tional box type grate, with about one-third of the area air opening. The grate is composed of a series of ribs ¾ in. wide by 3 ins. deep and tapered to ¼ in. to facilitate moulding. The 2 in. diameter trunnions supporting grate are offset ⅜ in. from the centre. This prevents the tendency of the grate to cock up and burn

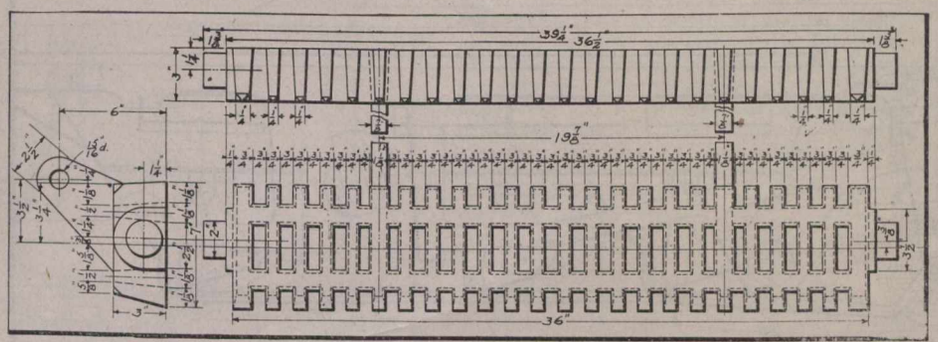

Fig. 2.—C.N.R. Standard Locomotive Grate Bars.

should shaker rods become disconnected. The grate is symmetrical and has two shaker arms, one of which can be broken off, depending on whether the bar is in the front or back end of the firebox. The bars in the fire door end of the box have the shaker on left side so that casting two arms on the bar avoids having a front and back bar.

The side bearer bars are so designed that there is ⅜ in. play between the bearer and grate shoulders. The grates are arranged in the box, so that there is ½ in. clearance between the end sheet and back grate. The grate supports are 7½ in. centres, and any difference in length is thrown into the stationary grate at the tube sheet end of fire box. This end grate rests on bearer bars and is held in place by lugs and washers bolted to studs in the mud ring as shown in fig. 3. Experience in bad water districts has shown that a grate of this kind close up to the tube sheet prevents a flow of cold air up the front of the tube sheet and tends to prevent consequent tube leakage. The top edge of the end grate is tapered off and tends to prevent the lodgment of ashes and clinkers.

The bearers are made in four parts, and are supported by studs in the mud ring. The stud holes are slotted to facilitate fitting, and the bars are fitted snugly between the sheets by means of small fitting strips left in the ends, which can be easily chipped to suit. The trunnion supports are left open on the same side as the shaker arm on the grate (i.e. on the left side at the fire door end), and the small lugs adjacent to the grate support prevent the grate from falling out of line on account of the offset in the trunnion.

ASHPAN.—The new C.N.R. ashpan, fig. 4, is quite a radical departure from existing practice, not only being inherently better in design, but also with the additional advantage of having a standard cast iron hopper, adaptable to all locomotives except the old standard types with shallow pans. The new law compelling railways to equip locomotives with some form of pan that would obviate the necessity of enginemen getting under the locomotive to clean the ashpans, led to the consideration of several designs and the final adoption of the design shown in fig. 4 as being the most suitable. The pan consists of one or more cast iron hoppers bolted to a superstructure of ¼ in. plate, which is fastened to the mud ring in the usual manner with studs and cotters. The necessary air vent, which should be one-seventh of the grate area, is provided by means of the C.N.R. standard air vent casting in the side and ends of the upper part of the pan. The whole arrangement is so constructed as to be readily removed when necessary. The hopper as shown in fig. 4 consists of two castings which differ only in the upper part of the back wall, which is arranged so that they may be bolted together as shown, when necessary. The bottom of the hopper is made from ⅜ in. plate bent up on each side, and suspended from lugs on side of casting. The front and back edges of the hopper bottom are reinforced by two angles, the back one forming a lip which sits up above lower back edge of hopper when in its closed position. The front edge of the swing bottom is the only part in contact with the casting, and in order to provide against freezing, a cored cavity has been run along the front of the hopper, through which steam may be fed from the pump exhaust or other supply, and condensation drained through ¾ in. opening at the centre.

The arrangement of lugs for the suspension of the hopper bottom with the centre of gravity of the bottom set out of the vertical line of the point of suspension, creates a tendency for the hopper bottom to remain closed, and this tendency is further augmented by the additional weight on the bottom, and the counterbalance on the operating shaft. The operating arrangement is quite simple, and is shown quite clearly in fig. 5. Cross rods through the front angle of the swing bottom, are fastened to rods which connect with arms on the operating shaft. Crank handles on each end of the shaft permit of ready manipulation by the crew, and the action of the counterbalance on the shaft, causes the bottom to close as soon as the operator releases the crank, which, it is hoped will overcome the occasional neglect of the crew in not closing the pan. An installation on an M-2-a consolidation locomotive is shown in fig. 5.

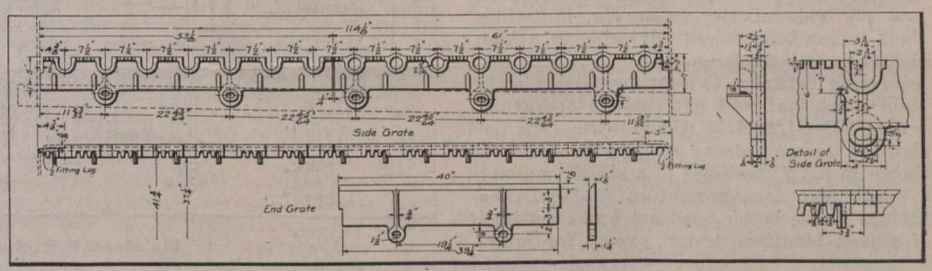

Fig. 3.—C.N.R. Standard Side and End Grates.

BLOW OFF VALVE.—It frequently happens that the locomotive blow off valve is out of order from scale or other foreign substance blocking under the valve, causing the valve to leak more or less badly. With the ordinary type of blow off valve, it is necessary to drain the boiler in order to get at the valve for repair. In the type of valve in use on the C.N.R., such a procedure is unnecessary. Essentially, this valve is a double one, shown in fig. 6; one valve is a blow off and the other an emergency. The blow off valve itself is on a vertical spindle, and is similar in most particulars to the ordinary blow off valve, and is operated by a vertical rod from a fulcrumed lever under the valve. Between the blow off valve and the boiler, concentric with the boiler blow off hole, there is the

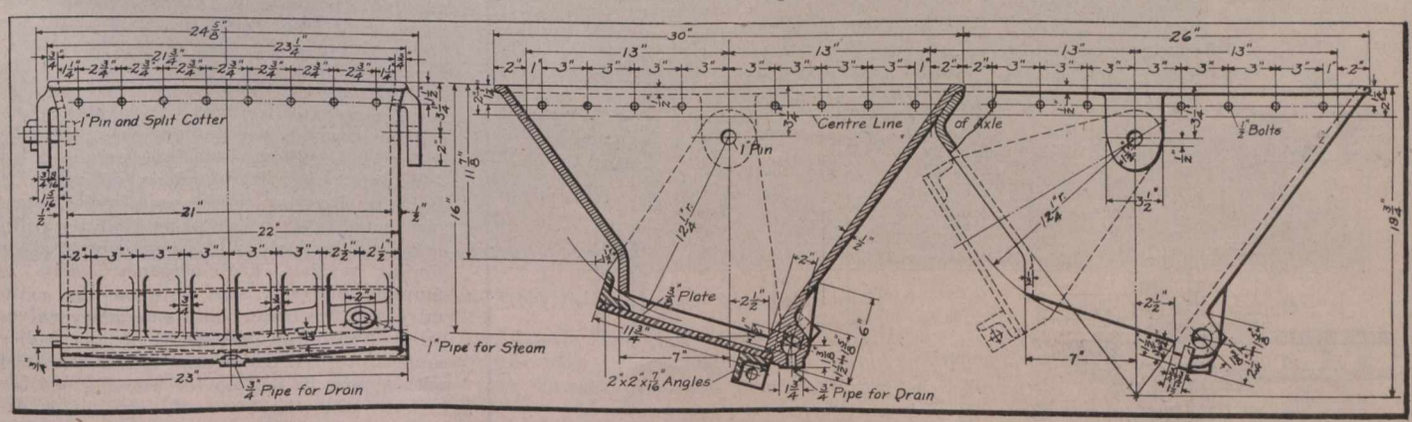

Fig. 4.—C.N.R. Standard Ashpan with Non Freezing Arrangement.