MAINTENANCE INSTRUCTION

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION • LA GRANGE, ILLINOIS, U. S. A.

SANDING EQUIPMENT
(Graham-White And Brewster)

GENERAL DESCRIPTION

The following Maintenance Instruction covers the complete sanding equipment used on switcher, passenger, and freight locomotives. Description, operation and maintenance of the following units are included: operating valve, sand traps, agitator tube and automatic "E" valve.

The operating valve used on passenger locomotives is a single acting valve incorporated in the automatic brake valve. To operate, the handle of the automatic brake valve is pressed downward, which in turn depresses the bail ring and opens the valve, permitting air under full main reservoir pressure to pass through the valve and down to the piston side of the automatic "E" valve. The single acting operating valve is for sanding in forward movement only, Fig. 1.

The operating valve used on freight locomotives is a single acting, manually operated valve, located on the wall of the cab to the right of the engineer's seat. When the operating valve handle is pulled backward, the intake valve moves down permitting air under full main reservoir pressure to pass through the valve and down to the piston side of the automatic "E" valve. This single acting valve is for sanding in forward movement only, Fig. 2.

The operating valve used on 600 and 1000 HP switcher locomotives is a double acting valve located on the wall

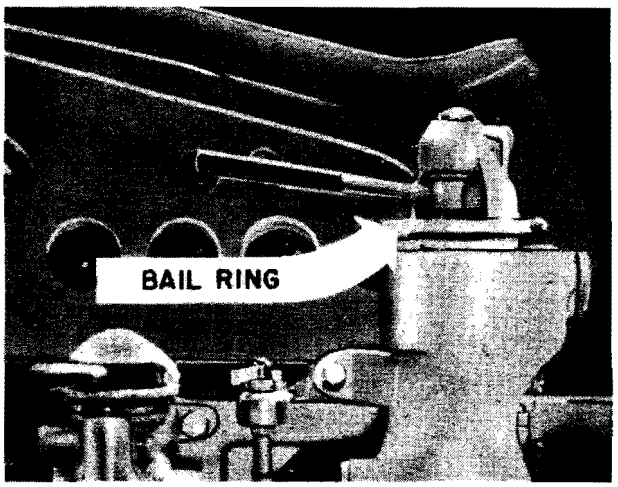

Fig. 1 - Automatic Brake Valve

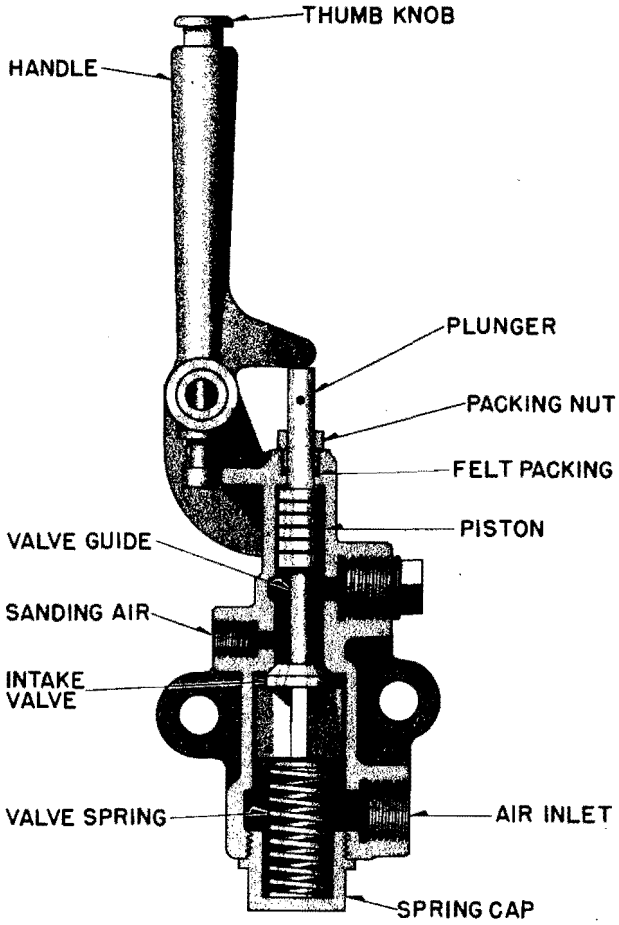

Fig. 2 - Freight Operating Valve

*This issue supersedes and cancels all previous issues of M.I. 1206 Rev. A.

of the cab to the right of the engineer's seat. The double acting valve is for sanding in both forward and reverse movements. As the operating valve handle is pushed forward for sanding in forward movement or pulled backward for sanding in reverse movement, the piston and intake valve moves downward. This permits air under full main reservoir pressure to pass by the intake valve and out the cleaning air and the sanding air outlet. One sand operating valve operates eight sand traps, four traps for forward movements and four traps for reverse movements, Fig. 3.

As the valve passes from closed to sanding position, where it latches, it passes through the cleaning position which allows full reservoir air pressure to flow for a moment through the cleaning port in the traps for cleaning the sand delivery pipes. The sand pipes and traps are automatically cleaned with a momentary high pressure blast of air before and after each sanding operation. This is entirely automatic, requires no effort on the part of the engineer, and insures sand under all conditions of rail or weather. The lever or handle should never be held in cleaning position unless pipes are badly clogged, and then for a few seconds only.

Normal sanding occurs until such time as the operating valve is placed in its off position. The orifice in the plunger, Fig. 2, of the operating valve is then exposed to the atmosphere and the charge of air in the 1/4" actuating line and in the cylinder on top of the actuating piston is then bled through this orifice. It takes approximately five seconds for the air to bleed through this orifice. Should the engineer pump the operating valve, the delayed action of the controlled sanding would not produce any variance in sand delivery to the rail as excessive clean out air cannot be combined with normal sanding air. This prevents the waste of sand and air.

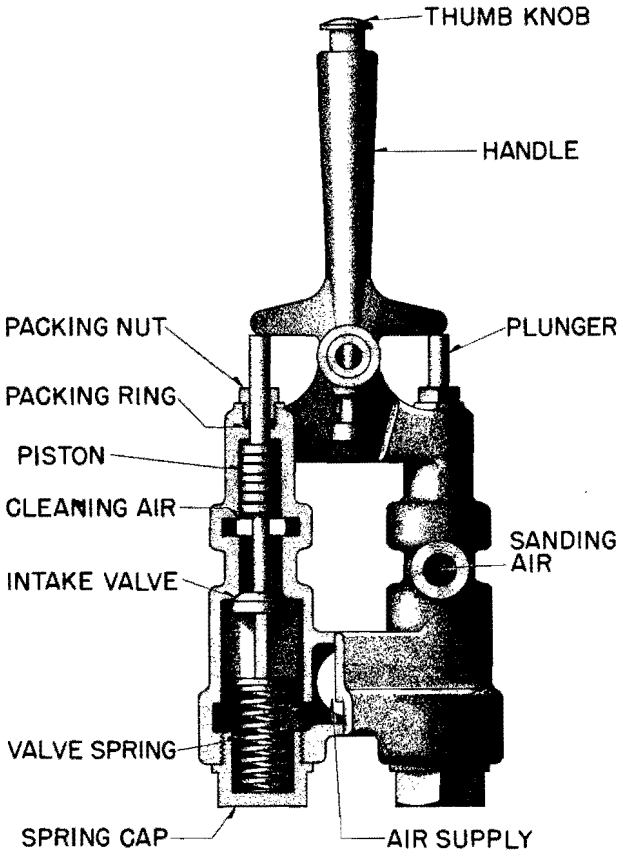

Fig. 3 - Switcher Operating Valve

The following information pertains to Graham-White sand traps, however Brewster sand traps are similar in design but do not have an agitator tube in the housing; all air that passes into the clean out port leaves through the sand pipe delivery tube.

The sand traps are located beneath the carbody underframe and mounted in front of the wheels to be sanded. All sand traps are gravity fed. When the operating lever in the cab is moved to the sanding position, main reservoir air enters the operating valve, located in the cab of the locomotive. Main reservoir air actuates the automatic "E" valve (passenger and freight only) and then enters the sand traps where sand is delivered to the rails.

NOTE: Switching locomotives do not incorporate an automatic "E" valve, but have a similar unit in the operating valve as explained above for switching locomotives.

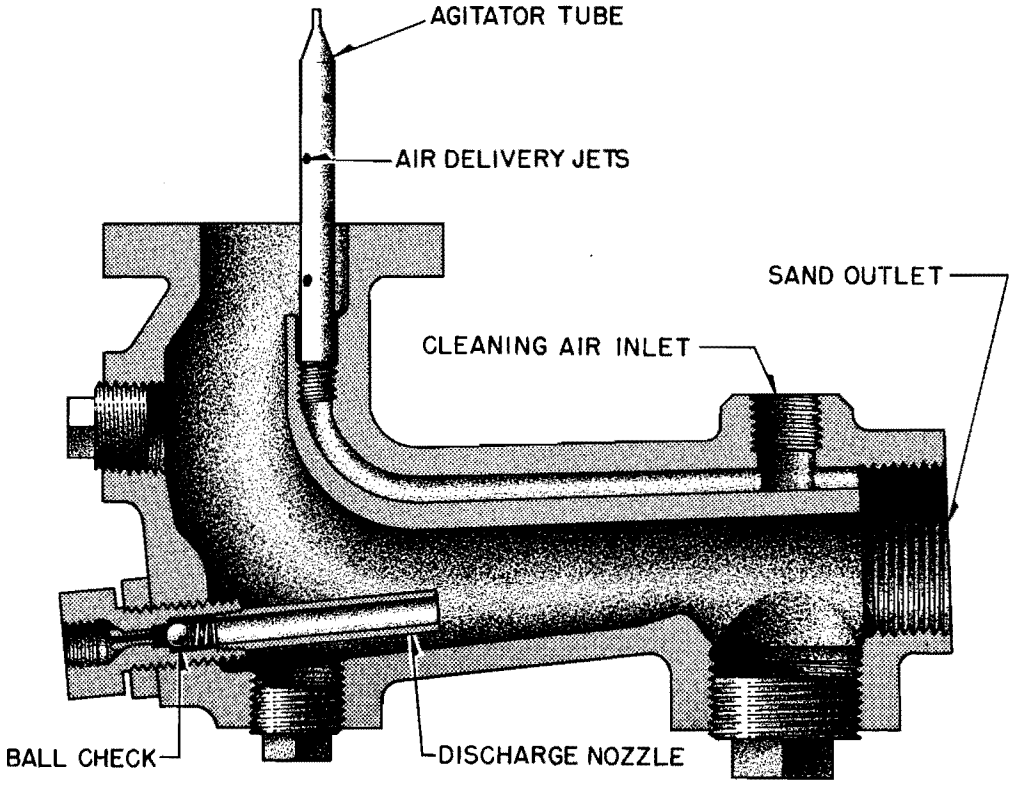

Fig. 4 - Graham-White Type "E" Horizontal Sand Trap

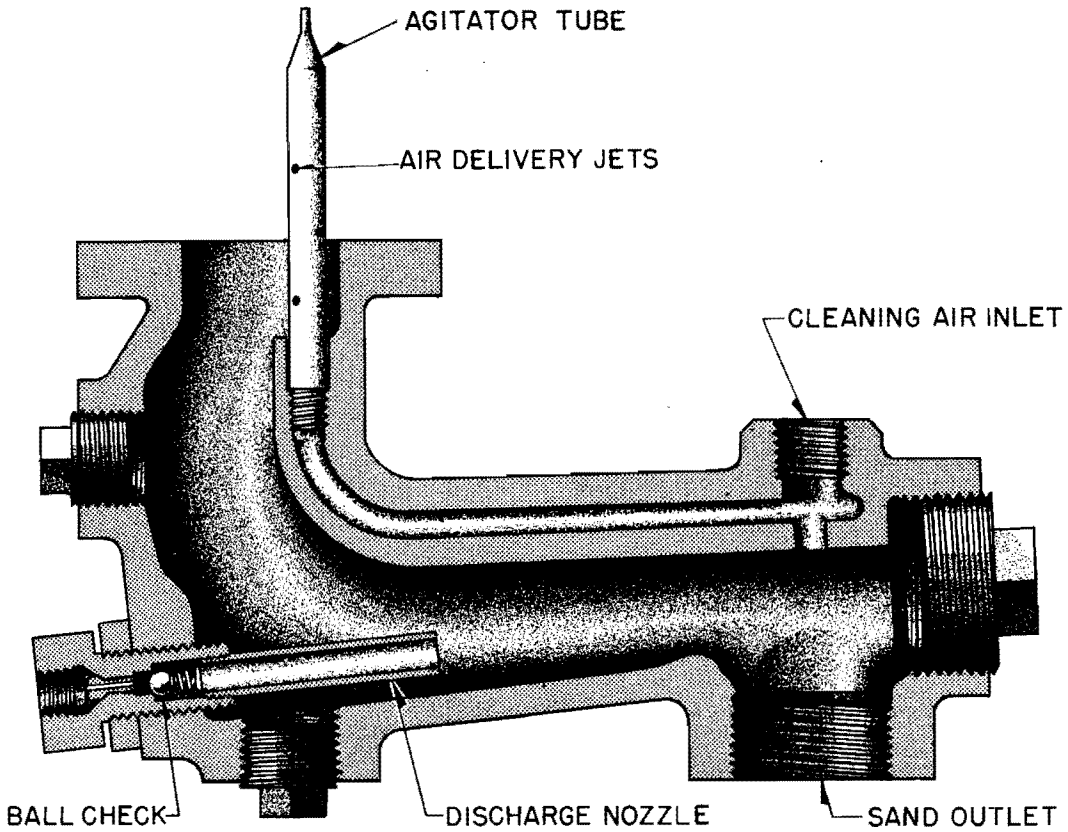

Fig. 5 - Graham-White Type "E" Vertical Sand Trap

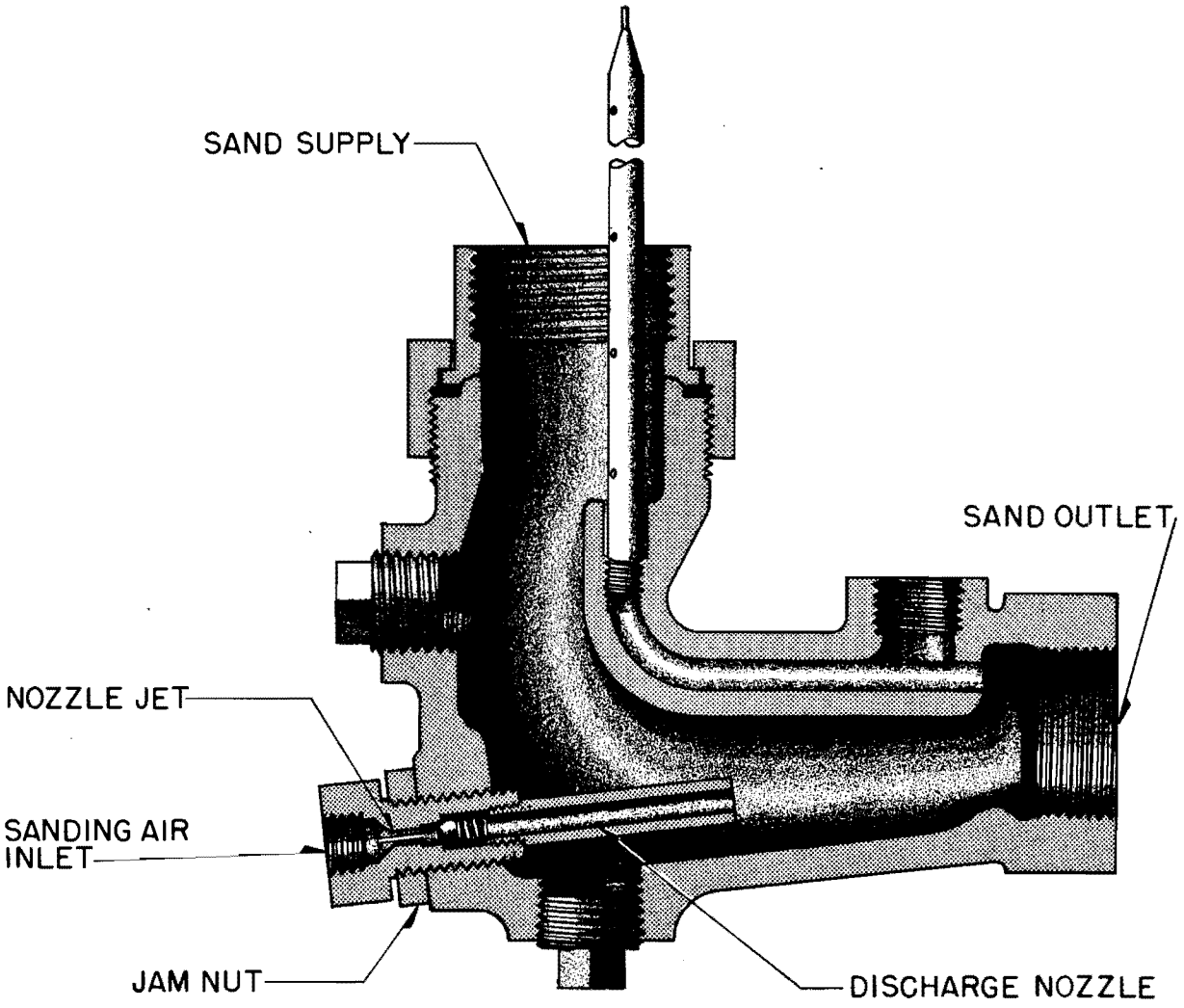

Fig. 6 - Type "B" Horizontal Sand Trap Delivery (Graham-White)

Type "E" sand trap has a flange fitting for bolting directly to the underside of the sand box with a vertical sand delivery leg tapped for 1-1/4" pipe.

Type "B" sand trap has a water proof union fitting for sand supply pipe connection and horizontal sand delivery end tapped for 1-1/4" delivery pipe.

The differences between type "E" and "B" sand traps are the mounting flanges and the length of the agitator tube.

Air pressure (main reservoir) enters through the sand outlet to the discharge nozzle and blows any sand remaining in the trap, through the sanding pipe to the rail. It is not necessary to disconnect 1/4" half union of the sanding air supply line to trap in order to clear nozzle or make sand volume adjustment. The square head brass plug may be removed for cleaning and adjustment of the sleeve to control sand volume, Fig. 4.

There are two types of nozzles that can be furnished with Graham-White sanders: ball check and the spiral nozzle. The nozzle lies in the sand thus insuring a positive flow of sand under all conditions. The traps are designed to move the sand horizontally with all air blast parallel to the wall of the traps and pipes. This prevents sand blasting of traps and pipes.

The spiral baffle nozzle adds turbulence to the sanding air in the trap, which insures positive and accurate sand

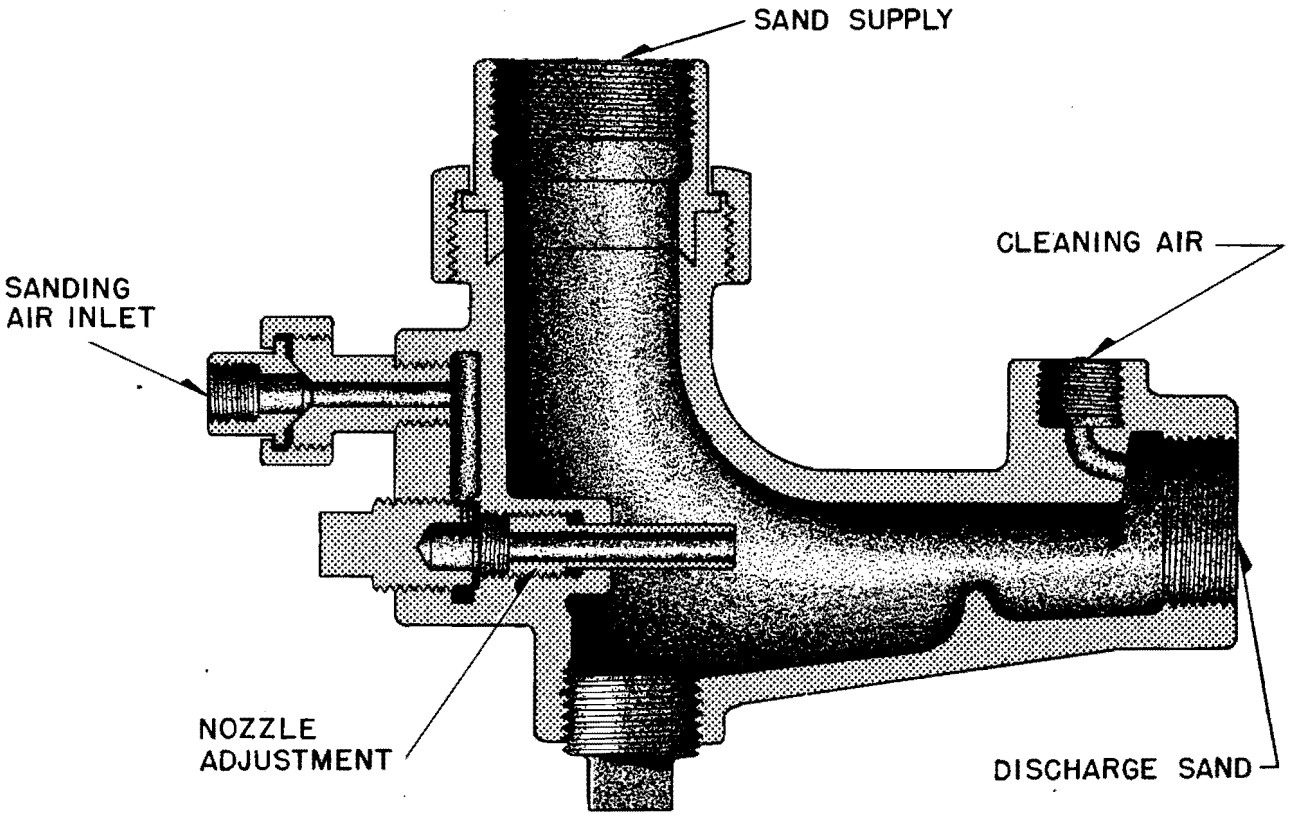

Fig. 7 - Brewster Horizontal Sand Trap Delivery

delivery under varying sand conditions. It eliminates the tunneling action of the needle blast where sand is damp or crusted. This allows the adjustment of the sander nozzle to a minimum sand flow without fear of having irregular sand flow under bad sand conditions. The turbulence created in the trap by this spiral baffle nozzle also makes possible the use of a fixed air orifice of minimum size in the trap to meet all conditions.

The nozzle jet in the trap is protected from stoppage from the air intake side by the air filter which will stop pipe scale and other foreign bodies from reaching the 5/64" port. On the side toward the sand trap, the spiral baffle in the nozzle tube prevents sand from reaching this port. However, the jet is so designed that the crossed-drilled port extends outside the body of the nozzle, making it possible to clean these restricted ports without the necessity of removing the jet from the nozzle or removing the nozzle from the trap.

An agitator tube is installed in the sanders insuring the breaking up of caked or wet sand. Sand varies in weight depending on weather conditions. In hot dry weather, sand is light and easily moved

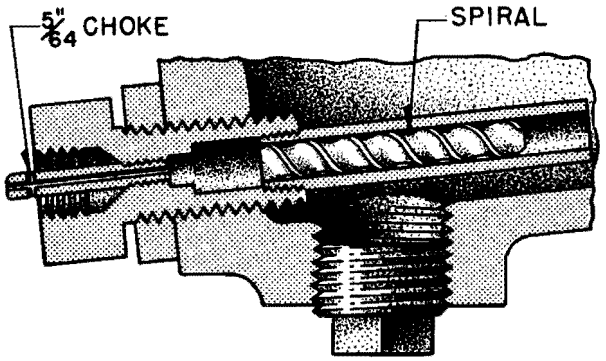

Fig. 8 - Spiral Nozzle

In wet weather, sand absorbs moisture which makes it heavy. This causes sand to bake or crust in the traps and prevent sand flow. The agitator tube is only active during the cleaning operation. Air enters the 1/2" pipe at the cleaning air inlet, passes down and blows what sand remains in the trap to the rails. Air

also enters the drilled passage at the cleaning air inlet and up to the agitator tube and out the delivery jets, breaking up any caked or dried sand. The agitator tube screws into the body of the sand trap and fits into the sand box, Fig. 5.

The automatic "E" valve is actuated by air controlled from an operating valve in the cab of the locomotive. When the operating valve is placed in sanding position, the 1/4" actuating line from the operating valve to the control valve is charged with reservoir air. This original charge of air is all that is necessary to actuate the control valve for one complete sanding cycle. There is no consumption of air in the operation of the control valve.

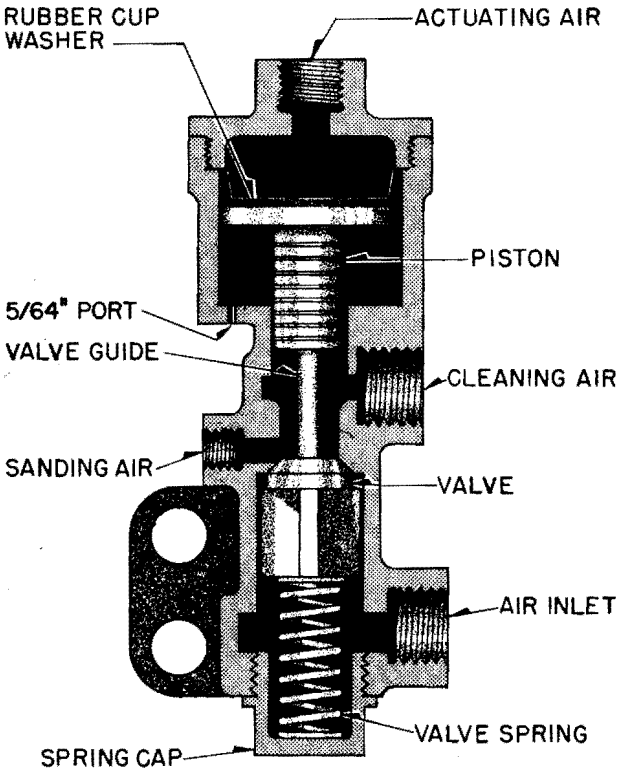

Fig. 9 - Automatic "E" Valve

When the charge of reservoir air enters the control valve at the actuating air inlet, the piston travels to its positive seat. During this travel, two actions occur: 1. The intake valve is forced off its seat and admits reservoir air through the air inlet. 2. A momentary blast of cleaning air rushes through the clean out port during this travel of the actuating piston to seat itself and also admit air to the sanding outlet. When the actuating piston reaches its positive seat, it is held there by the charge of air from the operating valve and therefore only sanding air is admitted to the traps through the sanding outlet port.

After the actuating air is exhausted through the orifice in the operating valve, two actions again occur: 1. The actuating piston is forced off its positive seat by the spring and air pressure at the main reservoir air inlet, allowing another momentary clean out blast through the clean out port. 2. The intake valve seats itself, thus shutting off the air supply at the sanding outlet and the clean out port.

Therefore, there is a momentary clean out blast at the beginning and end of the sanding cycle. This action cleans the sand delivery pipes and prevents clogging.

MAINTENANCE

Before each trip check all sanding equipment for proper operation. Sand pipes should be securely fastened and in place to delivery the sand on the rails in front of the wheel contact.

1. Check operating valve for sand delivery and cleaning air blast.
2. Check for break through in pipes.
3. Keep all joints and unions water tight.

Adjusting Sand Flow

The sander nozzle directly moves the amount of sand lying ahead of the nozzle tube. As the nozzle is adjusted in, the tube moves closer to the face of the sand cone, reducing the sand flow. As the nozzle is backed out, the tube moves deeper into the sand cone,

increasing the sand flow. This adjustment is positive, regardless of the condition of the sand.

Sand Traps

Maintenance for the various sand traps are very similar in every respect with the exception of the agitator tube in the Graham-White. The agitator tube should be inspected periodically.

Removal Of Sand Trap And Agitator Tube

1. Be sure that sand box is free from sand.
2. Disconnect air lines to sand trap.
3. In removal of trap, be careful not to bend agitator tube.
4. Screw tube from body of trap.
5. Delivery jets may be cleaned out with small piece of wire.
6. Inspect sand trap completely for any break through.
7. Remove sander nozzle, inspect, clean and replace.

NOTE: If for any reason the ball and spring are removed from the nozzle, be sure that the ball is put back first and the small end of the spring is installed next to the ball.

8. Replace all parts after a careful inspection and be sure to check all points where sand contacts metal for breaks in pipes.

Type "E" Automatic Control Valve

The automatic valve should not be dismantled unless it becomes inoperative. Its failure to operate properly should be indicated either by a constant blow of the cleaning blast during the entire sanding operation, or failure to deliver sanding air to the traps. In either case, remove the cap of the sleeve. Clean the cylinder and composition cup thoroughly. At the bottom outer edge of the large or actuating cylinder there is a 5/64" port to atmosphere. This is on the back side of the valve just above the bracket. Be certain that this port is always open. A small wire or pin may be used to punch this port open from the outside.

The following tests can be made:

1. Air is applied through the air inlet and through the actuating air port. The actuating piston should work freely and there should not be an excessive blow at the 5/64" port to atmosphere. A momentary blast should occur at the cleaning air port. A continual stream of air should flow from the sanding air port.

If the actuating piston sticks, indicated by an excessive blow at the 5/64" port or a continual blow at the cleaning air port, remove the cap, cup washer, and actuating piston. Clean parts thoroughly, including cylinder. Check the cup washer; if leaky or worn, replace. If there was a continual blow at the cleaning port, the seat may be worn and need to be ground in. Reassemble, placing actuating piston in first, then cup washer with flat face against top of actuating piston. Tighten cap.

2. Apply air at the air inlet only. There should be no evidence of air at the cleaning air port or the sanding air port. If there is evidence of air at these outlets, the intake valve is leaking at its seat.

Remove cap with spring and intake valve. Clean thoroughly.

Dress or replace seat on intake valve. Check for proper tension of the spring. Reassemble and tighten cap.

NOTE: The cap, spring and intake valve on the automatic "E" valve (Graham-White) are fully interchangeable with parts on the operating valve for all EMD locomotives:

Testing Operating Valves On Bench

1. Apply air with handle in closed position. If air blows through ports, the intake valve is leaking and must be ground, Fig. 3.

2. Screw 1/4" pipe plug into the sanding outlet ports, then latch the handle in sanding position. If air blows through 1/2" clean out port, the clean out piston is leaking due to improper fit or to insufficient lap of piston.

Testing Operating Valves On Locomotive

Apply 1/4" pipe plugs to sanding outlet ports in valve, or blind gaskets in the 1/4" unions in the sanding air line, then move handle to sanding position and inspect sand pipes at the rail. If any sand is being delivered or if air is coming through the pipes this indicates that the clean out blast is operating due to leaky piston or improper lap of the piston.

Fitting Oversize Pistons

A spiral reamer and reamer guide must be used in fitting oversize pistons into the operating valve, in order that the reamer may not chatter when it crosses the ports in the valve. Oversize pistons can be furnished in the following sizes: 5/8" plus .015", 5/8" plus .030" 5/8" plus .046", 5/8" plus .062" In reaming the valve cylinders, always use an undersize reamer for the first cut for roughing-in, and when making the finished cut, do not take out more than .008". This is in order to get a good, smooth job. Be sure to use a guide for the reamer. This will insure a straight round hole with a close fitting piston. The reamer used should be .001" larger than the oversize piston ordered.

NOTE: DO NOT, UNDER ANY CIRCUMSTANCES, enlarge the nozzle holes, or drill extra nozzle holes, or cut off nozzle tube. If nozzle should become clogged with scale or gum from air pipes, disconnect air pipe and blow out scale; also clean nozzle with pin or wire.

TYPES OF GRAHAM-WHITE TRAPS

1. Type "E" - Vertical Sand Delivery - Leg tapped for 1-1/4" pipe fitting.
2. Type "B" - Horizontal Sand Delivery - Leg tapped for 1-1/4" pipe fitting.
3. Type "JA" - Vertical Sand Delivery - Leg tapped for 1" pipe fitting.
4. Type "J" - Bolts directly to sand box 1" pipe fitting.
5. Type "KA" - Same as "JA" except no automatic cleaning - 1" pipe fitting.