

One Landis duplex screwing machine, 1' 8" between spindle centres,

5 speeds, belt-driven.

Two belt-driven two-spindle ball bearing horizontal stay drilling machines, 24" between spindles.

Made by: F. Pollard & Co. Ltd.

Eastern end of Centre or Main Bay:

One hydraulic 14' 6" gap riveter for barrels up to 6' 6" diameter. This machine is capable of exerting pressure of 33 tons to 66 tons.

Made by: Fielding & Platt.

One hydraulic 17' 6" gap riveter, capable of exerting pressures of 33, 66 and 99 tons.

Made by: Fielding & Platt.

For service at the Riveting Pits, the following machines were provided:-

Three portable horseshoe hydraulic riveters of the hinged type. Gap, 24" x 14". Capable of exerting a pressure of 40 tons.

Made by: Henry Berry & Co.

Three portable Bear type horseshoe hydraulic riveters. Gap 24" x 14" wide, capable of exerting a pressure of 40 tons.

Made by: Henry Berry & Co.

Six portable hydraulic hoists, 6' capacity, 30 cwt, at 1,560 lb per sq inch.

Made by : Henry Berry & Co.

One portable hydraulic horseshoe riveter, 1' 6" gap, with a hydraulic hoist on jib crane. Capable of exerting pressure of 30 and 50 tons.

Made by: Fielding & Platt.

One portable hydraulic horseshoe riveter with 1" 9" gap. Capable of exerting pressure of 30 and 50 tons.

Made by: Fielding & Platt.

Stands for inserting copper wall stays by pneumatic machines, supported on jib cranes.

One hollow spindle lathe for trimming up crown stays and longitudinal stays.

Made by: Craven Bros.

One jig for setting up boilers for final riveting.

One pneumatic flanging press for quickly flanging plates up to 1/2" thick.

Manufactured by: Messrs McCabe.

Boiler test pits were provided at western end of the Centre or Main Bay.

Three complete electric welding motor generator sets were located in the Centre/Main Bay, and these with power points suitably placed allowed welding operations to be carried out with a minimum of movement of the work. Each set consisted of a direct coupled motor and generator, with a direct coupled exciter on a cast iron bed plate. The starting switches were oil immersed. Motor: 'Squirrel' cage type. 25 cycle 3-phase 440 volts. Speed, 1,430 R.p.m. Output at 20 volts, 75, 110, 150 and 200 amps. No load voltage, 60. Continuous rating, 15 amps. These machines were capable of supplying 200 amps for one hour and 250 amps momentarily. Manufactured by Electric Construction Co., Wolverhampton, England.

One Plate and Die Rack at the northern side of the shop and within the span of the Goliath crane. The dies were located to suit the flanging presses, and the plates were arranged in suitable sections for easy handling by the crane.

Power House

This was located to the south east of the boiler shop.

The compressed air service was supplied by a P.R.E. type Ingersoll-Rand electrically driven compressor delivering 1,500 c. feet of free air per minute at 100 lb pressure per sq in, the motor being 250 h.p., operating at 214 r.p.m. on 440 volt, 25 cycle, 3 phase current.

The circulating water was cooled by being passed through Little's patent water coolers, which were capable of treating 2,500 gallons of circulating water per hour.

In the same building were two electrically driven three-throw vertical hydraulic pumps, with a capacity of 25 gallons per minute each, at a pressure of 1,560 lb per sq inch. The drive in each case was from a 50 h.p. induction motor, 470 revs per minute, 440 volts, 25 cycle, 3-phase, automatically controlled by an electric cut-out on the accumulator guides. The pumps had been manufactured by Henry Berry & Co.

The air and water pipes throughout the workshops were suspended between building columns to be accessible for maintenance.

The general shop motors operate on 440 volt, 25 cycle, 3-phase alternating current.

7.3 Substation

At the time of the inspection in September 1927 this building was unfinished.

The substation was to be a structure 150' long x 37' wide built to accommodate the following plant -

- 4 x 450 kW 600 volt rotary converter units
- 1 x 650 kW 1,500 volt rectifier
- 3 x 500 kVA 3-phase, 6,600/440 volt, 25 cycle transformers
- 2 x 750 kVA 3-phase 11,000/2,200 volt, 50 cycle transformers
- 2 x 1090 kVA 11,000 volt, 50 cycle potential regulators

The D.C. 600 volt and the 440 volt A.C. switch gear was of the open switchboard type, while the switch gear controlling the higher voltages was to be of the draw-out switch cubicle type, and fully metal clad gear was used for the 2,200 volt supplies.

The substation was designed to control an ultimate connected load in the workshops of 11,500 h.p.

An automatic telephone exchange for the shop services was to be incorporated into the substation.

Provision was also made for the necessary switch operating batteries and auxiliary plant, and accommodation for the operating staff.

7.4 Permanent-Way Workshops

By September 1927, work had commenced on the erection of a shop consisting of four bays, each 50' x 400'. The roofs of the shops were to be of saw-tooth construction - a design which would provide efficient lighting and ventilation.

The workshops were to accommodate the equipment from White Bay, the site of which was shortly to be taken over by the Harbour Trust.

Two and a half bays were to be used for the fabrication of steel structures, such as bridges, roofs, etc. and the remainder of the shops were for blacksmiths, machinists, fitters and the manufacture of points and crossings. Patternmakers were to be accommodated nearby in the saw mill building from White Bay. The wheelwrights were to have a small building beside the patternmakers.

It was planned that raw material from railway trucks would be fed into the shops at the southern end then handled by 5-ton travelling jib cranes operating on the railway tracks. After fabrication the items would be loaded directly on to railway trucks at the northern end.

The shops were to be fitted with 5-ton electric cranes, with the exception of the structural erecting bay where a 25-ton crane with auxiliary hoist would be installed. Using the latter, small bridges could be completely fabricated in the shops and lifted straight on to trucks.

7.5 Welding Shop

The welding shop consisted of a building 50' wide x 200' long, with an annex and an outside crane runway 200' long. It was equipped with a 5-ton electric overhead crane and machinery for cutting and straightening steel sections. It was noted that there was an overall plan to use electric arc welding for the more efficient fabrication of structural work.

Eleven arc welding sets were in use in the manufacture of signal bridges, overhead structures for the electrification of the suburban lines, and other light work for which welding was seen as an alternative to riveting.

7.6 Workshops For The Signal Engineer's Branch

The workshops were erected to replace the original signalling workshops which had been absorbed into the extensions for the city railway works. Work began in July 1924 and was completed by December 1925.

By September 1927 the signal engineer's workshops occupied a site of some twenty-nine acres adjacent to the Liverpool Road/Hume Highway, about one mile beyond the point at which the road crossed the goods lines at North Enfield. The shops were connected with the goods lines by a short branch railway.

The layout of the shops was designed for the progression of material during the process of manufacture. Most material to be used in suburban areas was transported by road because it was more economical to deliver it straight to the site. For this reason it had to be possible to drive motor lorries throughout the shops. Material for the country continued to be transported by trucks.

The following are details of some of the machinery in the respective shops -

Compressor Room

The direct coupled motor driven compressor, of 1,062 feet capacity of free air per minute, supplied air to the whole of the workshops, including the air hammers.

The water used for cooling the air compressor was passed through a water-cooling tower, pumped to the top of the tower from the compressor return sump by a 2-inch centrifugal pump, direct coupled to a 2 1/2 h.p. motor. After passing through the cooling vanes to an overhead tank, the water gravitated back through the compressor to the return sump.

Tinsmith's Shop

In this section, in 1927, almost all signalling and traffic lamps were manufactured, as well as footwarmers and signalling materials of various descriptions. The plant consisted of power presses with special dies, and a spot-welding outfit.

Foundry

The foundry was laid out to deal with all iron, brass, and alloy castings required for the signalling work.

Pattern Makers and Pattern Store

Here patterns were both manufactured and repaired. They were stored in the pattern store with duplicates of all important patterns kept in a separate section.

Blacksmith's Shop

A special feature of the blacksmith's shop was converted steam hammers working under air pressure. There was also a gas muffled furnace for heat treatment of high speed steel.

In the construction of the hammer foundations, a bed of compact sand was put in before the concrete was laid, and pitch pine was placed between the hardwood timbers of the anvil block. A series of louvre shutters operated by screw adjustment allowed for the louvre to be adjusted to any angle.

Ambulance Room

The ambulance room was fully equipped with modern first aid appliances for the treatment of injuries. It was centrally situated with a road constructed to allow the ambulance car to come right to the door.

Bright Steel and Iron Casting Store

This store was adjacent to the fitting and machine shops. The racks were specially constructed for easy access to the light sections of material, and the bins and racks were laid out in sections for accessibility. The manufacture of the electric interlocking machines required large stocks of a great variety of small parts.

Machine and Fitting Shops

Special provision had been made in these shops to deal with the manufacture of mechanical and electrical interlocking machines in addition to general signalling work. The line shafting was run on roller bearings. It had been cut down to short lengths to provide for individual motor grouping, which had been arranged as far as possible.

Two of the automatic screwing machines in operation in the machine shop dealt with all screws used in the signalling shops, from No. 7 B.A. to No. 11 B.A. and 1/4" Whitworth to 7/8" Whitworth. A third and larger machine was used for turned pins of all descriptions, from 1/4" up to 1".

In 1927, power interlocking machines were being manufactured and erected for electric and electro-pneumatic power signalling interlockings at important junctions relating to electrification and the city railway. They were also manufacturing mechanical interlocking machines for work outside the immediate Sydney district.

Electrical Fitting Shops

The whole of the electrical fitting, testing, coil winding, electrical repairs and assembly of electrical fittings was carried on in this shop. A feature of the work then in progress was the new colour light signals specially designed for the city railway and electrification work.

The items in process of manufacture in this shop were -

- Relays, direct current, of all descriptions, for signalling
- Electrically selected route indicators
- Electric releasing switches
- Electric signals
- Electric level locks
- Solenoids for electro-pneumatic working

Ferro-concrete Work

In this section all the concrete units used in connection with the signalling work were manufactured, together with special features such as concrete pegs, concrete troughing, and foundation units for the ground gear.

Structural Steel Work

General work relating to the assembly of mechanical signals was carried on in this section.

No 1 and No 2 Stores

The general items for signalling work were stored in No 1 store. Heavier materials and wire of all descriptions were kept in No 2 store.

Oil Store

A central oil store, in course of erection in 1927, was to deal with all supplies of oils, etc. for motor vehicles and for general signalling purposes. Petrol was to be delivered in bulk to the bowlers and issued by storemen to departmental vehicles. Oils were also to be delivered in bulk, and distributed as necessary to the various sections of the shops for dispatch to country depots.

Paint Shop

The paint shop dealt with the general signalling and traffic section of the work.

Carpenters and Joiners' Shop and Mill

This work covered the signalling and general requirements of other branches for cabinet making. The whole of the wooden troughing used for signalling and for telephone work was manufactured in this shop.

The exhaust system here was divided into two, one dealing with shavings and the other with sawdust. The shavings system had a double No. 6 Invincible exhaust fan driven by a 70 h.p. motor, discharging into 10' 6" diameter Cyclone type separator, passing then to an incinerator built up from an old boiler shell.

The system for dealing with sawdust had a No. 1 Invincible exhaust fan driven by a 7 1/2 h.p. motor, and discharging into a 5' 0" diameter Cyclone type separator, after which the material passed to a bin for bagging.

There were also 'sweep-ups' at appropriate places to dealing with floor sweepings, etc.

Timber Racks

The timber racks were situated near the mill with a fire-break between. Sidings were provided for the delivery of timber to the racks by truck.

Works Manager's Office

This was a bungalow built of ferro-concrete units manufactured in the concrete section of the workshops. In 1927 it was noted that ample ventilation had been provided and that the wide verandahs were to ensure comfort during the heat of summer. For winter requirements, a hot water heating system had been installed throughout the rooms.

7.7 Electric Car Repair Shops

The electric car repair shops were established adjoining the site of the future carriage shops. This was to be the main repair depot for all electric cars used on the city and suburban railway and the works were designed to provide maintenance for a total fleet of two thousand cars.

The layout had been planned so that the works could be built in four approximately equal instalments each of which was to be complete in itself. By September 1927 the first section - maintenance of five hundred cars - was complete and the second section underway.

Prior to designing the workshops, a study was made of those overseas.