

Overhanging housings to permit of planing plate edges in successive settings. Motor driven.

S7 Plate straightening rolls. Capacity $\frac{5}{8}$ in. plates. Distance between housings, 4 ft. 2 ins. Six 10 in. rolls arranged in two tiers, equal number above and below. Independent vertical and horizontal hand adjustment. One upper roll central with bottom roll, with others intermediate. Lower rolls at 10½ in. centres. Motor driven.

S8 Horizontal punch. 24 in. throat, with capacity for 1 in. hole in 1 in. stock, and having 3 gag punching attachment. Similar runway to that with S5. Motor driven.

S9 Structural steel punch. Capacity for 1 in. holes in 1 in. steel. Maximum c. to c. distance of outside punches is 38 ins., with depth of throat to centre of cast steel sliding head, 24 ins. Beam coping attachment so arranged that a beam coped at one end can be passed through without turning beam in the shop. Fitted with 8 complete gagged punching attachments. Main frame of partial steel. Spacing table arranged to handle beams from 10 to 20 ins. for both flange and web punching, and for 24 in. plates. Equipped with adjustable rollers for supporting beams and plates, and with guide rollers

in. gap, and capacity of 1 in. rivets with 80 lb. air. Equipped with four overhead electric hoists, each with capacity for 5,000 lbs., on a runway over centre line of pit. Runway is 160 ft. long, and bracketed to columns to give a clearance of 10 ft. for the hook in its highest position. 100 ft. pit.

S14 Metal cutting band saw. 36 in. wheels. Motor driven.

S15 Eight spindle arch bar drill. 10 ft. long. Three step cone drive geared 1 to 4. Motor driven.

S16 Double end punch and coping machine. Capacity for punching 1¼ in. holes in 1 in. steel, and for shearing 1 in. plates, 1½ in. round bars, 6 by 1½ in. flat bars, and 4 by 4 by ¾ in. angle bars. Throat, 25 ins. Motor driven.

S17 Bulldozer. Crosshead face, 89½ by 16 in., with 24 in. stroke. Die space with crosshead forward, 44 ins. Motor driven.

S18 Bulldozer. Crosshead face, 63 by 12 ins., with 20 in. stroke. Die space, 38 ins. Motor driven.

S19 Rapid action punch. Capacity for 7/8 in. holes in 5/8 in. steel at rate of 65 strokes per min. Throat, 16 ins. Motor driven.

S20 Draw bench. 50 ft. long, with pull-

wheels.

Triplex 3 by 8 in. hydraulic pump, with capacity of 35 gallons a minute against 1,500 lbs. pressure. Motor driven.

Thus, the parts enter the shop from the east, the sills and large plates, etc., passing along through the plate planer and beam punch, etc., to the rivetter, while the smaller parts pass down on the other side through the punches and shears, etc., to the rivetter. Forgings are made alongside, and such parts as can be so handled, are here assembled, before final assembling on the car. The cold working machinery is in the early part of the path, then the hot working machinery, and then the final assembly of the parts on the car. The routing is excellent, with no retrograde steps.

Along the south wall of the freight car shop, extending from the midway to the lavatory annex near the centre of the building, there is a storage platform, 288 by 21 ft. on the level of the ground. Centrally down this platform, there is a 2 ft. service track, with two turntable connections into the building, as well as connections at the front end of the platform. This platform is surfaced with 3 in. planking.

Along the outside of the platform, there is

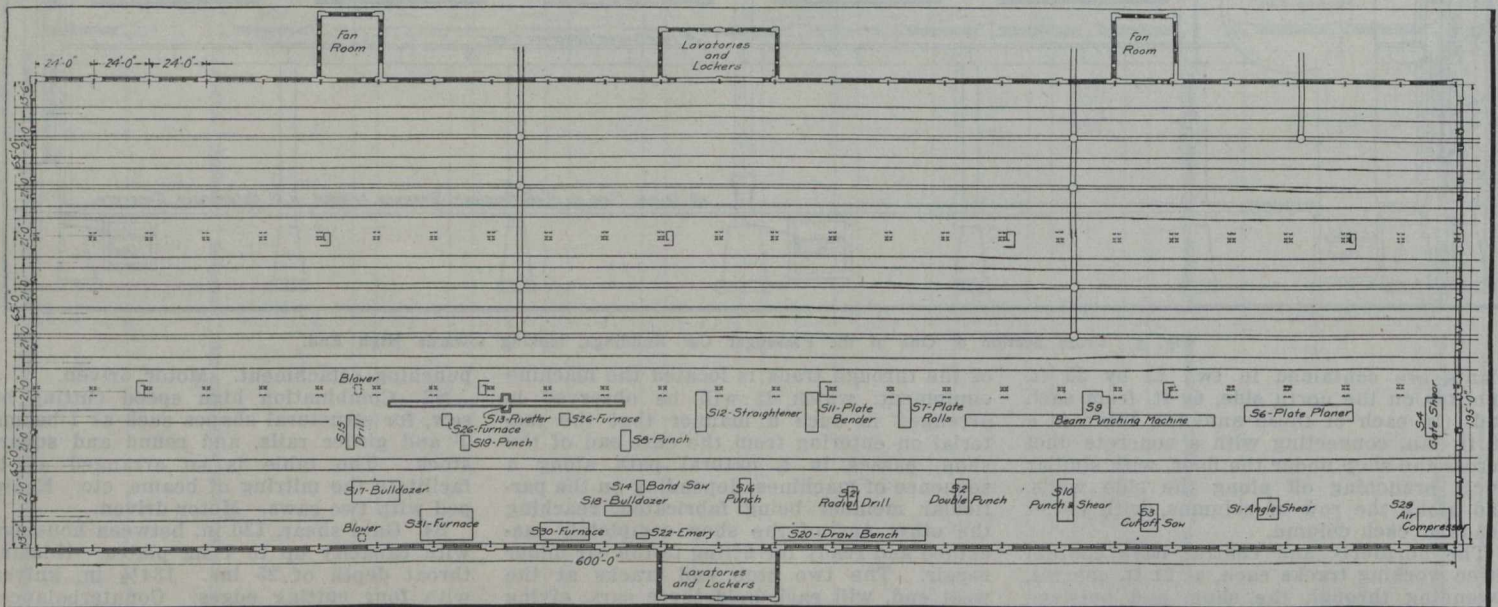


Fig. 4. Plan of Freight Car Shop, showing Machine Tool Layout in the Steel Car Shop Section.

on the punching fixtures to align the work. Carriage moved by hand carrying a pawl which drops into a notched strip along side of bed. Table length suitable for 40 ft. carriage travel. Weight about 64,000 lbs. Motor driven.

S10 Double end punch and shear. 18 in. throat on each side, and with a capacity to punch 3 in. hole in 2 in. steel, or shear 10 by 2½ in. bars, or 4½ in. rounds. Main frame partial steel. 5 in. stroke. Weight about 100,000 lbs. Motor driven.

S11 Plate bending rolls. Capacity for bending 10 ft. width of 5-16 in. plate. Pyramid arrangement of rolls, upper one 8 ins., and lower ones 6 ins. Top roll with solid extension for balancing, and back housing hinged for removal of plates rolled to complete circles. Lower rolls 7¾ ins. c. to c. Motor driven.

S12 Horizontal bending and straightening machine. For 15 in. I beams and channels, either way. Jaw, 51½ ins. wide, 26 ins. deep, and 16½ ins. high. Weight about 30,000 lbs. Bending ram to operate continuously when in use, and fed up to the work by a heavy screw and revolving nut, with a total adjustment of 4½ ins. Main frame of steel. Motor driven.

S13. Rivetting machine. 72 in. reach, 18

ing capacity of 10 tons. Motor driven.

S21 4 ft. radial drill. High speed type. Capacity, 1 in. hole, 8 ft. 1½ in. drill radius, and greatest height from base to nose of spindle, 4 ft. 10½ ins. Spindle traverse, 15 ins., and head traverse, 3 ft. 4¼ ins. Motor driven.

S22 Double emery grinder. 24 in. wheel, 3 in. face. Motor driven.

S26 Two stationary rivet furnaces. Oil fuel.

S29 Air compressor. Capacity, 1,000 cu. ft., at 110 lbs. pressure. Two cranks, two stage, double acting, motor driven.

S30 Double furnace. 8 ft. wide by 6 ft. deep by 2½ ft. high per chamber.

S31 Double furnace. 9 ft. wide by 3 ft. high by 12 ft. deep per chamber.

In addition to the foregoing stationary equipment, there are other machines in the shop as follows:

Pipe bending machine complete.

Oxygen welding outfit, complete with tanks, 3 welding torches, 1 cutting torch, 8 welding tips, reducing valves and pressure gauges for oxygen or blaugas. Four 50 ft. lengths of hose for the torches.

Six portable rivet furnaces, complete with oil burners, oil reservoir, fan, and flexible compressed air connection. Mounted on

also a light shed on the platform, 170 by 8 ft., with a height in front of 8 ft., sloping to the rear to 7 ft. This shed contains storage bins for the freight car shop.

There is a similar platform along the north side from the fan annex to the midway, with service track midway down its length, with connections into the building. The platform has a 50 ft. long stock bin shed.

This article will be continued in our next issue.

Hardwood Ties on Panama Rd.—The use of ties of lignum-vitae (guayacum resina) is a notable feature of the track construction of the Panama Rd., and the ties have given remarkably long service, those of good quality lasting for about 30 years under the tropical conditions on this road, even though unprotected by tie plates. The best quality of this timber is no longer available, however, as it is so valuable for use in connection with machinery and manufacture that it is not to be had at suitable prices for railway ties. Owing to its durability, the renewals on this 50 mile railway ranged from 4,000 to 10,000 a year (1880-1895) or 80 to 200 per mile, with an average of 7,000 or 140 per mile.