



Burlington's Shop Saves Time . . .

Power Assembly Overhaul Is One-Level Operation

Power assembly overhaul is performed at varying intervals on each Burlington diesel unit in the road's West Burlington, Iowa, shop. Engines are removed from the locomotive units for this work. The "Q" has found that working these engines on the shop floor releases overhead cranes for other work, reduces repair time, and makes engine work easier and safer.

Once out of the carbody, engines are moved to the adjoining heavy machine bay for disassembly. At post locations are $\frac{3}{4}$ -ton electric hoists which facilitate parts removal. Parts reclamation work areas are connected with conveyors.

Eight men are assigned to an engine, each with a definite work position. Their responsibilities are to remove the foundation bolts, and then follow the engine to the floor where parts are removed and disassembled. Following this, replacement assemblies are applied and engine is returned to the unit. It takes about 2½ hrs to remove an engine, and two 8-hr days for the complete overhaul operations. While the work described

power, similar simplified procedures are followed on Alco and Baldwin units.

Each power assembly—head, piston, liner and connecting rod—is removed as a unit at the engine repair station. All parts of this assembly go first to the lye vat for cleaning after being placed in vat boxes which are handled by shop tractors and trailers. The lye vat is located outside to keep undesirable fumes and odors from the main shop. After cleaning, two men remove the head from the liner, and the head is stripped of its valves, springs and keepers. Rods are separated from the pistons and wrist pins and bushings are removed. Rings removed from the pistons are scrapped. Wrist pins are put in a separate container and sent to the small engine parts

cleaning room. There they go through a cleaning solution, are inspected and checked for wear, and are then either returned to service or scrapped. No reclamation is done on wrist pins.

Liners

Liners removed from the lye vat are placed eight on a special trailer for sand blasting. Water ports on the C liners are protected by steel plates, and liners with lower seals have the seals left in place for this operation. After being returned to the conveyor line, they are checked and marked for rebore, honing or scrapping. Ridge reaming is not done. Instead, rebore operations are based on 0.030 in. and 0.060 in. oversizes, then the liner is scrapped. Liners worn about 0.004 in. are honed. In this case, the port relief zone is not touched. Liners are then wiped clean, lower seals removed (upper seals are left on for a water test), and they are moved on the conveyor to an American Pace Maker lathe adapted for boring. The boring

On Our Cover . . .

Diesel engine repair shop at West Burlington, Iowa, is the area where engines are placed after they are removed from locomotives. Parts removed here are then transferred to the adjacent heavy machine bay (shown above) where the processes described



Liner reclamation is handled in the area at the center. Behind and to the right is the conveyor system for heads. Post cranes and tramrails facilitate materials handling at various steps in the processes.

roughing and finishing tool, and does the job in one operation, including the port relief. No honing is done after boring. The next operation is an 80 psi water pressure test. Following final cleaning, studs are inspected and checked for length. All seal surfaces are wire brushed. The edges of holes on the inside of the port relief zone are chamfered, and the new size is restenciled on the liner. From here they go to assembly. The present output of rebored liners is 16 per day.

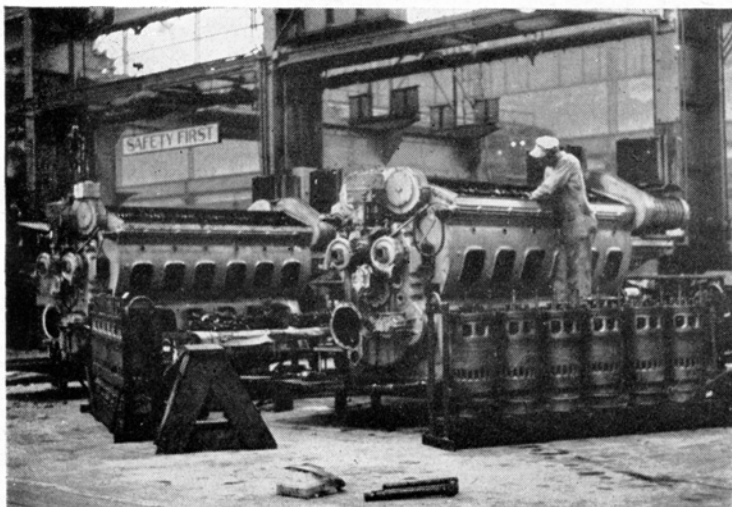
Heads

After cleaning, heads are returned to the cylinder head department where they are unloaded and placed face down on a trailer for sand blast. Each trailer holds ten heads and is tractor handled. Cleaned heads are inspected and those with cracks go to the welding booth.

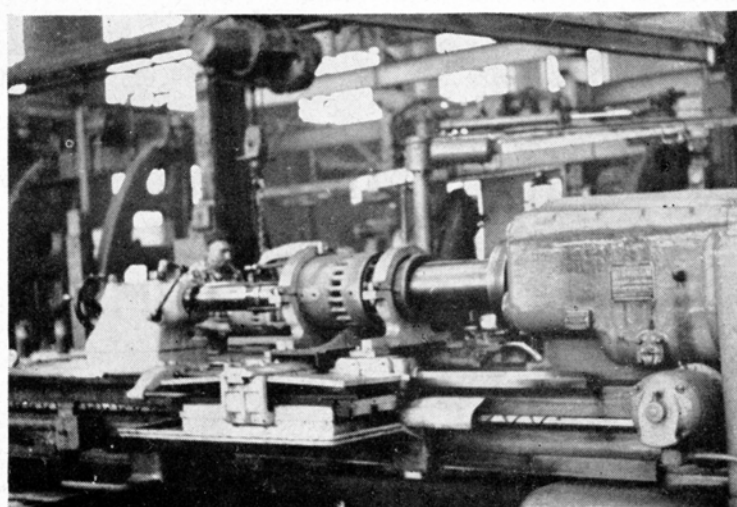
In handling heads not requiring welding, a reamer is run through the valve guides, and the relief valve hole is re-drilled and retapped. Heads meeting a pressure test of 80 psi go to a drill press

for recutting of the valve seats to proper clearance. Next operation is on a boring mill where the upper head seal groove is polished and the head is faced if necessary. The railroad has developed its own standards in maintaining the proper distance between the face and head retainer seat, if the head is faced.

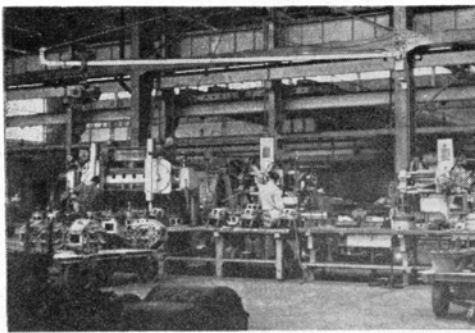
A lapping operation follows. The work is done on a 54-in. Putnam boring mill with an adapter table having fixtures to lap seven heads at once. The fixture is designed to impart a rotary motion to



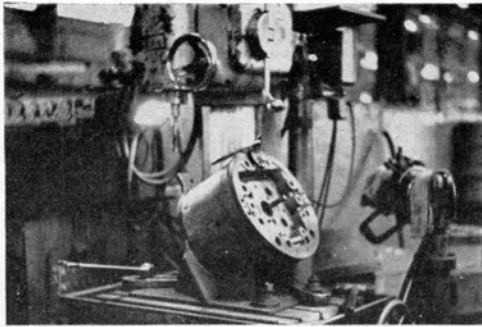
Engine assembly area is equipped with cranes which make it unnecessary to



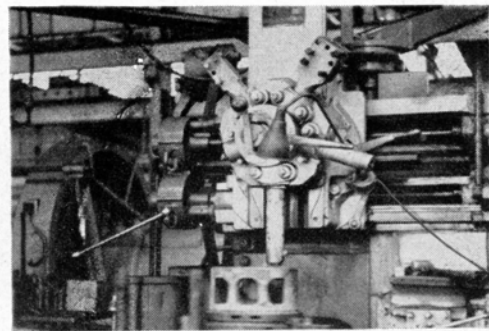
Spring loaded boring bar equipped with both roughing and finishing tools



Head conveyor line connects the various reconditioning stations. Sequence of these operations is from right to left.



Special jig holds EMD head for the redrilling and tapping of the relief valve hole. Burlington has installed much special tooling.



Upper head seal groove is polished at this station. The head is faced here if that is necessary.

heads while the table revolves. During this time, the operator inspects studs and the injector well seats on other heads on a bench. After lapping, the heads are wire-brushed, and a final pressure test is given. The heads then move by conveyor to the valve-seat grinding operation. Two oscillating, Hall-Toledo, valve-seat, hand-type grinders produce thirty-five heads per day. With an additional man on the grinder, fifty heads can be turned out.

The final station is assembly of valves, springs and locking collars with a hydraulic spring compressor in one operation. The completed heads can either be used immediately or sent to the storeroom.

Cracked heads have the cracks melted out and welded with Heliarc equipment. All studs are removed before welding. The heads are preheated to 1,400 to 1,450 deg F in a lined circular metal box applied to a welding positioner. The box is supplied with covers having various openings to match the location of cracks. The positioner can be tilted at any angle to facilitate welding. After welding, the heads go through the drill press and boring mill operation on machines assigned to handle repaired heads. They are then placed on the regular production line conveyor for lapping and subsequent operations.

Pistons

Pistons from the lye vat are sorted by size, placed in lift truck skips in quantities of thirty-six, and brought to the repair line for visual inspection and pressure test. In the next operation, the pistons are mounted in a lathe and given a 5-min rotary wire brushing. This is followed by checking and cleaning grooves, and then removing shoulders on an adjoining lathe. Where groove width exceeds manufacturer's wear limits, the piston is scrapped. Cleaned and inspected pistons are magnafluxed and made ready for assembly with repaired liners.

The piston carriers are also cleaned and inspected. If the pilot on the carrier is worn, it is metallized and finished. A new bushing is applied, rough turned and broached with a shop-made tool made from a steam locomotive wrist pin. The broach is pushed through the bushing under hydraulic pressure. The bushing is then finish bored to size.

Connecting Rods

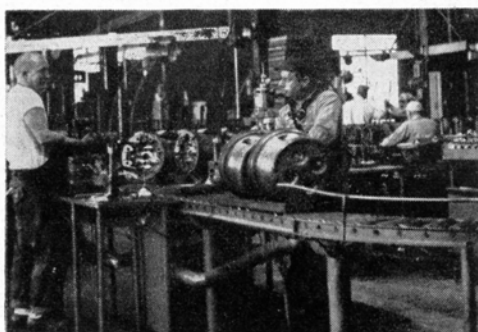
After rods are cleaned and Magnafluxed, they are trucked to the diesel engine department and placed in racks. The floating bushing is applied and each rod is checked for length, straightness and slipper surface. Each basket is kept with its rod. Metal spray is used to re-

store baskets to size. This is followed with a ground finish to assure correct length of the rod and fit on the bushing. The rods then move to assembly where all power parts are assembled and placed in wooden racks holding either four or six complete power units. These are handled by a crane to floor engine locations. Book records are kept in the assembly department showing the serial numbers of the engines, size of liners, pistons, heads, whether parts are new or reclaimed, date of repair, and other information.

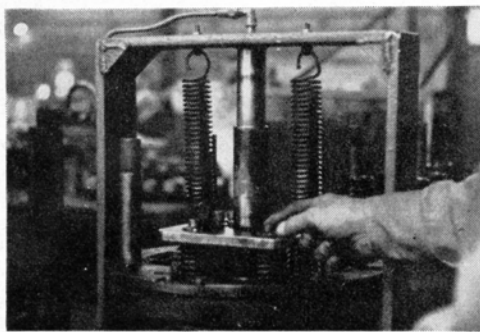
Engine Lubrication

When necessary to remove power assemblies at maintenance points, the injectors and connecting rods are also changed out, rocker arms are inspected, and lash adjusters and wrist pins renewed if necessary. Replacement assemblies are furnished from West Burlington and parts removed are returned for reclamation or scrap.

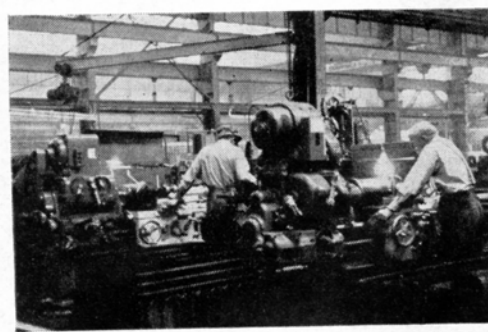
A straight mineral base lube oil is used in Burlington passenger and freight engines. This oil is changed at 48,000 and 40,000 mile intervals respectively. Blotter tests and spectograph analyses are not done. The oil removed is reclaimed. Samples are then checked in the laboratory at Aurora, Ill., and reclaimed oil is generally re-used in all classes of power.



Conveyor brings the heads to the valve seat grinding station. The operator is shown at the right.



Valves, springs, and locking collars are assembled at this station with a shop-made hydraulic machine.



Pistons are wire-brushed at the back. The other machine removes shoulders and cleans up ring