772 ft., and the centre spans are 160 ft. above the concrete piers. The superstructure is carried on 53 piers. As soon as the bridge is completed, track will be laid across it and tracklaying will be resumed on the roadbed west of the Battle River and pushed forward towards Edmonton. The bridge over the Saskatchewan River at Clover Bar is also expected to be completed early in Nov. It is expected that track will be laid into Edmonton by the end of the year. C. Schreiber, consulting engineer to the Department of Railways, who returned to Ottawa Sept. 28, after an inspection of the line, said the new railway will be in full operation from Winnipeg to Edmonton by Jan. 1, 1909. A joint station with the Canadian Northern Ry. at Edmonton will, it is understood, be constructed. Between Edmonton and Wolf Creek, Alta., a distance of 127 miles, the grading is well advanced, and it is expected that the grading gangs will be within 10 miles of Wolf Creek by the end of the year. Tracklaying will be started from Edmonton westerly, Dec. 1, and will be continued to Pembina River, a distance of 65 miles. At this point a large bridge is under construction, the foundations of which it is hoped to complete by Feb. 1. The steel work for this bridge will then be completed and tracklaying pushed westward. The contract for the substructure of the bridge across Wolf Creek is expected to be let at an early date.

The company will call for tenders for the construction of 200 miles from Wolf Creek westerly at an early date, which will bring the mileage under contract well into British Columbia. Final arrangements for the route over the inner table land have not yet been

made, but it is understood that this matter was discussed between the British Columbia Government and C. M. Hays, President G.T.P.R., during the latter's visit to Victoria, Oct. 14.

Mr. Hays returned to Vancouver, B.C., from Prince Rupert, Oct. 13. He said he had been up the Skeena River as far as its confluence with the Copper River, making an inspection of the construction going on there. He was very well pleased with the progress made by the contractors and announced that tenders would be asked at an early date for the construction of a further 100 miles easterly from Prince Rupert.

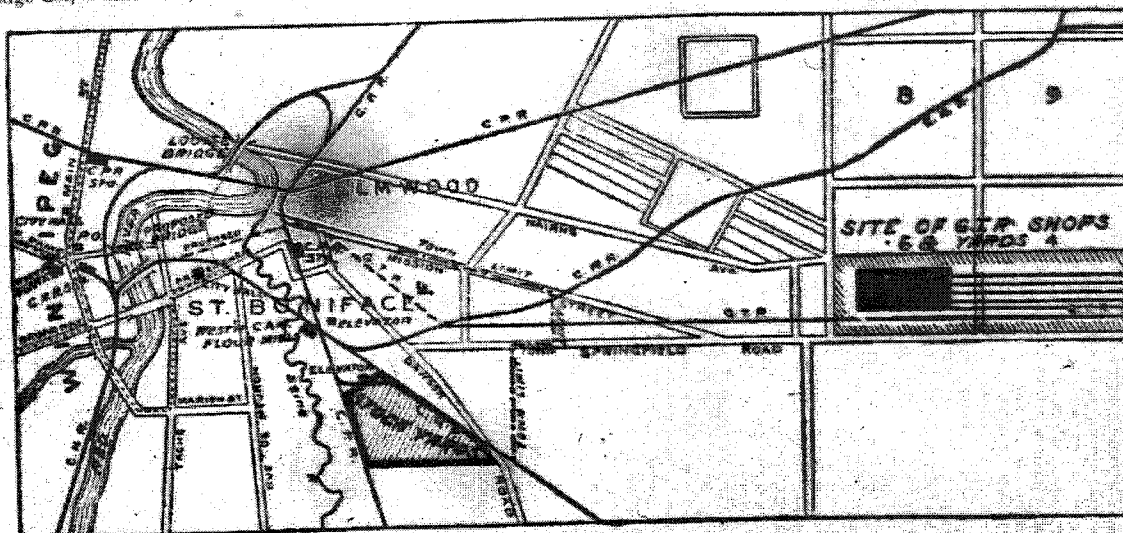
C. C. Van Arsdale, Division Engineer, who formerly had his headquarters at Edmonton, Alta., and is now located at Prince Rupert, B.C., has jurisdiction over construction from that point to the McLeod River. R. W. Jones, Division Engineer, who has transferred his staff from Saskatoon to Edmonton, closing the Saskatoon office, has had his jurisdiction extended westerly to the McLeod River.

The Toronto Globe's Ottawa correspondent wired, Oct. 20, that the G.T.P.R. proposes to construct what will be practically a second line of railway stretching right across the prairie provinces. The route as projected will start from the present main line north of Brandon, run to that city, thence west across Saskatchewan, and into the coal districts of Southern Alberta. We are advised that this is no new proposition. Probably the report has reference to some of the various branches contemplated to act as feeders to the main line and which were shown on the map we issued as a supplement in Nov., 1907.

In an interview at Victoria, B.C., Oct. 14, Mr. Hays said the company eventually intended to have a branch southerly into that city, where a water frontage had already been secured. This water frontage, local reports state, was acquired at a cost of \$150,000. There were, said Mr. Hays, some details of the project to be worked out, but it was desired that the line, when constructed, would run the entire length of Vancouver Island. The general plans of the company show such a line and also a line from Vancouver, connecting with the main line at Fort George, B.C.

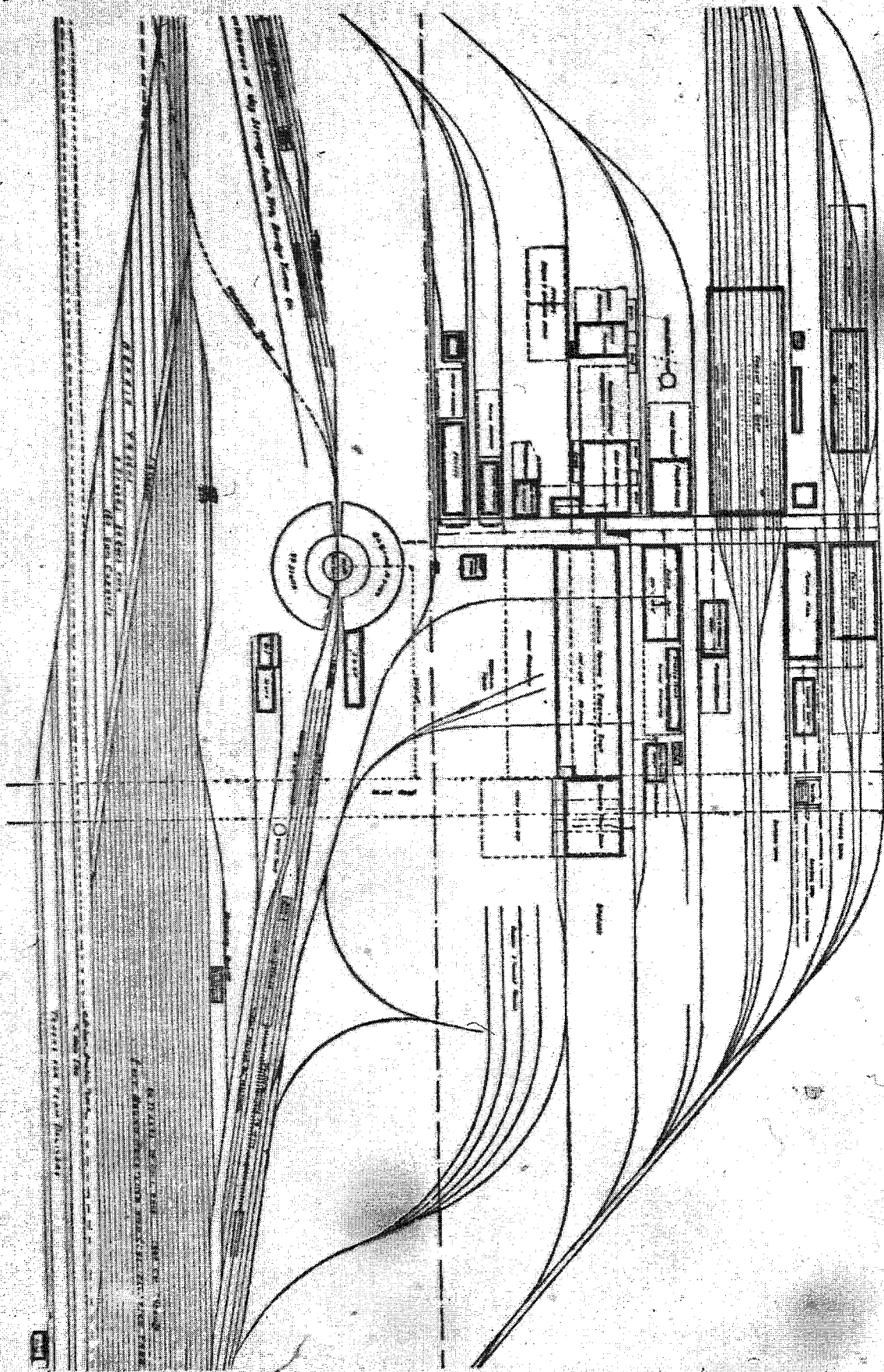
The company has placed an order for 15,732 tons of steel rails with the Algoma Steel Co., Sault Ste. Marie, Ont., and another for 28,095 tons with the Dominion Iron and Steel Co., Sydney, N.S. (Oct., pg. 725).

D. B. Hanna, Third Vice-President Canadian Northern Railway, expects to leave Toronto on a trip to Great Britain early in November.



MAP SHOWING SITE OF SHOPS TO BE ERRECTED BY THE NATIONAL TRANSCONTINENTAL RY. COMMISSION NEAR WINNIPEG.

GROUND PLAN OF NATIONAL TRANSCONTINENTAL RAILWAY SHOPS AND YARDS NEAR WINSTED.



INTERCOLONIAL
RAILWAY
MONCTON
SHOPS

C H RIFF

The Intercolonial Railway Shops.

By C. F. Bristol, *Stud. Can. Soc. E. E.*

The new I.C.R. shops are located about a mile from Moncton station, on the main line to Montreal. The site is on a plateau, about 60' above sea level, and although nearly flat, slopes gently to the southward in the direction of a small creek. As shown on the plan, two main sidings, with numerous branches and spurs, facilitate shunting and render ready access to all buildings and yards. The two passenger car shops are long and narrow, and so designed that cars may be placed transversely in each shop. These two buildings are parallel to each other and at right angles to the main line, with 18 tracks in each. Cars may be readily transferred from any track in one shop to any track in the other by means of the electric transfer table between the two shops. The stores and office building, power house, producer gas house, freight car shop, planing mill, lumber shed, and dry kiln are all laid out parallel to the main line of the railway, and are all served by side tracks. The planing mill is situated convenient to the passenger car shop and freight car shop. The locomotive shops comprise the machine shop and annex, boiler shop, boiler erecting shop, engine erecting shop, and smith shop, all under one roof. The four latter shops are parallel to the main line, but at right angles to the machine shop.

A notable feature in connection with the engine erecting shop is the arrangement of the pits. The main pit runs almost the entire length of the shop, while the track is continued across the machine and passenger car shops into the paint shop, where locomotives may be painted should the erecting shop be crowded. The side pits are all laid at an oblique angle to the main pit, and this arrangement provides greater facilities for stripping and repairing engines.

The foundations rest on firm, dry, red clay. The pressure on the clay under the column footings and foundations was not allowed to exceed three tons per sq. ft. The foundations are of 1-3-5 concrete, with a 6" batter on each face, and whenever the load is concentrated, as in the case of side columns, the width of the foundation is increased proportionately. The column footings are in the form of truncated pyramids.

The Passenger Car Shop is 134' 5" by 362'. Two rows of columns divide the shop into three bays, each 44' wide and each containing two tracks through the entire length of the shop. In addition to these there are several narrow gauge tracks for small trucks. The first wall course is 1' high by 24" thick on the ends, and 12" on the sides, this being increased to 20" at the side columns or pilasters. The upper outside edge of this first course has a 1" bevel running completely around the building. Expansion joints divide the wall into sections of 40'. On the sides, with 20' centres, extending from the first wall course to the roof, are the concrete pilasters, 4' 6" wide and 16" thick, with a small projection on each side which serves as a casing for the window frames. The space between the pilasters is entirely glass, except a strip 2' 3" wide, which is made up of 2" x 4" corner studding covered on both sides with expanded metal lath and plastered with Portland cement mortar.

In each end are six doors, 12' wide by 16' high, and above the doors the walls are only 12" thick, with the exception of the lintels, which are 9" thick and 8' high. The reinforcement in the lintels consists of horizontal steel rods and 18" centre to centre, and vertical rods, with 2' centres, extending into the cornice. Each alternate row of horizontal rods through the lintels is carried completely across the building. A number

of vertical rods is also run up in the concrete about 2" from the sides of the windows, in the ends of the monitor, and also in the thin portion of the wall at each side of the doors, where recesses are left for the door frames. The centre columns are made up of 12" channels held together by riveted angle work, while steel trusses support the roof and form the monitor. The ends of each row of purlins are firmly imbedded in the end walls, while the two outside rows are completely imbedded in the concrete cornice. The outside vertical members of the trusses and monitor are imbedded in the concrete plaster. The outside purlins surrounded by the concrete cornice serve as a very efficient reinforcement, but small bent rods of steel were also placed near the face of the cornice three feet apart. The roof slab consists of concrete, 1-3-4 mix. The slab forms a knee on each side of the I beam purlins, and completely covers the upper flange and half of the web, thus giving them lateral support. The reinforcement in the roof slab is electrically welded wire cloth, 10" x 4" mesh. The transverse wires are about 3/4" diameter, and the longitudinal wires about 1/2" diameter. This reinforcement is arranged so as to come 1/2" from the bottom of the slab at the centre of the span between the purlins, and 3/4" from the top of the slab at a point over the purlins. The bottom plane of the concrete slab is 12" below the plane of the top flanges of the purlins. A thin layer of cement plaster is spread over the under slab to cover up the sharp projections, and over this a thin layer of pitch. Three plys of roofing felt are laid longitudinally, then hot pitch poured thereon, and the whole covered with a layer of gravel. At the edge of the roof the felt is well nailed to wooden strips imbedded in the cornice. The weight of the gravel and the adhesion of the pitch securely hold the felt to the roof, and obviate the use of transverse nailing strips. The monitor, 14' wide and 8' high, with continuous side lights, pivoted, extends the full length of the shop. The vertical members of the monitor truss are imbedded in small concrete columns similar in shape to the large side columns. Two rows of skylights on each side of the roof, with galvanized iron frame, on a 6" concrete wall 2' high, furnish additional light.

The planing mill is 81' 10" x 200' 5", and is constructed practically the same as the freight car repair shop, except that outside steel columns are imbedded in concrete side columns, and that the monitor only extends within twenty feet of the ends of the building. Hence, the trusses at these points were designed to carry the monitor end walls. The steel columns were set up first and well girted, then the trusses were riveted in position and the purlins laid. No anchor bolts were used to hold the columns, as the forms were built around them to form the concrete plaster. The cornice forms were next placed, and the columns and cornice areas were filled with concrete in one operation.

The Passenger Car and Paint Shops are each 344' 8" x 80'. The cabinet shop is elevated half a story in one end of the passenger car shop, on what is termed the mezzanine floor. In the car paint shop, on a similar floor, are the upholstery and varnish rooms. These buildings are constructed entirely of reinforced concrete, and being exactly similar, the same forms were used for both. The column footings are built independently of the columns, and have 14" square steel rods, 4' long, projecting about 18" above the top, thus giving a firm head between the footings and the

(Continued on page 651.)

The Intercolonial Railway Shops.

(Continued from page 649)

ons. The columns are 14" square, chamfered corners and knee braced at girder connections. Eight twisted steel rods, four of which are 1/2" square, and four square, arranged alternately and spaced distant in a circle, are enclosed in a spiral of 4" pitch and 10" diameter, formed of 1/2" x 1/8" steel band, the whole reinforcement extending from end to end of column. The bars and helix are wired together at the intersections, resulting in a strong and neat reinforcement.

The first wall course, which is 10" thick, the upper outside edge bevelled, both horizontal and vertical reinforcement is consisting of 3/4" square steel rods. Vertical rods project about 6", ensuring firm bond with the next course. The thickness of the wall is 12" thick, and is all in the form of wall columns, with recesses for windows and doors, 60% of wall area being of glass. The reinforcement in these wall columns consists of 3/4" square and 1/2" square bars, placed horizontally and vertically, and all wired together to form a coarse mesh. The window sills, 8" thick by 2" high and 12" long, consist of two 3/4" square twisted steel bars 20" apart, laid near the bottom, and two 1/2" square bars each 20" long, one in the centre and the other near the top. These bars are wired 2" each way into the side wall columns so that they are securely fixed. The door sills are smaller, but of practically the same construction.

The mezzanine floor in the south end of building is supported by a transverse girder resting on four columns, and a number of secondary beams at right angles to girder. The secondary beams are carried by the transverse girder and the end columns, while the 4" floor slab is taken from the flange of the beams. 1/2" square twisted steel bars, 20" long, and laid with centres, constitute the slab reinforcement, and are placed about 1/2" above the bottom of the slab. The reinforcement in beams and girder is similar to that used in roof girders and beams described

roof is carried by six longitudinal



FREIGHT CAR REPAIR SHOP, INTERCOLONIAL RY., MONCTON, N.B.

rows of columns, including the side wall columns. The rows of columns are 20" between centres, while the columns in each row are 18" apart, centre to centre. Each transverse row of columns carries a continuous roof girder, and the girders carry secondary beams spaced 6' 4" apart and at right angles to the girders. The 3" roof slab rests on the top of the beams and girders, and is figured as one piece with them, serving as the flange. Where the continuity of the secondary beams running longitudinally is broken by openings for the skylights, the beams project about 2' 8" from the girder in the form of short cantilevers, which support the skylight walls.

The concrete for the foundation, column footings and lower portions of the wall

was mixed in the proportion of one part of cement, two of sand, and six of gravel; for the interior columns, there was used one part cement, one part sand, and four parts gravel, which had to pass a 3/4" screen, but five parts of gravel were used for the wall columns, beams, girders, and roof slab. A richer concrete was used in the corner columns in order to give the greater strength necessary. All the concrete was "wet mix" and thoroughly tamped. The tamping rod consisted of a piece of gas pipe, in one end of which a thin steel blade about 3" wide was welded. This blade was always shoved down into the concrete, close to the form. By this means all the stones in the concrete were pushed back from the faces of the forms, permitting the fine sand, etc., to form the outside surface. This tamping always resulted in uniform smooth surfaces when well done. Of course, the 3" roof slab could not be tamped in this way, but it was well stirred by the shovels and straight edges run over the surface and the rough places smoothed off with a float. The reinforcement in the girders consists of four twisted steel bars 1/2" square, extending across the span between each pair of columns and lapping about 1' with the reinforcement in the next span. Six 1/2" square stirrups were wired to the four twisted bars at each end, so that the complete reinforcement for each span could be easily handled and laid in position in one piece. In the secondary beams, the reinforcement is made up of three 1/2" square twisted steel bars and wired together with the stirrups. At an angle of 45° two 1/2" square twisted bars 5' long are thrust down into the knee brace on each side of the column, while three 1/2" square twisted rods are laid in the slab over each column. The slab reinforcement on the passenger car shop consists of no. 10 gauge 3" mesh expanded metal, while on the passenger car body shop 1/2" square twisted rods are laid transversely with 12" centres.

The form for the walls, side columns, etc., employed in the construction of these buildings consists of 1 1/2" x 8" and 2" x 8" boards, placed on one side, and strongly bound together by means of 2" x 6" cleats spaced about 24" centres. The outside and inside forms are held together by 1/2" bolts



PASSENGER CAR REPAIR SHOP, INTERCOLONIAL RY., MONCTON, N.B.

and equidistant by either wooden or metal spacers. The wooden spacers were laid out and thrown aside as the concrete was brought up to their level. Obstacles, for additional bracing, were used. The centre column forms were erected on the same principle, i. e., l and g. lumber held together by bolts, and the cleats on each side being nailed to one another. The side pieces were kept apart by long bulkheads, which held the other two sides. The moulds for the girders and beams were made up of l and g. boards. Openings were cut in the sides of the girder forms to receive the secondary beam forms, while cleats across-bar formed a yoke to support the form. The secondary beam forms, in addition to the sides and bottom pieces, had longitudinal carrying pieces, which were nailed to the vertical cleats to carry the roof joists. The box forming the knee brace was fastened on to the column form cross pieces by means of four uprights. One pair of these uprights was held in position by a bolt running through the column. Two transverse rows of wall and centre column forms were first set up, nailed and braced in position, without being up. Then the knee brace boxes were slipped into place and fastened to the four uprights with a few nails. The columns and boxes being then in one piece the girder boxes were dropped into position, cleats being run tight to the sloping bottom of the knee brace. When the girder bottom was slipped into position it acted as the spacer between the two side forms, while the secondary beam forms, when dropped into place, acted as side braces. The joists for carrying the roof panels were next put in place across the carrying pieces on the secondary beams and nailed. Finally, the roof panels, which were composed of 1" l and g. stuff, were laid over the joists. Forms for half the building, plus one extra panel, were set up, and when completely put together, the whole was braced and nailed. The extra panel was left up when the shift from north half to south half was made in order to carry the forms after the first shift.

The building was erected by the Portland Cement Co. of Oregon. The first and second floors of the stores and office building are intended for the local and general department, and the second story, the western half, will be utilized for the offices of the stores department and the department of Motive Power. An excavation 12' from the sides of the building about 1' above ground, supports a raised concrete slab platform along the sides of the building. The platform is also raised out 25' on the east and with a 4' for trucks on each side. The reinforcement in this platform slab is made up of square twisted bars 3" 3" long and 3" 3" laid transversely, and 2" round 18" centre in centre, longitudinally. In addition to this the outside edge is provided by a 4" x 6" steel angle. The reinforcement in the exterior and interior walls, on the first course above the foundation consists of 1/2" round horizontal rods 3' centres, and 1/2" square vertical rods 3' to centre, projecting above the floor. These rods are all wired together by a coarse mesh, and are expected to prevent cracking from the expansion and contraction of the concrete. The pedestals for the columns have eighteen 1/2" twisted bars, 4' 8" long, laid transversely each way, about 4" from the top. Also two 1/2" square bars project above the basement floor line to form a firm bond with the base of the column. The columns supporting the floors are square with bevelled corners, reinforcement consists of eight 1/2" rods set equidistant in a circle, with

1/2" x 1/4" flat steel band wired to the vertical bars in the form of a spiral of 3" pitch.

The floors are of all concrete construction in the form of slabs stiffened by ribs. These ribs are a series of heavy transverse girders resting on the centre and wall columns, and a similar series of secondary beams at right angles to, and supported by the main or transverse girders. The floor slab, with the girders and beams supporting them, are moulded in place in one piece. Twisted square bar reinforcement is used altogether for the floors, girders, and beams. The tension bars in the transverse girders on the first floor consist of six 1" square twisted bars, while in the secondary beams only five 1/2" square twisted bars are used. Five 1" square bars in the girders and four 1/2" bars in the secondary beams comprise the tension bars for the second floor. In the roof, five 1/2" bars in the girders and four 1/2" bars in the secondary beams form the reinforcement. All tension bars in the floor and roof ribs are tightly wired to the stirrups and were generally made up as shown in illustration opposite.

The forms for this building were made on the same principle as those described under passenger car shops. Forms were made up for half of the first floor, plus an extra panel. The first floor was moulded in two shifts, and the second floor over half of the building in the third shift. For the roof the same girder and beam forms were used, but tilted up, and the increased length was obtained by increasing the length of the forms by means of wedges, and finished in two shifts in like manner. New column forms, however, had to be made each time, as the columns for the different floors diminished in size and increased in length for the upper portions of the building. The same panels were used each shift for the different floors and roof, although considerable repairing and patching was found necessary, due to shrinkage, rough usage, etc. Both the store room and office floors are finished with 1/2" l and g. hardwood flooring, fastened to 2" x 2" nailing strips spaced 16" centres, and laid transversely to the building, the intervening space between the floor slab and hardwood flooring being filled with fine dry ashes.

A test cement was used in all the concrete below the ground line. The important factor in favor of this cement, from a contractor's standpoint, was that it cost about \$1 a barrel less than the Portland cement, L. & B. cement. An average taken from a month's tests is as follows: Assuming 500 lbs. per sq. in. as the standard tensile strength of a good Portland cement, this slag cement gave an average result of about 58% at 7 days and at 28 days about 85% of the standard, although some individual tests ran very close to the 500 lbs. per sq. in. When given a longer period than 28 days in which to set the tensile strength indicates a still greater increase, but for want of time very few tests were made on briquettes over 28 days old. Where a large amount of concrete work is being carried on it is a question whether the use of this cement is economical, as it is slow in setting, thereby retarding the progress of taking down and setting up forms. In several instances, during cold, damp weather, this cement took six days to set.

In the floors and roofs of these large reinforced concrete buildings, the transverse girders are all continuous. The concrete was deposited transversely to the building, but as strips of only 40' to 50' could be laid in a day, numerous joints necessarily occurred in the secondary beams. In making these joints, the system followed was of great importance, as the efficiency of the beam depended on the position of the joint and the care with which it was made. The

outer edge of each day's deposit terminated as nearly as possible at the points of counter flexure in the secondary beams. A "wet mix" was used for this work, and the semi-fluid concrete was allowed to run into the trough or beam forms, taking a sloping shape as the cement set. Each morning, before the mixers were started, the face of the pour was prepared as follows: The concrete was cut away slightly, and the surface of the pour was swept clean and sprinkled with water. Finally, just before the first batch was deposited, the pour was covered with a thin coat. A pour made in the manner described above will give approximately 85% of the strength of standard cement.

The Lowerware Plant includes five shops: viz.: The machine shop, 177' 6" x 408' x 30' high, divided into two bays by a centre line of columns, each bay being served with an overhead electric travelling crane of ten tons capacity. The shop has an annex 44' x 408'. The paint shop, at right angles to the machine shop, is 75' x 275' x 27' high. Water gas will be used for the different furnaces. Job cranes are to be placed conveniently near the several furnaces and furnaces, with a track through the centre of the shop, outside the handling of heavy work by means of trucks. The engine erecting shop, separated from the smith shop by a partition, is 80' x 275' x 35' high. Two electric travelling cranes are to be installed for moving and placing locomotives. Through the centre runs a surface track with a shallow concrete pit in each side of the central track and right side tracks with pits arranged herring-bone style. These side tracks are designed to accommodate engines requiring heavy repairs, and this form of layout provides ample space for overhauling. This leaves the central track free for light repair work, and obviates the necessity of lifting one engine over another. Between the engine erecting shop and boiler shop walls is a space 23' wide, which permits of additional side lights. The boiler shop is 104' x 275', divided into two bays by a row of columns down the centre. The bay intended for boiler erection is 44' high, and the west end of it contains the riveting tower, 25' long by 75' high. A 15-ton electric travelling crane is to be installed in this bay, and a 30-ton crane in the riveting tower to serve the hull riveter. The tool bay is served by means of a 10-ton electric travelling crane, which traverses the entire length of the shop. In addition to this, job cranes are to be placed convenient to the different bays.

These buildings are of structural steel framing. The columns rest on concrete pedestals spaced 27' centre to centre throughout. The side walls, for a distance of 17' above the ground, are of concrete, and at each exterior column, extending up to the cornice is concrete pilaster. The 8' partitions between the various shops are of reinforced concrete. In the south shop the gravel is brought to grade and filled with selected filling, rolled, and matted. The floor in the engine erecting shop consists of 3" headlock plank spiked to 4" x 6" sills, spaced 2' 9" centres, and resting upon a 4" layer of concrete. The boiler shop has 3" hemlock plank on 6" x 6" cedar sills laid 4' apart, while in the machine shop 3" hemlock plank is nailed to 2" x 2" nailing strips resting upon a 3 1/2" layer of concrete. The roof slab is composed of four inches of concrete reinforced by 1/2" square twisted steel rods 12" centre to centre. On the upper sides of all skylights situated on the slope of the roof, the slab is raised to form a cricket to shed water freely. Side lights comprise a large percentage of the outer wall area, while numerous skylights

ply additional light. The machine shop well under way, but beyond the foundations, nothing has been done to the balance of the locomotive shops, which will not be completed for some months.

The Power House is built on the same plan as the planing mill, viz.: steel trusses imbedded in concrete pilaster, steel trusses to support the roof. The engine room and boiler room are each 60' 100', and separated by a reinforced concrete wall. The floor in the engine room consists of 3/4" maple flooring, overlying hemlock planks spiked to 3" x 3" nailing, imbedded in a 3 1/2" layer of concrete. In the boiler room the floor is of tar macadam, on a 6" course of gravel, well rammed and rolled. The boiler equipment consists of four Babcock & Wilcox water tube boilers, 250 h.p. each, arranged in two batteries, the necessary space is reserved for a fuel battery. Fuel economizers, and a water heater and pump, are installed to take care of the feed water. An induced draft plant forms part of the equipment, with a 1,000-gallon a.w. pump. In this plant, a fan, direct connected to an auxiliary engine, supplied the heat required in the night car shop. The coal bins are arranged along the side of the building in front of the boilers.

The engine and generator equipment is as follows: Two horizontal double-acting engines, normal rating 500 h.p. each, adapted to drive two 300 k.w. direct-connected, sixty-cycle a.c. generators. These generators are three-phase, 1,500 r.p.m., 220 volts. In addition to these machines there will be two 70 k.w.d.c. belt-driven generators of 250 volts and 875 r.p.m. The gas engines are driven by producer gas, which is to be manufactured in the producer house, situated near the power house. The gas for the furnaces in the smith shop will be water gas, also manufactured in the producer house. The gas generators will convert continuously about 1,000 lbs. of coal per hour, generating therefrom about 18 cu. ft. of water gas for the furnaces, and about 55 cu. ft. of producer gas for the engines.

The shops are heated by the hot blast system, using exhaust steam from the auxiliary engines and pumps, supplemented by live steam from the boilers. Fans, direct connected with engines, force the hot steam through concrete conduits, furnished with risers in the walls. These risers discharge close to the floor near the windows. The sewerage system is extensive, consisting of a main 2,400 feet long, emptying into a creek which flows to the Petriehead. This is a concrete pipe, egg section, 4' high by 3' wide, with an 8" wall. From this main sewer, branches, varying from 20" diameter, extend past the various shops to receive the drainage from the down pipes, shop tiles along the foundations, shop drains, etc. The two main branches consist of concrete pipe, while 12" and 6" vitrified pipes are used for the others. Wherever a pipe discharges into a branch or sewer, concrete catch basins are provided. The interior surface of the walls, concrete floors, and ceilings are painted with cold paint, applied with a spraying machine, giving a very white finish, and increasing materially the brightness and lighting effect of the buildings. The steel columns and beams are painted a dark red, while the window frames and doors are covered with lead paint.

Each roof the snow and wind load is estimated at the minimum of 20 lbs. per square foot, vertical load. The design is intended to facilitate the removal of snow by the wind, but in event of the snow load being twice as great as assumed, the increased unit stress in the steel would not be great. However, all of the roofs during construction were loaded beyond

this minimum, showing no signs of injury to them.

THE CONSTRUCTION MACHINERY OR PLANT consists of eight mixers, both yard and half-yard sizes, located convenient to the various buildings. Where the concrete had to be elevated, the mixer discharged into a bucket which was hoisted up an elevator and dumped automatically into a hopper, from which the mix could be taken by barrows. Both the mixers and hoisting machinery were driven by small donkey engines. Two gas engines were also used, one for twisting the steel and the other for pumping. Two derricks, with 60' booms, and one with a 90' boom, were used for steel erection, while a travelling yard crane, with a 40' boom, was used for unloading and other purposes.

W. A. Bowden, of the Department of Railways and Canals, is the Designing Engineer of all these buildings. The economic handling of material between the various shops was the prime factor in determining their location in relation to each other, and they are so placed as to enable any shop to be enlarged without interfering with the future extension of any of the others.

The foregoing paper was read before the Canadian Society of Civil Engineers recently.

Taxes Paid by Railways.

H. J. Pettypiece, ex-member of the Ontario Legislature, whose hobby is increased taxation of railways, has published the following statement of taxes paid by various railway companies for the year ended June 30, 1907:

Alberta Ry. and Irrigation Co.	\$ 3,131.95
Algoma Central and Hudson Bay	704.32
Bellington and Nelson	1,271.34
Brandon, Saskatchewan, and Hudson Bay	1,359.00
Brockville, Westport, and Northwestern	3,813.20
Canada Southern	33,362.60
Canadian Pacific	677,572.99
Canadian Northern	14,464.27
Canadian Northern Ontario	538.84
Canadian Northern Quebec	17,875.91
Crow's Nest, southern	1,034.24
Central Ontario	1,154.50
Dominion Atlantic	823.99
Equinault and Nainville	2,076.27
G.T.R. in Canada	403,295.87
G.T.R. (Canada Atlantic)	33,489.81
Halifax and Southwestern	25.00
Ironbridge, Bancroft, and Ottawa	153.81
Karlo and Bouché	3,448.06
Kingsdown and Pembroke	2,957.68
Kondyke Mines	161.25
Lake Erie and Detroit River	24,255.20
Liverpool and Hudson	20.56
Lothian and Kenanville	606.45
Macdonald and North Shore	43.20
Manitoulin and North Shore	79.23
Manitoulin Valley	1,446.56
Montreal and Atlantic	2,941.63
Montreal and Province Line	1,775.04
Montreal and Windsor Junction	285.94
Morrissey, Perre and Michel	321.91
Midland of Manitoba	1,336.00
Nelson and Fort Sheppard	2,041.78
New Westminster Southern	854.04
Ottawa and New York	1,422.26
Phillipsburg Ry. and Quarry Co.	60.00
Quebec, Montreal and Southern	1,268.73
Quebec and Lake St. John	9,361.78
Quebec Ry. Light and Power Co.	14,046.14
Red Mountain	1,347.25
Shanstead, Bedford and Chambly	291.25
St. Clair Tunnel	834.49
St. Lawrence and Adirondack	2,845.03
Tenikoming and Northern Ontario	392.17
Toronto, Hamilton, and Buffalo	4,130.73
Vancouver, Victoria, and Eastern	4,277.62
Vancouver, Westminster and Nelson	2,360.44
Victoria and Sydney	1,507.28
Victoria Terminal Ry. and Ferry Co.	1,043.36

Tenikoming and Northern Ontario Ry.—Gross earnings for June, \$39,132.96; operating expenses, \$38,550.92; net earnings, \$582.04. Total earnings for six months ended June 30, \$372,158.62. Approximate earnings for July, \$96,400.

Mrs. E. T. Boland, wife of the western agent of the Robt. Reford Co., died in Toronto recently.

TRANSPORTATION APPOINTMENTS.

The information under this head, which is almost entirely gathered from official sources, is compiled with the greatest care, so as to ensure absolute accuracy. Any of our readers who may notice any error in our announcements will render a favor by advising us.

Canadian Northern Ontario Ry.—W. R. Kelly has been appointed Trainmaster, Office, Parry Sound, Ont.

C. I. Webster has been appointed Master Mechanic, Office, Parry Sound, Ont.

W. B. Clearwater has been appointed Roadmaster, Office, Parry Sound, Ont.

Canadian Northern Quebec Ry.—A. F. Dion, heretofore Local Freight Agent, Quebec, and Lake St. John Ry., Quebec, has been appointed Local Freight Agent, C.N.Q.R., Montreal, vice S. F. Beaman.

Canadian Northern Ry.—F. Knight heretofore Locomotive Foreman, Edmonton, Alta., has been appointed Locomotive Foreman, Port Arthur, Ont., succeeding G. H. Hedge, appointed Assistant Master Mechanic at Winnipeg, as announced in our July issue.

D. MacNicol, leading hand Port Arthur, Ont., shops, has been appointed Locomotive Foreman, Brandon, Man., succeeding W. M. Armstrong, transferred.

W. M. Armstrong, Locomotive Foreman, Brandon, Man., has been appointed Locomotive Foreman, Edmonton, Alta., succeeding F. Knight, transferred.

Canadian Pacific Ry.—R. King, heretofore Agent at McAdams, Ont., N.B., has been appointed Terminal Agent, West St. John, N.B., succeeding J. K. Gillingham, appointed Superintendent Montreal Terminals, as announced in our July issue.

F. H. Cogswell, Chief of the Tariff Bureau, is reported to have resigned to take service in the M.C.R. Freight Department, Detroit, Mich.

M. J. Tarpy has been appointed Passenger Agent at Niagara Falls, N.Y., vice R. E. Schornstein. Mr. Tarpy will remain at Niagara Falls until Sept. 30. During the winter D. Isaacs will probably represent the company there.

G. C. Wilson has been appointed acting City Freight Agent, Buffalo, N.Y., succeeding W. S. Nevins, resigned.

T. J. Wall is reported to have been appointed Travelling Passenger Agent, with headquarters at St. Louis, Mo., vice W. S. Merchant.

F. Nason has been appointed City Passenger Agent, San Francisco, Cal., succeeding W. C. Chawson, resigned.

H. T. Wilgus, who has been transferred from Kobe, Japan, to the Yokohama office, as announced in our Aug. issue, has been appointed chief assistant to the Manager of the Trans-Pacific Steamship Line.

Grand Trunk Pacific Ry.—G. C. Dunn, formerly Division Engineer, National Transcontinental Ry., at St. John, N.B., has been appointed District Engineer for the G.T.P. Ry., with headquarters at St. John.

W. F. Davis, Passenger Traffic Manager G.T.R., has also been appointed to a similar position G.T.P.R., Office, Montreal.

G. T. Bell, General Passenger and Ticket Agent, G.T.R., has also been appointed to a similar position G.T.P.R., Office, Montreal.

I. E. Quick, General Baggage Agent, G.T.R., has also been appointed to a similar position G.T.P.R., Office, Toronto.

D. W. Steeper has been appointed acting Trainmaster Lake Superior Branch, Office, Westport, Ont.

H. H. Brewer, heretofore Superintendent Lake Superior Division, Westport, Ont., has been appointed General Superintendent, in charge of transportation, with headquarters at Winnipeg, succeeding G. O. Whalen, resigned.

Intercolonial Railway Connecting Lines.

These reports stated recently that a commission had been appointed to enquire into the equipment, conditions and business outlook of the branch, or rather connecting lines of the I.C.R. in Nova Scotia, New Brunswick and Quebec, and that the investigation made was preliminary to the acquisition by lease or purchase of lines which could produce a profit to the I.C.R. We are officially advised that the use of the word "commission" is a mistake, as no commission has been appointed. During the last session of the Dominion Parliament, the question of the advisability of securing for the I.C.R. some of the lines connecting with it as branches was discussed, and it was urged that if the I.C.R. was not a Government road, some of these feeding lines would become part of the system as a business proposition. The Minister of Railways promised in a speech in the House that during recess he would have an investigation made as to the possibilities of connecting lines, and as a consequence E. J. Allen, General Traffic Manager I.C.R.; D. A. Stoney, General Freight Agent I.C.R.; and W. C. Bowden, Engineer of the Department of Railways and Canals, have been authorized to make an investigation so that the Minister and the Government may be in a position to consider the whole matter intelligently.

The resolution was unanimously passed by the Nova Scotia Legislature at its last session calling upon the Dominion Government to acquire the various short independent lines in that province on a basis of their original cost and present earning capacity, and operate them in connection with the I.C.R. as branch lines. The late Government of New Brunswick had previously made application to the Dominion Government to take over the short lines in that province for operation as I.C.R. branches. The matter was brought before the notice of the House of Commons last session by the ex-Minister of Railways, Mr. Cameron.

In the fall of 1907 the then Government of New Brunswick appointed G. Brown, C.E., and M. L. Barnes, M.L.A., to inspect and report upon the lines connecting with the I.C.R. in the province, and a report dealing with them was subsequently presented. The report states that "The Commissioners traveled over each of the lines, inspected the bridges, stations and all conditions connected therewith. In general they found all the properties noticeably improved during recent years. Considerable amounts have been expended in rails, bridges, rolling stock, etc., and all properties have been brought up to a better standard. Wooden bridges and trestles are the curse of most of the branch lines. On most of the roads there are a great many such structures, some

of them of great length, and they are all a constant source of annoyance, expense and danger. The Kent Northern, the Beersville, and the York and Carleton have no bridges, and this fact contributes largely to the excellent financial showing made by the Kent Northern in particular. A great many of the Howe truss bridges of the different lines are old and nearly worn out, and it will be necessary to rebuild these in a very short time. Nearly all the lines are poorly equipped with snow-fighting appliances, and so a number close down when deep snow comes. The Kent Northern is an exception. There is a scarcity of ballast on all branches. In some cases this is excusable. Another big factor in maintenance of good track is plenty of ties. In this lumber country, where ties may be bought comparatively cheap, it is inexcusable that they are not better supplied. A large percentage of the rails laid on the branches are excellent, and quite heavy enough for the uses and in good condition. The locomotives as a rule are in working order. They are light and well adapted to the light traffic. The rest of the rolling stock is only in fair condition. The passenger cars are all old and not in particularly good order. The St. Martins Ry. has two splendid passenger cars, however. Practically all of the freight is handled by the trunk lines. Both passenger and freight traffic have increased remarkably in the last few years, and the present year will probably show a still further increase. The number of passengers carried has increased in the last five years from 22% to 158%, and freight has increased 18%. The Kent Northern and the York and Carleton show an unusual increase. The gross earnings show an increase of 21% over 1901. Operating expenses on all lines except two have increased considerably in five years. This has kept net earnings down, but still there is a gratifying increase. In 1901 six out of the nine lines showed a deficit. In 1906, the condition was reversed. In 1901 deficits of the nine lines were \$5,764. In 1906 the surpluses were \$10,650. From 1901 to 1906 inclusive, 419,893 passengers were carried on the nine connecting lines. Not one of these was killed and only two injured. Six of the nine lines had no accidents. From 1901 to 1906 there were 1,097,218 tons of freight carried by these connecting railways."

Information with respect to the lines in Nova Scotia which it is suggested should be acquired is contained in the report of the Provincial Engineer, a summary of which appeared in our September issue.

Of the lines connecting with the I.C.R., there are a number that can be at once eliminated from further consideration, notably the Quebec, Montreal and Southern Ry., owned by the Delaware and Hudson Co., a

United States corporation, the Quebec Central Ry. and the Temiscouma Ry., owned or controlled by the same interests in Great Britain, which contemplates connecting the two lines and amalgamating them into one system; the Halifax and South Western Ry., and the Inverness Ry. and Coal Co.'s line, owned by Mackenzie, Main & Co. interests, and destined to form part of the Canadian Northern Ry.'s completed system, and the Dominion Atlantic Ry., operated in connection with a steamship line to Boston, Mass., by a British company. There are also some other lines owned by coal mining companies, which are connected with the I.C.R. In this category are the Sydney and Louisburg Ry., owned by the Dominion Coal Co., the Nova Scotia Steel and Coal Co.'s railway, the Cumberland Ry. and Coal Co.'s line, and a number of smaller lines in Nova Scotia and New Brunswick. Apart from these lines there are in the three provinces of Nova Scotia, New Brunswick and Quebec, a number of lines entering on a general railway business which can be classed strictly as branch or connecting lines of the I.C.R. The lines in Quebec are the Lachine and Megantic Rys., and the Atlantic and Lake Superior Ry. Both lines, however, are at present in the position of extension, and if these plans materialize to any considerable extent, the usefulness of the lines as branches of the I.C.R. will be destroyed, as the apparent object of the new construction is to effect connection with lines at or near the United States boundary. The duty of the investigating officials will, therefore, practically resolve itself into an examination of the traffic possibilities of one railway in Nova Scotia and nine branches, representing 12 lines in New Brunswick. Statistics showing the earnings and expenses, etc., of these several companies -- the latest at present available were published on pp. 105 of our Feb. issue, and pp. 217 of our April issue. The additional information showing capitalization, subsidy aid and rolling stock owned is given in the table in this page.

Train Service at Omemee.

The Board of Railway Commissioners issued order 5200 Sept. 1 as follows: In the matter of the Municipal Council of the Corporation of the County of Victoria and the Township of Emily, Ontario, complaining that by reason of the location of the G.T.R. station at the Village of Omemee, Ont., the inhabitants of the village are subjected to great inconvenience, expense, and loss, that the railway conditions existing at Omemee are unreasonable and not in the interests of the community, and asking for such relief as justice to complainants may demand. Upon hearing the representatives for the complainants and counsel for the G.T.R., and what was alleged, and the consent of the Board of Trade and Council of Omemee and the G.T.R., filed -- the Board orders that the G.T.R. train service be as follows, namely: That all trains each way stop at the outer or junction station, as at present. That at the inner or new downtown platform, the following trains stop: The noon mail train leaving Toronto at 7.50 a.m., via Lindsay and Peterboro. Either the evening mail train leaving Toronto at 5 p.m., or the evening flyer leaving Toronto later. The morning flyer from Peterboro to Toronto. The evening mail train leaving Peterboro at 5 p.m. for Lindsay and Toronto. The alternate proposal to be determined by the Omemee Council. The Board further orders that the train service herein provided for be brought into operation not later than Sept. 15. And that the platform be placed from the sidewalk on Sturgeon St. westward.

Line	Mile age	CAPITAL			PASSENGERS			ROLLING STOCK		
		Stock	Bonds	Misc.	Dom.	Prov.	Muni- cipal	Loco- motive	Pass- cars	Freight cars
Quebec Central	34.00	\$1,000,000						3	4	50
Beersville	32.00	250,000		500,000	\$101,700	\$94,500		7	4	42
York and Carleton	68.00	950,000	\$500,000	19,770				1	2	39
St. Martins	16.78	6,250								
Atlantic and Lake Superior	28.00	44,900	50,000					2	2	8
St. Lawrence	30.00	90,000	90,000		83,612	145,000		1	2	7
St. Lawrence and Rich- mond	27.00	75,000	50,000		58,334	128,000		2	2	1
St. Lawrence and Rich- mond	7.00	20,000			22,406	21,000				
St. Lawrence and Rich- mond	58.00				100,000	150,000		3	3	72
St. Lawrence and Rich- mond	36.00	214,845	13,900		115,000	92,308		3	3	45
St. Lawrence and Rich- mond	50.00	150,000			26,391	135,000	\$70,000	3	3	34
St. Lawrence and Rich- mond	19.00	125,920			51,400	48,000				
St. Lawrence and Rich- mond	3.75	34,320			18,336	18,997		2	1	3
Total	409.53	\$3,002,735	\$763,300	\$79,270	\$67,006	\$1,164,485	\$70,000	26	26	292

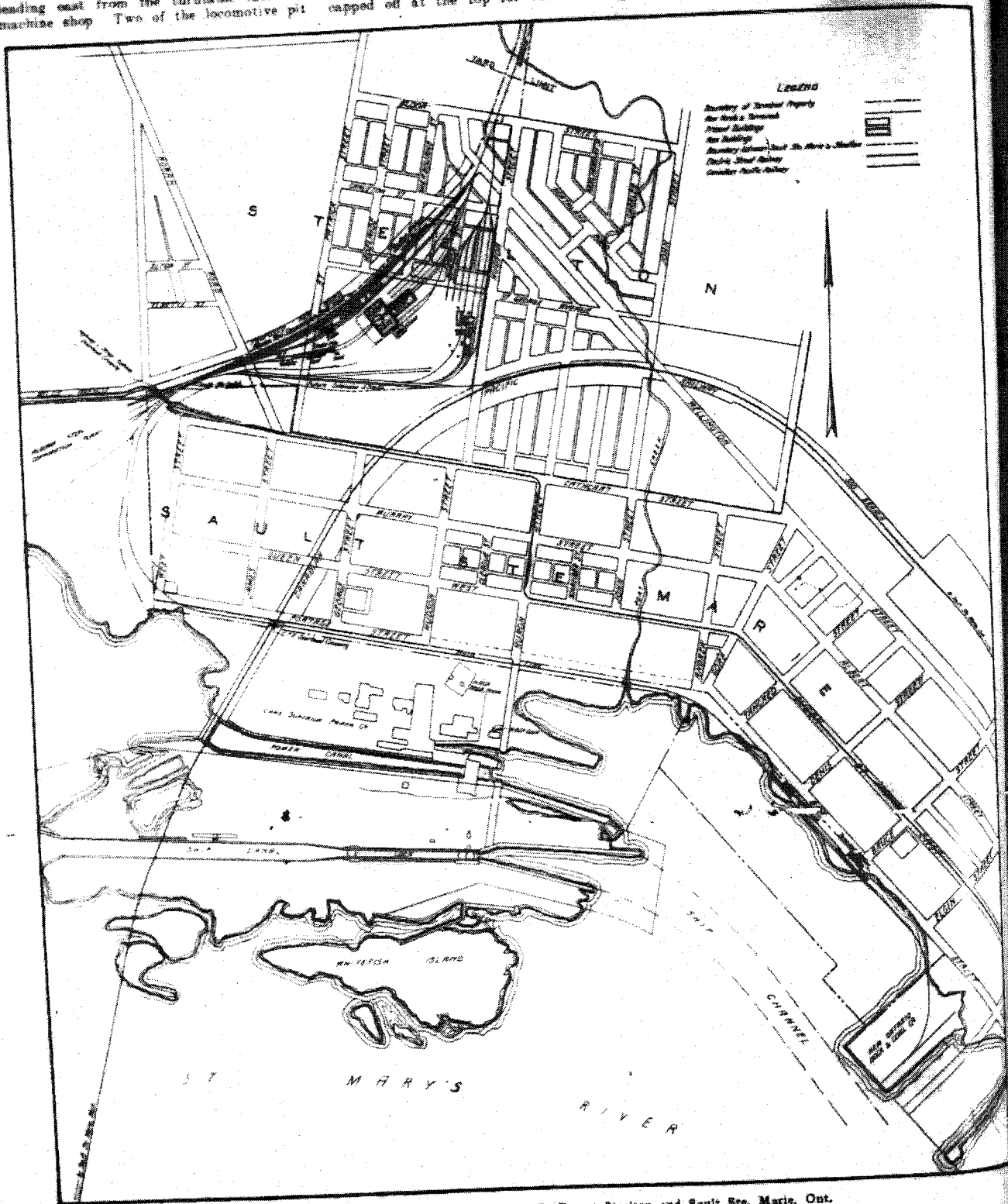
ALGOMA
CENTRAL
RAILWAY
TERMINAL

LOCOMOTIVE HOUSE: The present locomotive house covers an area of 178 by 266 ft. and is designed for a future extension of 88 by 266 ft. on the west side. The building is a departure from the ordinary locomotive house in that it completely shelters and encloses an 80 ft. deck turntable. There are at present 14 locomotive pit tracks radiating from the turntable within the building, and, with the future extension, the building will enclose 24 locomotive pit tracks in addition to the turntable. The operating advantages thus afforded by the enclosed turntable, eliminating many causes for delays due to weather conditions, and saving in the expense of handling locomotives in bad weather, will be readily appreciated by those familiar with the climate and deep snows prevalent in this or similar locations. There are two

tracks entering the locomotive house from the west, both leading direct to the turntable. There are also two radiating tracks leading east from the turntable into the machine shop. Two of the locomotive pit

ried up to a height of 5½ ft. above grade, or 5 ft. above the floor line. This wall has an offset on the outside of two inches, 1½ ft. above grade, for a water-table and is capped off at the top for the full length

also, by its color, contrasts with the brick above. Above this base the brick work is laid up in stretcher bond with struck joints of cement mortar and forming pilasters 3 ft. wide and 17 ins. thick. These pilasters



New Terminal Arrangement of A.C. & H.B. Ry. at Steelton and Sault Ste. Marie, Ont.

tracks are provided with driving wheel drop pits and two others with truck wheel drop pits.

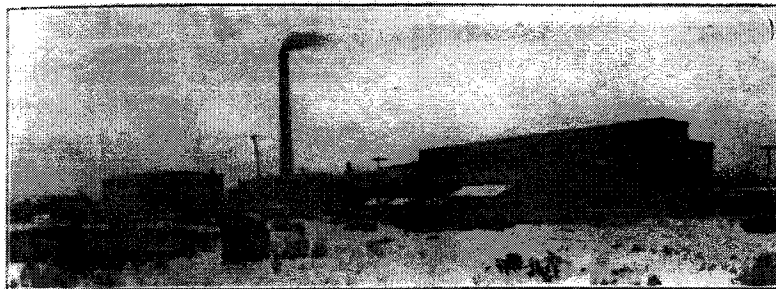
All foundations are of concrete and are

with a 7 in. course projecting 2 ins., which forms the sills where windows occur and also a distinct division line between concrete and brick above. This concrete base,

are 22 ft. centres, alternate ones supporting steel roof trusses. Steel sash of the modern type are set between pilasters anchored in the brick, their size being in most cases 19 ft. wide and 14 ft. high.

is composed of pivoted sections which can be opened variable amounts for ventilation. A maximum amount of outside light is obtained through these windows, which are glazed with factory ribbed glass. Above the windows is a four course brick corbel, which brings the face of pilasters and panels above windows flush, and gives the effect of weight at the top of the building, though this wall is but 13 ins. thick. The brick work above window and door openings is supported on steel lintels of the I beam and

the building. The rest of the space is devoted to a locker and wash room, with concrete floor, for the employees. The equipment will consist of 154 steel lockers in double rows, back to back, with ample aisles between, in which there are seats; also a double row of lavatories, 32 in number, at one side of the room, which provide adequate washing facilities for the employees. This room is well lighted, having large windows on both sides, by which ventilation is also furnished.



Rear View of A.C. & H.B. Ry. Tagona Shops.

bottom plate type. The window lintels have an angle on the bottom of the plate for its full length, to which the top of the steel plate is fastened with hook bolts, providing a neat, secure and weathertight anchoring.

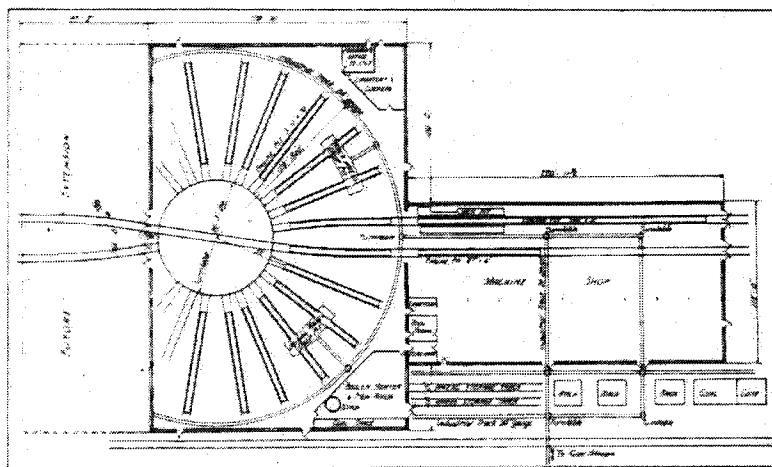
All outside doors in this building are of wood, the pass doors being 3½ by 7 ft., and the large track doors are 13 ft. wide and 17 ft. high. The track doors consist of two parts, each 6½ ft. wide with a 3¼ by 7 ft. pass door and a sash at the top with fifteen 16 by 16 in. lights. These doors are 3¼ in. thick and are of a 3 ply construction, fitted with wrought iron stiffeners, heavy hinges and a locking device of special design.

Steel columns of latticed channel box type are used and are spaced 44 ft. centres each way except at the turntable, which is in the centre of a clear space 88 ft. square. With the exception of the above mentioned space the roof is supported on 44 ft. steel trusses, 18 ft. clear above top of rail in bases, with 22-ft. wide monitors over the bay running from east to west for the width of building, with one running in transverse direction between two, over the turntable. These monitors are all topped with Pond continuous steel sash and at top to swing out, the angle of which may be adjusted by the worm and gear operator, which is controlled from floor. This sash is so built that when closed to its full extent it will permit of rain entering under ordinary conditions, consequently provides good ventilation at all times. Steel beam purlins resting on roof and monitor trusses carry two inch sheathing, on which is laid a 5 ply specification roofing, finished off at eaves with a copper gravel guard, giving a substantial roof. The roofs of the monitors drain over the edges to the roof below, which is saddled to drain water to down conductor heads, set in top of box gables, and connected to cast iron soil pipes set in concrete piers by wrought iron downspouts, making a neat and inconspicuous disposal of roof water to sewers. The entire floor is of vitrified paving brick laid on edge in a sand cushion on a 5 in. base of concrete.

In the southeast corner of the locomotive house is a room approximately 40 ft. square, with partitions of wooden studs, expanded metal and cement plaster separating it from the rest of the interior. A portion of this room, 17 by 22 ft., is partitioned off for the foreman's office and for a small store room.

In the southeast corner of the building is a space approximately 40 ft. square, partitioned off in the same corner as the locker room. In this room are located the boilers, stack, heating fan and engine, boiler feed pumps and vacuum pump. Along the south wall is a coal bin, 40 by 6 ft. wide, provided with small doors in the outside walls, permitting of unloading coal direct from cars into the coal storage space.

The turntable is 20 ft. long, 200 tons capacity, standard deck type.



A.C. & H.B. Ry. Locomotive House and Machine Shop.

and is operated by a pneumatic turntable tractor. The turntable ring wall is of concrete, with four expansion joints equidistant on its circumference, the inside diameter of which is 80 ft. 5 ins. This wall is capped off at the base of rail with curved segmental curb timbers, 8 by 14 ins., each of which is fastened at two places with ¾ in. anchor bolts to concrete. The circular rail of the turntable is fastened to 8 by 8 ins. by 2 ft. cross-rotated ties anchored to a concrete base, cast integral with the ring wall. The pit floor is of 5 in. concrete pitched to drain to circular gutter 14 ft. from centre of pit, which drains to a large sump, the top of which is covered with a cast iron grating, and is connected to sewer. The sump is of concrete and liberal in

All pits under locomotive stalls are of concrete, 70 ft. long by 3 ft. 11 ins. wide, are 2 ft. 8 ins. deep at the high end and drained to low end, which is 3 ft. 2 ins. deep, and has a sump covered with a cast iron grating and a connection to sewer. All pits are absolutely clear on the sides, having no projections of any kind, and the bottoms are paved with vitrified paving brick, arched at centre and laid in ½ in. sand cushion on concrete.

The 80 lb. rails used exclusively are supported on the concrete side walls of pits, spiked to 6 by 8 ins. by 1 ft 4 ins. cross-rotated cross ties, which are cast and anchored in the concrete. Outside of the rails, parallel to same, and flush with floor, are 6 by 10 in. dressed jacking timbers, fastened to blocks, which may be readily taken up at any time when repair of rails is necessary, without disturbing any of the brick floor paving.

The wheel drop pits are of concrete and extend radially a little more than the width of two stalls, having a 24 in. gauge track on the concrete bottom from end to end for transferring wheels on truck, which, when lifted to floor level, are run on 24 in. gauge track connected to circular industrial track at end of stalls by a turntable. The pits are to be equipped with modern air jacks and removable rails, supported by I beams across the pit. Drainage is obtained by gutters, which drain to a sump connected to sewer.

The smoke jacks are of sectional cast iron construction, with an opening 8 ft. by 3 ft. and a 30 in. diameter stack with a hood at the top. The bottom of the jacks are 16½ ft. above the top of rail and the jacks are supported upon the steel roof members.

The building is heated by the indirect system, consisting of a steam driven fan and Green Positive horizontal heater coils.

The hot air is forced through underground concrete tunnels and vitrified tile ducts to the turntable pit and all engine pits. Dampened outlets are provided, giving good distribution throughout the building. Steam for heating is supplied by three internally fired boilers of 150 h.p. each, for 100 lbs. working pressure, fitted with 50 in. inside diameter by 12¾ in. long, Morrison furnaces. A steel smoke breaching connects the boilers to a Weber reinforced concrete chimney, both outer shell and lining of concrete, lining extending 30½ ft. above grade and top of outer shell 125 ft. above grade. The chimney is protected from lightning by modern lightning rods, well grounded.

Steam, air and water are conveyed to the locomotive stalls by nine mains, with decms

stalls. One set of drops fitted with double valves and connections serves every two stalls.

THE MACHINE SHOP is 112 by 221 ft. long, the long way being in an east and west direction, and is directly adjacent to the locomotive house, the west wall of the machine shop being the east wall of the locomotive house. All foundations are of concrete, as are the base walls to the sill lines, the same as described for the locomotive house. Brick is used for the walls

the steel purlins and on the wall at the outside, and are covered with 5 ply Barrett specification roofing, which is finished off at the edges with copper gravel guards. Drainage from this roof is allowed to run off edges to the ground. The floor of this building is to consist of a 5 in. concrete sub-base and 1 in. sand cushion, on top of which will be laid 3 in. crenelated maple paving blocks.

In the southwest corner is located the foreman's office, approximately 12 by 12½

feet, the beam when lifted to its full height. The jacks are all operated together.

The overhead 10 ton electric crane in this bay affords a method of handling heavy parts for repair work in any part of this section of the shop. A 24 in. gauge industrial track, running in the centre between the two standard gauge tracks, connected to the circular track in the locomotive house by a small turntable, extends to within 56 ft. of the east end of the machine shop. Two narrow gauge tracks are connected to this at right angles by turntables, one in the centre of the third bay from the east end and one in the sixth. These tracks run south through the machine tool department and through doors out into the yard.

The space used for the machine tools and blacksmith shop comprises the 44 ft. bay and about a 10 ft. strip of the 66 ft. bay, with the exception of the space allotted for office, tool room and lavatory, and space for the fan and heater. This building is heated in the same manner as the locomotive house, except the hot air is partially distributed through overhead galvanized sheet metal ducts.

THE STORE HOUSE is located in a position of easy access from all the present and proposed buildings, and has necessary facilities for the receiving and shipping of material, having platforms on each side adjacent to tracks. The building is 68 by 91 ft., and provision is made for an extension on the west end. It has three floors, a basement, first floor and second floor, and their heights are 10 ft., 13 ft., and ranging from 12 to 14 ft. on the second floor, respectively. The entire building, from foundation to first floor line, is of concrete, reinforced where necessary, including the 5 ft. permanent platforms and walls of same, in which are steel sash for the admission of light and ventilation to basement. The use of this space under platforms gives additional floor space in basement. The first floor is of reinforced concrete of the mushroom or flat slab type. The stairs to the basement, from the first floor in the southeast corner, are of reinforced concrete, and are inclosed in walls of expanded metal and cement plaster, with steel door and frame into basement.

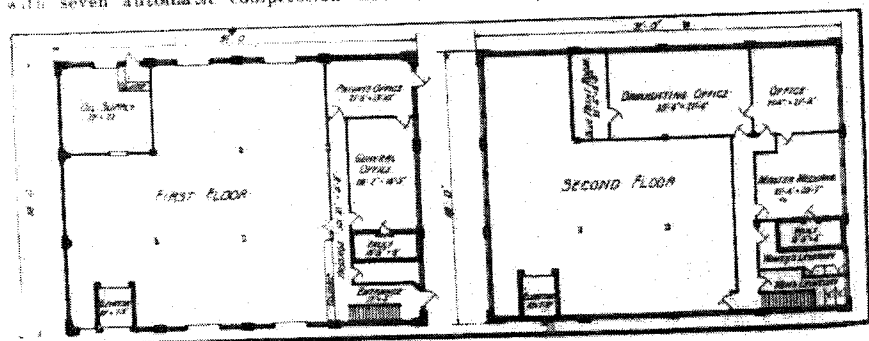
Directly alongside of the stair well is

above the sill line, and extends to under side of roof, being supported over window and door openings by steel lintels. The building consists of two bays, the one on the east side being 66 ft. and the one on the west side 44 ft. wide. Lengthwise of the building there are 10 bents at 22 ft. each.

Over the 44 ft. bay is a single pitch steel truss supported by steel columns at each end, with a clearance below to floor line of 18 ft. 2 ins. This truss carries 1 beam purlins which in turn carry the concrete slab roof. Over the 66 ft. bay, with a clearance of 32 ft. above the floor line, is a steel truss with a steel monitor framing, which is about 33 ft. wide and extends the full length of the building. 1 beam purlins are carried on both truss and monitor for the support of concrete roof slabs. These trusses are supported at the inside by the same columns that support the 44 ft. trusses and by steel columns at the wall. The inside and the outside wall columns are of heavy construction and at the top of 24½ ft. above the floor support a crane rail girder on which a 10 ton, 63 ft. 4 in. span electric travelling crane operates.

Steel sash are used exclusively, both sides of the monitor and that portion of the wall where the roof over the 44 ft. bay is lower than the one over the 66 ft. bay is equipped with two rows of 3 ft. high, pond continuous sash, for approximately the full length of the building, one row being fixed in each case and the other operated by gang operator from the floor. The steel sash set in the brick walls are of the unit type, which, in the south wall, are 19 ft. wide by 14 ft. high in one horizontal row, and in the north wall are two rows, the lower one being of units 19 by 14 ft., and the upper 19 by 11 ft. All the sash have pivoted sections, which may

be turned up or down, and partitions of sheet metal and sheet metal ceiling, all of which are supported on rolled steel sections. North of and adjacent to this office, is the tool room, 22 by 22½ ft., with crenelated block floor and steel framed partitions of sheet metal and wire mesh, 8 ft. high. North of the tool room is a space about 11½ by 22 ft., which is provided for a general and private lavatory. This lavatory is to be equipped with seven automatic compression closets,



A.C. & H.B. Ry. Store House.

enclosed in Brown sanitary water closet shields.

The erecting pits are located on the two through tracks leading from the locomotive house through the erecting shop. These tracks are on 21 ft. centres in the erecting shop. An electrically operated locomotive screw jack hoist is provided on one of these pits for unwheeling and mounting locomotives. The hoist consists of a pair of stationary screw jacks, and a pair of movable jacks mounted on rails outside of the pit rails. Each pair of jacks is provided with a lifting beam, which extends across

located a lavatory room with light from the windows in the outside wall. A door from this room furnishes access to the janitor's closet under the stairs. At the east end, a little to one side of the centre, is a brick vault 6 by 16 ft., which is directly underneath the vaults on first and second floors. In the northwest corner of the basement is the oil storage room, approximately 27 by 22 ft. The walls of this room are of expanded metal and cement plaster, with one doorway 4½ by 7 ft., equipped with double sliding automatic fire doors. Light and ventilation are admitted through windows in

of concrete.

The first floor is used for the storage of both light and heavy parts, in racks and bins, and necessarily all shipping and receiving is done on this floor from platforms through doorways 8 by 7½ ft., equip-

temporary wood platform 20 ft. wide for the full length of the building, and 25 ft. wide for a length of 40 ft. east of the building line, with a ramp 7 ft. wide and 30 ft. long, to grade level. A platform of the same type is built across the east face of the

basement. These tanks are used for the following kinds of oil: 1. car oil, capacity 500 galls.; 2. locomotive oil, capacity 500 galls.; 3. headlight oil, capacity 500 galls.; 4. valve oil, capacity 300 galls.; 5. signal oil, capacity 300 galls. The tanks are ¼ in. black steel plate, with all seams single lap, thoroughly riveted and caulked. Three of the tanks are 4½ ft. in diameter by 5½ ft. high, and two are 3½ ft. in diameter by 5½ ft. high, these dimensions being inside. All tanks have a 4 in. pipe connection at the top, which extends to the first floor, where fill boxes are set in concrete slab and have easily removable covers flush with floor, which, when taken up, and cap on end of 4 in. pipe is removed, allows of rolling a barrel over the filling box and filling the tanks by gravity. Connected to these 4 in. pipes, just above tanks, are 2 in. pipes, which extend through building wall to outside track along the platform, where they each have a stop cock and hose connection, thus providing a method of filling the storage tanks from cars. Each tank has a 1½ in. vent pipe extending 18 ins. above the roof. The tanks are set 1 ft. above the floor level on a concrete base, in which is a small trench under each tank to allow for a 1½ in. drain pipe and waste cock at the front of the tank. At the north side of this room, under the platform, is a fireproof room partitioned off for the storage of waste.

A tank for gasoline storage, 3½ ft. in diameter and 5 ft. long, is located 20 ft.

A.C. & H.B. Ry. Terminal Building under Construction, Dec., 1912.

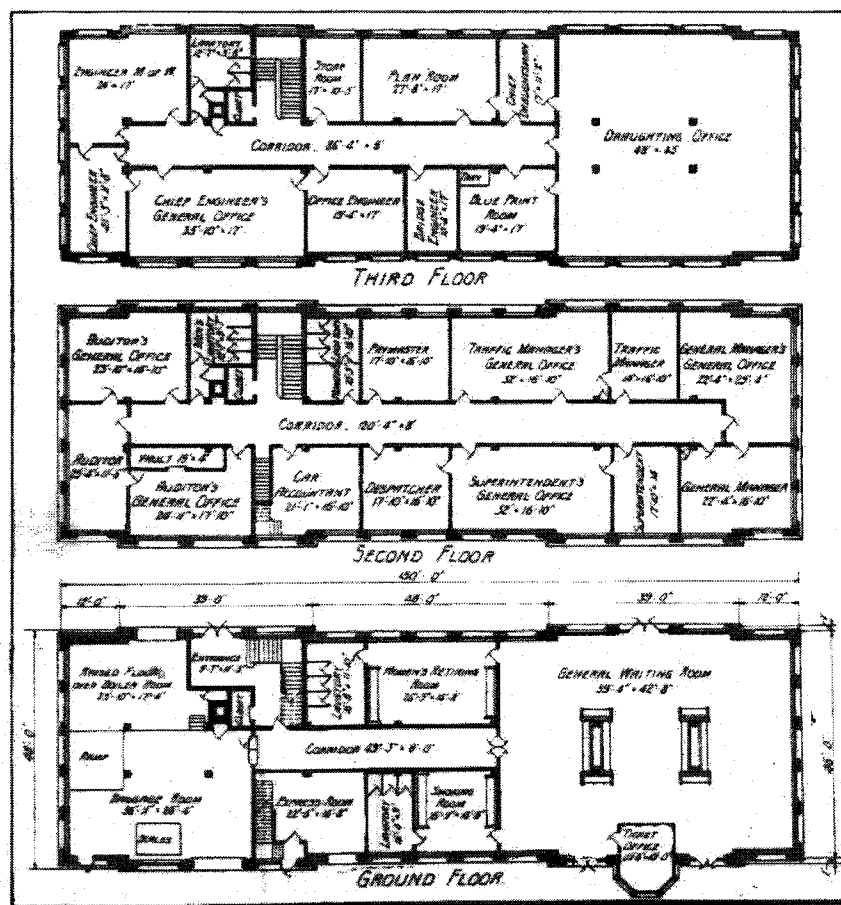
ped with rolling steel shutter doors, of which there are two on both the north and south sides. The main entrance is at the south end of the east wall. Just inside of the entrance is a stairway to the second floor and at the side of this is a hall, which leads to a counter in the storeroom. At the east end of this floor is located a small tool storeroom 5 by 16½ ft., a vault 6 by 15½ ft., a general office 16½ by 28 ft., and a private office 14 by 21½ ft. These rooms are partitioned off with wooden studs and lath and plaster walls, with the exception of the vault, which is of concrete. Access is had to these offices by a long hall at the back, running north and south, which is separated from the large storeroom by a long counter and railing with a pass gate. In the north-west corner on this floor is the oil supply room, which is fireproofed with expanded metal and cement plaster partitions and ceiling. The inside door is a double sliding automatic fire door, and access is had to the outside platform by a rolling steel shutter door and a pass door.

The superstructure above the first floor is made with steel lintels over door and window openings, steel columns and girders, and second floor of heavy joist and plank construction. The brick walls and steel columns extend to roof, with steel girders between columns, which support the heavy joists and sheathing. The roof is of low pitch type with standing gutters, and is drained by inside downspouts of cast iron pipe connected to cast iron downspout heads at roof and to the sewer in the basement. Barrett 5 ply specification roofing is used and is finished off at edges with overhanging roof with copper gravel

The second floor is used for the storage of material and also for offices. These are partitioned off with wood studs and lath, and all the walls and ceilings of the offices are plastered. The rooms consist of the Master Mechanic's office, 30 by 21 ft., a private office 21 by 21 ft., a draughting room 12 by 36½ ft., a blueprint room 9 by 21 ft., a concrete vault 6 by 15½ ft., and two lavatories. This whole building is well lighted from all sides by large windows of the sash provided with adjustable, pivoted, louvering sections. A hand power elevator runs up all floors and basement is located in the southwest corner of this building, the dimensions of which is 7½ by 10 ft., with a capacity of 2,000 lbs. and a lift of 23 ft. On the north side of the store house, outside of the concrete platform, there is a

building, and provides storage space for parts that may be left exposed to the weather, also for additional receiving and shipping facilities, and the ramp provides for trucking to and from the building.

OIL STORAGE EQUIPMENT: The equip-



A.C. & H.B. Ry., Bruce St. Terminal Station.

ment of the oil storage room in the basement, and the oil supply room on the first floor of the storehouse, is very complete towards providing an efficient and clean system of oil handling and storage. The storage of oil is in five tanks located in the

west of the building, and is buried in the ground below frost line, and encased with 6 ins. of concrete. The filler pipe projects from the ground directly above the tank and a 1½ in. suction pipe extends to pump in oil supply room. This tank is also equip-

this point. There is a full clearance of 23½ ft. from base of rail to under side of the girders. This extension is 1½ miles long to the site of the terminal station at Bruce St., and lies along the water front of the St. Marys river.

THE TERMINAL STATION AND general office building is located on Bay St. at the foot of Bruce St., the east line of the building being on the east line of Bruce St., locating the main entrance into the station directly across Bruce St. It is a thoroughly modern and substantial structure, 46 by 160 ft., with three stories, a small basement, and a loft under its pitched roof; and, with the exception of the roof framing, the building will be fireproof. Construction was begun on April 21, 1912.

On the ground floor is located the general waiting room and ticket office, women's waiting room, men's smoking room, express room, separate entrance hall (giving access to the offices by ample stairway, and by provision for an elevator), and the baggage room. Along the street side, the floor of the baggage room is 3½ ft. higher than its main floor. The two elevations are connected by an inclined runway, but in addition baggage can be delivered directly from trucks to the high elevation and from there drawn into drays at the elevation of the wagon box. The second floor provides space for the General Manager's general and private offices, the Traffic Manager's general and private offices, the Superintendent's general and private offices, the Auditor's general and private offices, the Car Accountant's office and the Train Dispatcher's office. On the third floor will be located the Chief Engineer's general and private offices, office of the Bridge Engineer, the Engineer in Charge of Maintenance of Way, the office engineers, drawing room and Chief Draughtsman's office, plan room, blueprint room and store room. Lavatories are provided on all floors.

The footings are of concrete and were carried back below the elevation of the river. The foundation walls from the footing to ground are of rubble, 2 ft. thick. The walls of the building are of hard native sandstone from the Root River Quarry, grading in from a grey to red brown. From the water level to the first story sill course, the walls are of rock faced coursed masonry. Above this line, rock faced, hammered ashlar masonry being used. The first-story walls are 18 ins. thick, second story 18 ins., and third story 18 ins. The cut stone trim is of red sandstone, Entry sandstone, from Houghton, Ontario, and blends well with the native sandstone.

The trim consists of water table, flat and arched lintels of first story windows and windows, a heavy belt course at the level of the second floor, sills and cornices of the second floor, and a heavy lintel course of the third floor. The windows are surmounted by a heavy copper cornice and gutter, and the building will be covered by a pitched roof of Vermont variety, green and purple slate. A hipped roof covers the main entrance opposite the baggage room. Provision has been made for train sheds of the umbrella type, to be built in the future.

The structural supports of the interior of the building are two rows of seven steel columns and concrete piers carried to rock foundation, and one additional column in the center containing the elevator shaft and forming 24 bays; 16 of approximately 20 ft. along the sides of the building and carrying the offices, and 8 of approximately 9½ by 20 ft. down the middle of the building and carrying the corridors. These form the girders between columns and between the end columns and the masonry walls. The second, third and fourth floors are of reinforced concrete and are of the type known as the Johnson sys-

tem, resting directly on the floor, except the portion over the basement, which is reinforced.

The building will be heated with steam and the mains will run from the basement, where the boilers are located, through tunnels under the first floor. The building will be electric lighted. Conduits are carried from floor to floor through a wiring duct, with distribution closets at each floor, and the circuits for any one floor are carried in conduits laid in the concrete of the floor above. All partitions are of hollow tile and are plastered. Exterior walls are plastered on metal lath carried by metal furring. Stairs are of steel. Floors of entire first floor and of corridors and lavatories of second and third floors are of granolithic finish. Remaining floors in building are of maple or rough sheathing and sleepers, anchored in concrete. The general interior trim is red oak.

The present concrete train platforms will extend 100 ft. each way from the station, giving a total length of 350 ft. Walks will extend along the east side and front. The space at the west end of the station for 60 ft. out will be paved.

All outside work, including grading, tracks, etc., is being done by the company's forces. Plans for this building were made by the Arnold Co. and the McPhail & Wright Construction Co. are the contractors.

THE FREIGHT HOUSE is a frame building on solid concrete walls and piers, covered with corrugated iron and a prepared felt roof. It is 32 by 112 ft., with an office in the east end, and was built by the McPhail & Wright Co. on plans furnished by the railway company.

All the above work is being carried on under the writer's general charge as Chief Engineer, with J. A. Hedgecock in direct charge of the forces. L. B. Wulff, as Superintendent for the Arnold Co., in charge of their part of the work, and H. H. Dickinson, Engineer in charge of this work at the Chicago office, have rendered excellent service to the railway company. The writer is indebted to Mr. Dickinson for the above description of the terminal buildings. All outside work is being rapidly completed, and the inside work at the shops and station buildings will run into the winter. The Mechanical Department took possession of the Locomotive House on Dec. 1, and has been using it regularly since.

In addition to the above terminal work, the railway company is considering the construction of a modern coal dock with unloading machinery and storage capacity at this point. A similar dock is also planned for Michipicotee Harbor and Little Current.

Maintenance of Way by Contract.

The article on this subject in Canadian Railway and Marine World for October, pg. 507, and the extract from a railway official's letter published in the November issue, pg. 559, have aroused considerable interest among maintenance of way officials. The following contribution from J. B. Cameron, Somerset, Pa., will also be read with interest:—

This subject has received more or less consideration from maintenance of way officials for several years without any railway of prominence as yet adopting the system; but such failure does not in any way indicate that a system of contracting would not result in increased efficiency and decreased costs, both of benefit to the railways.

Efficiency is the slogan of the day in all branches of railroading and especially in the maintenance of way department. Wages

worker has not kept pace with them. It has on the contrary decreased, and this is to be expected, since the price of labor depends entirely on the economic laws of supply and demand and a large demand results in small supply, increased wages and increased indifference on the part of the laborer.

If increase in wages will not result in increased efficiency it is apparent that any other scheme offering even a suggestion of improvement is worthy of careful consideration.

There are but two methods, the writer believes, that will increase the efficiency of the worker and they are, first, by awakening an interest in the laborer for his work, and second, by increased efficiency in supervision. Either scheme is in its elements a contract scheme, for to awaken in any laborer an interest in his work can only be accomplished by making his earnings depend on results and not on a fixed amount per diem. Thus the laborer becomes in a measure a contractor, and increased efficiency in supervision can in a similar manner be best obtained by making the cost to the railway company depend on results and not on a fixed daily wage.

To contract for work it is necessary to have unit costs on which to base payment for same, but a just basis for such payments can only be arrived at after careful study and investigation. There are many classes of work that have been thus standardized, and in railway maintenance work any material increase in the efficiency of the worker will only result after such a standardization as will insure to the laborer adequate compensation for a fair day's work.

The writer does not believe the method of awarding contracts for such work to a large contractor to be desirable at present, but he does believe in treating each foreman as a contractor in some such fashion, as is done by certain large industrial concerns. Men will do more work for the same individual as a contractor than they will do for him as a foreman of a railway company. As a contractor the foreman could therefore do work cheaper than he could as a foreman, providing he gave the work the same efficient supervision in each case.

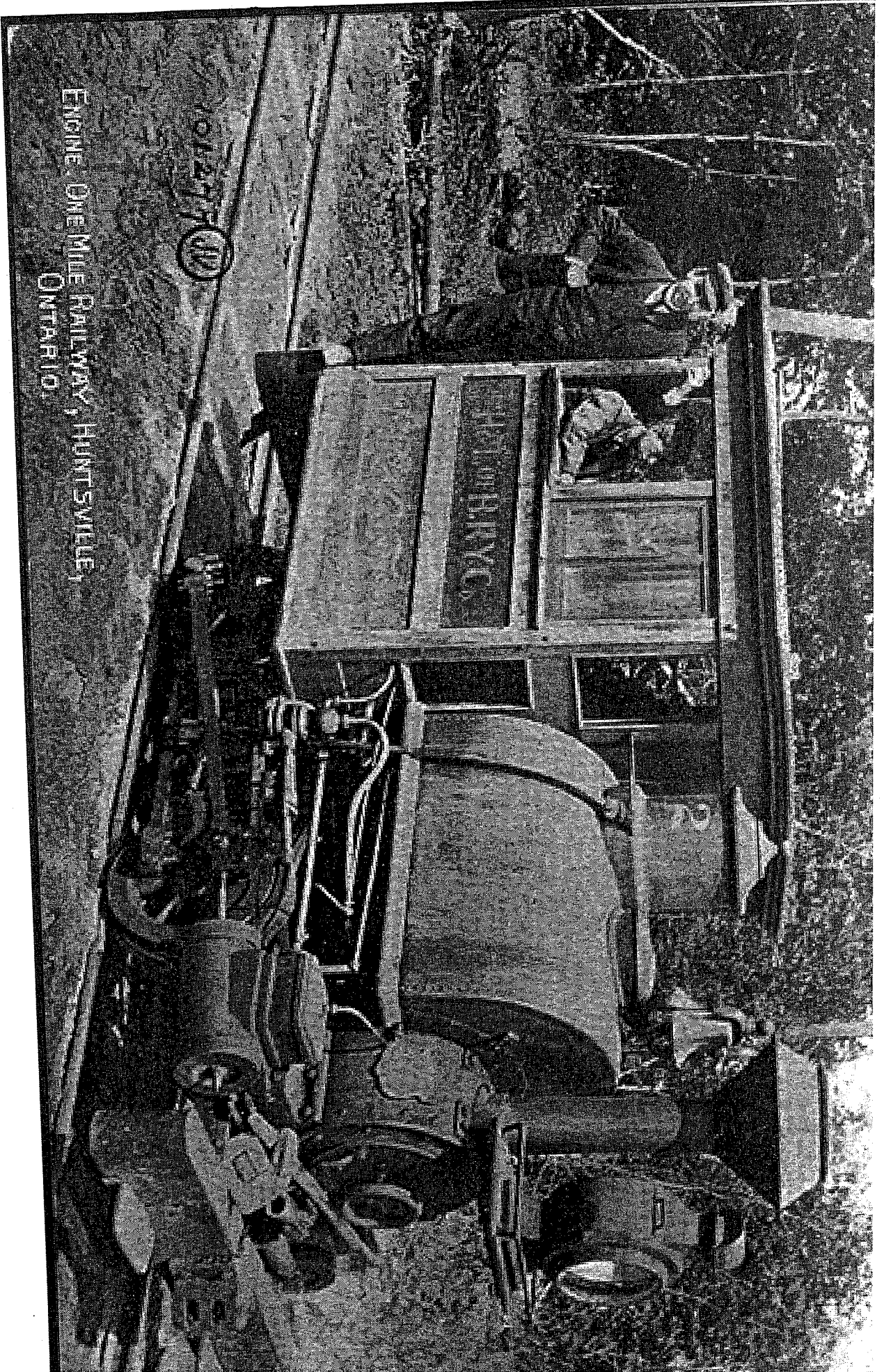
Some people will claim that a poorer grade of work would result from such an arrangement, as the contractor, in order to obtain larger profits, would be satisfied with a poorer grade of work. This might well be answered, however, by considering the results obtained by the contract system on construction work. Engineering Record.

The Alaskan Railroad Commission, after having completed an extensive tour through the territory, spent some time recently in Ottawa, Ont., investigating the methods of building railways in the northern regions and the Government attitude thereto, before returning to Washington to prepare a report.

W. M. PORTEOUS, Agent, Canadian Pacific Ry., Freight Department, St. Louis, Mo., in remitting renewal subscription, writes: "I might state that I enjoy reading Canadian Railway and Marine World very much, as it is the only reliable means of information regarding Canadian railway matters in general which I receive."

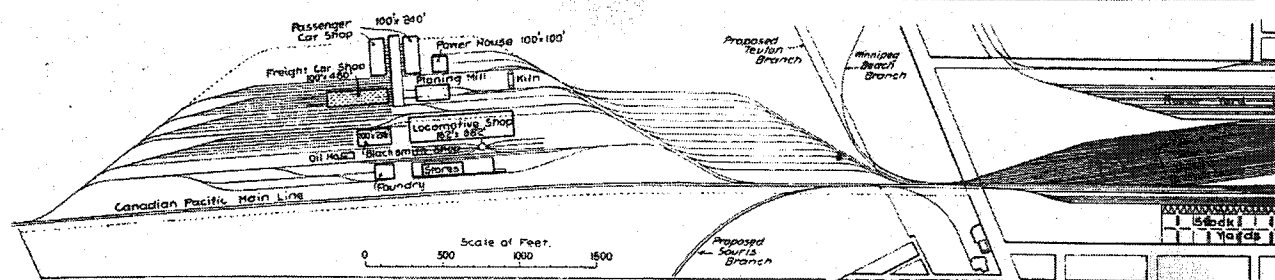
The Interstate Commerce Commission recently dismissed the Humboldt Steamship Co.'s application for the establishment of through routes and joint rates, with the White Pass and Yukon Route, between Seattle, Wash., and Dawson, Yukon, and other Canadian points, on the ground that it had no jurisdiction over a company located, owned and operated in a foreign

ENGINE ONE MILE RAILWAY, HUNTSVILLE,
ONTARIO.

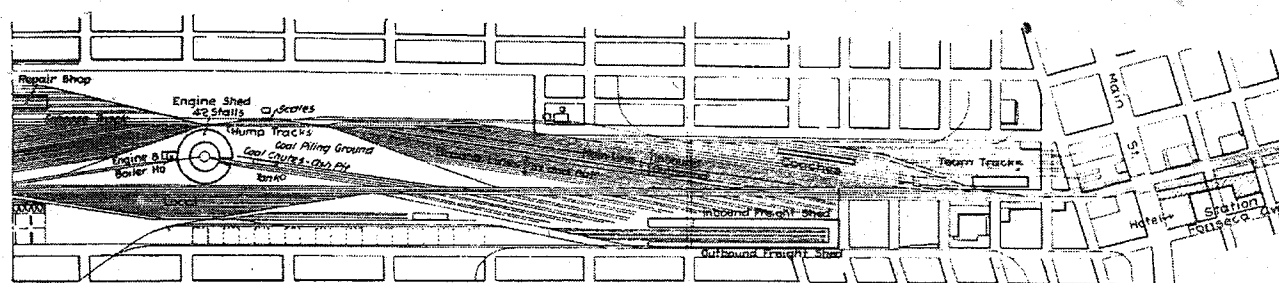


Huntsville and Lake of Bays Ry.—The grading on the mile of railway being constructed under this charter by the Huntsville, Lake of Bays and Lake Simcoe Navigation Co., between Lake of Bays and Peninsula lake, Ont., is nearly completed, and track-laying will be commenced at once if the weather continues favorable. It is expected that a train will be running within three weeks after tracklaying has commenced. Steel rails 56 lbs. to the yard will be laid. Professor Kerry, of McGill College, laid out

CANADIAN
PACIFIC
RAILWAY
WINNIPEG
TERMINAL



WESTERN PORTION C. P. R. TERMINALS AT WINNIPEG.



EASTERN PORTION C. P. R. TERMINALS AT WINNIPEG.

C.P.R. Betterments, Construction, Etc.

Atlantic and Northwest Ry.—The Dominion Parliament at its current session passed an act extending the time for the completion of the lines authorized by the act of incorporation of the A. and N. Ry. (June, pg. 193.)

Grade Reduction at Farnham.—Press reports state that work is in progress near Farnham, Que., on an extensive piece of grade reduction.

Piles Jet. to Grand Mere.—The C.P.R. has been given, at the current session of the Dominion Parliament, an extension of time for the construction of its proposed line from Piles Jct. to Grand Mere, Que. (June, pg. 193.)

Place Viger Yards Extension.—After lengthened discussion and negotiation the Montreal city council has passed a resolution permitting the C.P.R. to close up certain streets in the vicinity of the Place Viger station, with the object of extending its yard accommodation there. (Oct., 1903, pg. 355.)

Toronto-Toronto Junction Double Track.—The double-tracking of the line between Toronto and Toronto Junction has been completed and ballasting is in progress. Nothing had been done beyond Toronto Junction June 25, but it is understood that the work is to be gone on with not only on the Owen Sound line as far as Weston or Kleinburg, but also on the Windsor and Detroit line as far as Streetsville. (June, 1903.)

Toronto-Sudbury Line.—F. Paget is assistant engineer at Wahnapiet, in charge of construction of the Toronto-Sudbury extension between Romford and Byng Inlet, Ont., having under him the following resident engineers in charge of 10-mile sections each: Residency no. 1, H. A. Le Sueur; Residency no. 2, H. B. R. Craig; Residency no. 3, R. Harcourt; Residency no. 4, E. L. Miles; Residency no. 5, A. J. Isbester. On the location south of Byng Inlet there are two parties in the field, one under H. M. Killaly, and the other under S. Keemlé, while on location working north from Woodbridge are also two parties, one under H. Carry, and the second under I. T. Morkill, who are all assist-

considerable information about the extensive works contemplated and under way by the C.P.R. at Winnipeg to meet the requirements of its greatly increasing traffic there. Early last year the company bought 350 acres west of its present yard site, and it is now utilizing this property for its new shops, etc. The improvements being made in the yard are of a radical nature, as the general layout has been entirely changed with the exception of the main tracks and a few of the branch line tracks serving the industries surrounding the yard. The plans provide for two combination receiving and classification yards for branch and main line traffic which are connected by means of two "hump" tracks. Each yard contains six inbound and six outbound main tracks, nine branch line tracks, six storage tracks and three independent running tracks. The yard is arranged with the locomotive shed, stand pipe, coal chutes and ash pit in the middle, and all freight is classified over the hump tracks. This system of having all the facilities convenient to the point where the engines are engaged will save a large amount of time and money. Other interesting and economical features are the arrangement of the weigh scales, which are on a descending grade, thus allowing cars to be separated and weighed by gravity without rehandling, and an elevated caboose track situated so as to be convenient to the outlet of the classification yard, so that cabooses can be attached to outgoing trains with little delay. The accompanying yard plan shows how both the local and main line traffic may easily be classified. The arrangement of the eastbound and westbound main tracks has not been changed, and they run directly through the lower part of the yard. The junction of the tracks of the branch lines to Souris, Teulon and Winnipeg Beach has, however, been moved further west between the main yard and the new car and locomotive shops. According to the new arrangement all the eastbound trains of both branch and main lines will pull directly into the west receiving yard. The cars are weighed in passing over the hump and are then classified on the main and branch line tracks in the eastern half of the yard. The same operation

new car, locomotive and other shops are being built to the west of the main yard. The new buildings include two passenger shops 100 by 240 ft., freight car shop 100 by 408 ft., planing mill 100 by 216 ft., power house 100 by 100 ft., locomotive shop 162 by 680 ft., blacksmith shop 100 by 216 ft., foundry 100 by 100 ft., and a stores building 85 by 260 ft., with a 200-ft. platform and offices above. Some of these buildings are nearly finished and all are under construction.

In the main yard proper a new locomotive house and freight sheds are being built. The locomotive house is of fireproof construction throughout, with walls of masonry, brick and concrete, and with roofs of concrete and steel supported on steel posts encased in concrete. It contains 42 stalls divided into four sections by brick fire walls. The turntable pit is 71½ ft. in diameter, and the inner wall is 95 ft. 2½ in. from the centre of the pit. The depth of the roundhouse is 80 ft. The outer door and roof supports are made of steel, and are 13 ft. 7 in. from centre to centre at the front circle, diverging to 25 ft. at the outside walls. The pits are 58 by 4 ft. wide. The walls and footings are of concrete, and the floor is paved with hard burnt brick on an arched bed of well-puddled sand. They are from 2 ft. 4 in. to 2 ft. 8 in. deep, and a catch water basin is built at the end of each pit. These basins are connected with 10-in. drain pipes graded to run to the main outlet. An easy inspection is obtained by this method and any blocking of drains can be remedied without digging or taking up the pipes. The track rails are bolted to the pit walls by wrought iron angle-shaped plate anchors placed in the concrete when the wall is built. The drop pit is built between and connects two pits and is 7 ft. wide. At the locomotive pits the opening is spanned by steel I-beams so arranged that they can be removed to facilitate the handling of driving wheels. The pit is 5 ft. 2 in. deep to the first floor level and has a car track 2 ft. in gauge. Under the track is an opening 1 ft. 5 in. wide and 5 ft. deep for the pneumatic jack. The roof is of concrete and steel construction and the main beams over the posts are of steel. The cross beams are built of steel rods and concrete.

Chateauguay and Northern Ry.—

has been served on the municipality of I Point, Que., to the effect that the company prepared to proceed with the construction of an electric railway on the main road of the municipality, and to connect the same with the main line of the C. and N. Ry. at the lines of the Montreal Terminal Ry. The line proposed to be constructed covers the district which the Montreal Park and Island Ry. Co. desired to enter, but which it was enjoined by the courts from entering.

By an arrangement with the C.P.R. the C. and N. trains will be switched over the former's lines from Hochelaga to the wharves, so that for some time it will not be necessary to construct an independent line to the water front.

Rapid progress has been made with the bridges over the river at Bout de l'Isle, and it is expected that the line will be opened for freight traffic early in Oct. The steel work on the western section of the bridge is nearly completed. The grading between Charlemagne, on the mainland, and Joliette is well forward and was expected to be completed by the end of Sept. Tracklaying has been going on for some time, and four miles, between L'Epiphanie and L'Assomption, was laid early in Sept. The rails, ties, etc., are all on the spot ready for laying. (Sept., pg. 305.)

The Colechester Coal and Ry. Co. has been incorporated under the Nova Scotia Companies' act with a capital of \$1,000,000, the promoters being J. Fleming, Halifax, and J. Hayes, M.D., Parrsboro, N.S., who have associated with them a number of prominent men, including officials of the Dominion Atlantic Ry. The company owns considerable coal areas at Debert, and has completed surveys for four miles of railway from the mines to Debert station on the I.C.R. There are no engineering difficulties in the way of construction; the grade will not exceed 1%, the total rise from the Debert station to the mine being only 150 ft., or 1 ft. in 140 ft. R. Archibald, C.E., made the surveys and is in charge of operations at the mine. (July, pg. 234.)

October 1903

CANADIAN
PACIFIC
RAILWAY

ANGUS
SHOPS

Hon. T. R. McInnes, formerly Lieut.-Governor of British Columbia, who died in Vancouver, B.C., Mar. 15, was father of Mrs. Jas. Wilson, wife of the Superintendent C.P.R. Telegraphs, Pacific division.

W. H. Rosevear, senr., General Car Accountant G.T.R., has been elected Mayor of St. Lambert, Que., to fill the vacancy caused by the resignation of the Mayor. Mr. Rosevear was Mayor in 1902 and 1903.

Mrs. J. J. Patterson, who died in Hamilton, Ont., Feb. 26, was widow of Thos. Patterson who died about the end of Dec., 1903, and mother of John Patterson of the Hamilton Cataract Light, Power and Traction Co.

Lieut. G. B. Johnston, Royal Engineers, a son of J. W. Johnston, ex-Mayor of Belleville, Ont., has been appointed to take charge of the telephone and telegraph lines connecting the fortresses and other defences of Ceylon.

W. Dow, formerly general air brake inspector C.P.R., Montreal, has resigned to take a similar position on the Erie Rd. under

eral Agent for Toronto in the Dominion Express Co.'s service.

T. H. Hopkirk, formerly chief clerk to the Superintendent of Motive Power C.P.R., was recently presented with a dressing case by the employees of the mechanical department at Montreal on leaving for a position on the Erie Rd. at Meadville, Pa.

Sir Thos. Shaughnessy, President C.P.R., sailed from New York, Mar. 9, for England, intending to join Lady and Miss Shaughnessy, who are on a tour through Europe. Lady and Miss Shaughnessy, while visiting Rome, had an audience with the Pope.

H. H. Gildersleeve, the recently appointed Manager of the Northern Navigation Co. of Ontario, was presented Mar. 19 with a gold watch by citizens of Kingston, Ont., on giving up his position as Manager of the Lake Ontario and Bay of Quinte Steamboat Co.

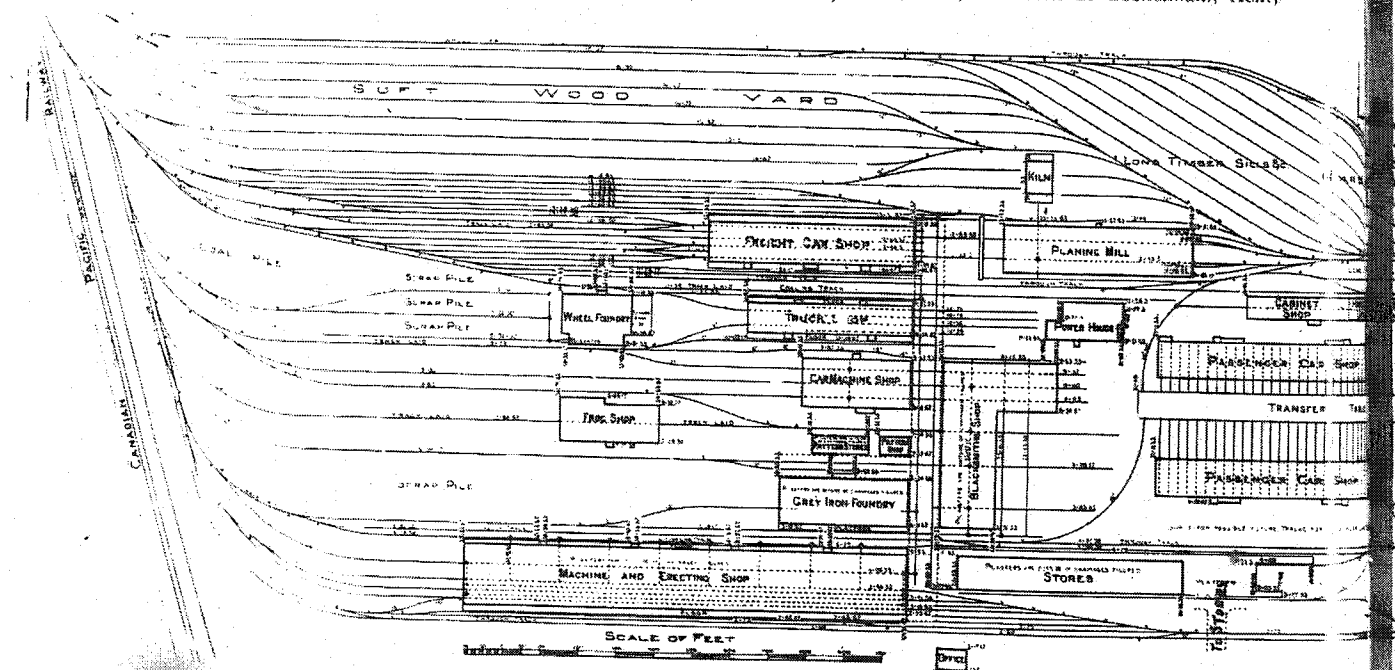
The Guelph, Ont., city council and board of trade have formed a joint committee for the purpose of collecting funds to present a suitable testimonial to Jas. Mills, L.L.D., formerly

and Mrs. Leonard, are making an extended trip to the Southern States. Press reports state that Mr. Leonard will shortly join one of the United States lines, the Atchison, Topeka and Santa Fe and the Southern Pacific being mentioned.

R. Currie, who died at Galt, Ont., Feb. 20, was father of C. Currie, 2nd Vice-President and General Manager Northern Ohio Traction Co., Akron, Ohio, and of Jas. Currie, Secretary-Treasurer Eastern Ohio Traction Co., Cleveland, Ohio, both of whom were formerly connected with the London, Ont., Street Ry. Co.

L. P. Duff, K.C., who has been appointed Judge of the B.C. Supreme Court, was a member of the firm of Bodwell & Duff, solicitors for the Victoria, Vancouver and Eastern Ry. and Navigation Co., and was also interested in the Victoria Terminal Ry. and Ferry Co., and other projects, promoted in the interests of the Great Northern Ry., U.S.

S. E. Dewey, who has been appointed Travelling Freight Agent G.T.R. at Hamilton, Ont., was born at Beckenham, Kent,



GROUND PLAN OF C.P.R. "ANGUS" SHOPS AT HOCHELAGA, MONTREAL. (See descriptive

E. A. Williams, Assistant General Manager, formerly Superintendent of Rolling Stock C.P.R.

W. Walsh, was recently presented with an address, gold watch, chain, and chain by the Toronto staff of the Dominion Express Co., on his giving up the position of General Agent to become Assistant to the General Manager.

H. Tompkins, one of the oldest of the operators of the C.P.R. telegraphs at Winnipeg, was presented with a travelling case by the night and day staffs, Mar. 20, on his resigning after 20 years service, to go to San Francisco.

L. Frappier, formerly a painter in the employ of the C.P.R. at its Hochelaga shops, has been found guilty of conspiracy to defraud the Company by procuring a third party to obtain money by false pretences. Sentence has been reserved.

H. P. Sharpe was entertained at dinner and presented with a cabinet of silver recently by the business men of London, Ont., on leaving there on his promotion to the position of Gen-

Principal of the Guelph Agricultural College, on his appointment as a railway commissioner.

W. P. Tierney, railway contractor, Nelson, B.C., fell off a trestle Feb. 18, at Granite siding to the rocks below, a distance of 40 ft., in endeavoring to escape being run down by a train. He was seriously cut about the head and face, and received some internal injuries.

Mr. Hays, wife of the 2nd Vice-President and General Manager G.T.R., was a passenger on a G.T.R. train which was snowbound for 42 hours in the Blue Cut, near St. Mary's, Ont., Mar. 3. She was on her way to St. Louis, Mo., from which place she has since returned to Montreal.

J. H. Manning, formerly Second Assistant Superintendent of Rolling Stock, C.P.R., at Winnipeg, Man., is reported to have been appointed Superintendent of Motive Power of the Delaware & Hudson Co., at Albany, N.Y., succeeding J. R. Slack, appointed Assistant to the General Superintendent.

L. W. Leonard, formerly Assistant General Manager C.P.R. lines west of Port Arthur,

Eng., July 4, 1879, and entered railway service with the G.T.R. in 1897, since which his record has been: 1897 to 1903, in Division Freight Agents' office, Toronto; May, 1903, to Mar., 1904, City Freight Agent, Hamilton.

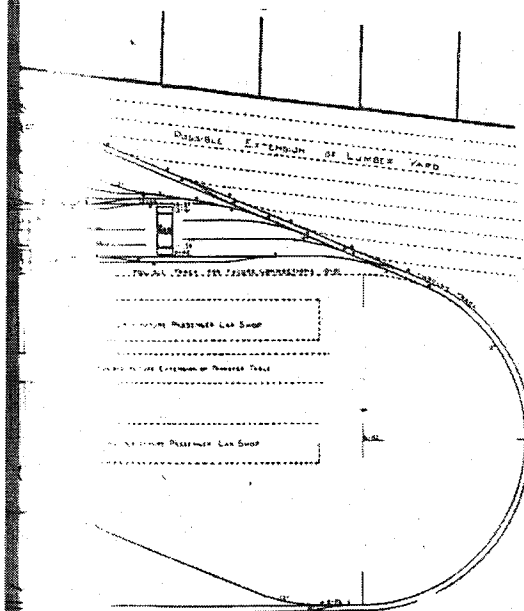
F. Lee, who has been appointed Assistant Engineer Western division C.P.R. at Calgary, was born at Chicago, Ill., Mar. 7, 1873, and entered railway service in Jan., 1895, as rodman and draughtsman on location and construction of extensions to the Government railways Trinidad, British West Indies; since which his record has been: May, 1896, to Nov. 1902, on construction and maintenance Chicago and Northwestern Ry.; Nov., 1902, to Jan., 1904, signal engineer C.P.R. at Montreal.

Hon. M. E. Bernier, who has been appointed Deputy Railway Commissioner for Canada, was born in St. Hyacinthe, Que., in 1841, brought up on his father's farm, studied law and admitted to practice as a notary in 1867. He has always taken an interest in farming, and has been owner of a farm near St. Hyacinthe. He has been President of the local agricultural society for 15 years, and has

been connected with industrial establishments and banking institutions. He represented St. Hyacinthe in parliament for 22 years, having been first elected in 1882. From 1900 to 1904 he was a member of the Railway Committee of the Privy Council.

R. E. Tate, First Vice-President Engineers' Club of Toronto, entered railway service in 1871 as rodman on surveys and construction of the Midland Ry., now part of the G.T.R., and was Chief Engineer for five years ending 1881. He was subsequently resident engineer in charge of double track construction and a branch to the Sarnia tunnel for the G.T.R., and was with the C.P.R. during the construction of the line between Farnham, Que., and Mattawankeag, Me.; the Smith's Falls extension in Ontario; and the Crow's Nest Pass line, as well as being engaged on survey and other work. Since 1900 he has been resident engineer for Mackenzie, Mann & Co. at Toronto.

W. T. Marlow, who has been appointed Import Freight Agent C.P.R. at Montreal, was born in Limerick, Ireland, Oct. 25, 1872, and



entered railway service with the C.P.R., Sept., 1886, since which he has been consecutively: Sept., 1886, to Sept., 1888, in train dispatcher's office, Toronto; Sept., 1888, to Mar., 1889, in Assistant Superintendent's office, Toronto; Mar., 1889, to 1895, in office of Assistant Freight Traffic Manager, Toronto; 1895 to 1896, in office of General Freight Agent, Toronto; 1896 to 1902, in office of General Agent C.P.R. at Hong Kong. After six months' leave of absence, he was appointed in Mar., 1903, assistant to the Foreign Freight Agent, Montreal, remaining there until his present appointment.

J. Cardell, who has been appointed Master Mechanic Central Division C.P.R. at Winnipeg, was recently entertained at dinner by the railway officials and residents at Calgary, Alta., where he had been acting Master Mechanic Western division, on the occasion of his leaving to take up the duties of his new position. The C.P.R. shop employees presented him with a gold-mounted cane, and the conductors gave him a pipe. Among those present were: R. R. Jamieson, General Superintendent; J. Niblock, Superintendent; J.