may gather inside this oil space. It is controlled by a blow out valve.

The "superheated" oil passing on from the heater, is controlled by an oil feed or firing valve near the burner. The form of the valve, as shown in fig. 5, closely resembles a plain taper turn cock, the main point of difference resting in the shape of the passage through the inner or turning part. Of necessity, the

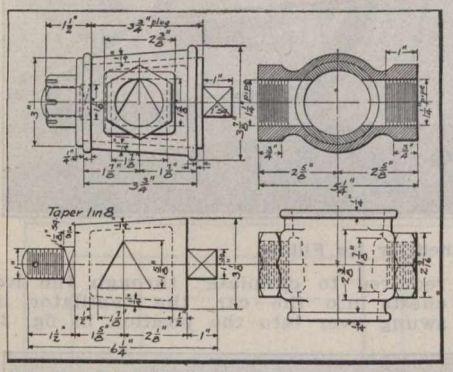

Fig. 5. Feed Valve for Close Adjustment.

valve, to be efficient, must be capable of a very close control, and this has been obtained in a very satisfactory manner by making the inner passage triangular in section, so that the supply may be regulated within very close limits, especially when under light operation, the oil flow being concentrated in the tip of the triangular passage.

The arrangement of the oil valve control mechanism may be seen in fig. 1. A horizontal oil control rod on the end of the valve lever connects with a lever on the lower end of a vertical shaft at the rear left hand corner of the fire box, on the upper end of which there is the regulating quadrant in fig. 6. This quadrant has a 90 deg. throw, with a notched engaging surface into which the engaging pin in the handle grips. This lever is connected to the vertical rod referred to, by a squared end fitting a corresponding opening in the handle, the whole being pinned together. Near the notched rim of the quadrant on the "closed position" side, there is a short circumferential slot, in which a block may be clamped in the position desired. As shown by the detail of the stand by block and catch, the handle contains a spring plug that engages in the notch in the upper end of the clamped block, but which at the same time may be moved past the catch when desired. When the locomotive is standing by at a terminal or for any protracted period between runs, a small sustaining flame is all that is required, just sufficient to keep the flame burning. This position is first determined, and the block in the quadrant set, so that the fireman can almost automatically set the valve in the stand by position with a consequent saving in fuel oil.

Experiments have shown that the best types of burner for locomotive use are those using a wide, flat flame, with the oil supplied at low pressure. In this particular, railway practice differs from stationary practice, for, in the latter, it appears to matter very little what shape the flame assumes. The wide, flat flame is here desirable so that the whole interior of the firebox may be completely lapped by the flame. Better combustion is also to be had with a low pressure from the oil with an outside mixing type of burner. With the inside mixing type of burner an oil pressure in the tank must be maintained if the best results are to be obtained from the combustion of the oil. This has been tried in locomotive practice, maintaining a pressure in the tank with compressed air. Satisfactory results were to be had from an oil burning standpoint, but the increased amount of trouble introduced in the auxiliary apparatus required to maintain the air pressure in the tank, did not warrant its continued use, especially when equally satisfactory results were to be had with the outside mixing heater, in which the tank pressure is dispensed with.

The type of burner which is used on the British Columbia lines of both the C.P.R. and the Great Northern Ry., is the VanBoden-Ingalls, which is in use on the Southern Pacific lines. It is an outside mixer, and is shown in fig. 7. Oil entering the upper chamber from either the upper or lower pipe connection depending on the piping (the one not used is plugged), passes forward, dribbling down on a corrugated surface table at the front end, from which it is picked up by a jet of steam coming through a thin wide slit in the lower chamber, the steam in passing over the corrugated surface of the table atomizing the oil and spraying it over a wide area in the fire box. The steam enters the burner from the rear around the lower oil connection core. The burner is made of cast brass, as the porosity of cast iron makes it unsuitable, the steam penetrating the partition between the two chambers, causing the flame to act in an ir-

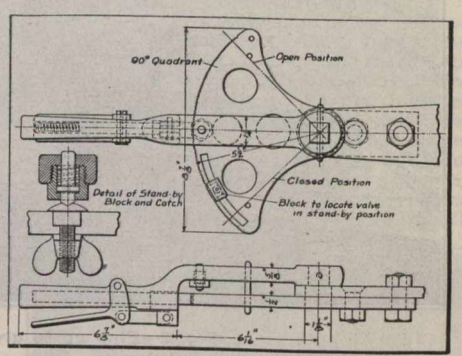

Fig. 6. Quadrant for the Fireman's Control of Feed Valve.

regular manner. The burner is carried in the forward end of the brick pan, projecting the flame backward as mentioned earlier.

The brick pan which replaces the old grate bar arrangement is made of ¼ in. plate, and is attached to the interior of the fire box all around, some few inches above the mud ring, by cast steel brackets attached to the latter. This is a desirable arrangement, as the rivets through the mud ring are thus left exposed where they can easily be got at for caulking.

Experiments conducted to determine the best point at which to bring in the draught of air that is to combine with the spray of oil have shown that the most satisfactory results are to be had when the air combines at a point where the spray comes to a focus some 5 or 6 ft. from the burner. In the installation under consideration, the draught is admitted through griddings in the sloping sides of the fire brick pan about 5 ft. from the burner. These griddings, one on each side, consist of a cast iron frame containing three rows of 4½ in. deep openings to extend through the bricks about 2 ins. square, 8 in a row. These two draughts focus with the nearly horizontal fan shaped spray at nearly the same point.

Through the fire door there is also a small opening through which the flues may be cleaned by the fireman by the insertion of a small funnel containing fine sand, the draught drawing the sand into the flues, the sharp cutting edges removing effectively the oily carbon deposits that result from the use of oil as a fuel. This operation is performed by the fireman every few miles, depending upon the load.

The C.P.R. is equipping 90 locomotives with oil burning apparatus, these being of the following classes and general dimensions:—

Class.	No. in Class.	Type.	Heat. surface.	Grate area.
N-3	41	2-8-0	3,001	49.5
R-1	6	0-8-8-0	3,417	59.0
D-9	16	4-6-0	2,850	49.6
D-3	2	4-6-0	1,291	23.4
D-4	11	4-6-0	1,299	28.0
L-3	1	2-8-0	1,731	32.0
L-5	3	2-8-0	1,872	32.5
U-3	1	0-6-0	1,544	52.0
V-1	2	0-8-0	2,005	32.7
D-5	6	4-6-0	1,593	31.8
A-5	1	4-4-0	1,150	17.0

The balance of the 97 mentioned earlier are at the stationary pumping plants at 7 points along the line.

The oil for distribution through the oil burning area is to be received at Vancouver, where large storage tanks are constructed. Other tanks have been built along the line. At Revelstoke, there is one of 22,000 barrels capacity, while Kamloops, Field and Rogers Pass each have tanks with a capacity of 15,000 barrels. Smaller distributing tanks are located along the line, a 1,000 barrel one at Notch Hill, and a 600 barrel one each at Sicamous Jct. and Golden. At the larger storage points, there will be additional distributing tanks with necessary piping connecting with the larger storage tanks.

As in the locomotive tenders, the oil in the storage tanks requires heating for a free flow. This is accomplished by means of a gridding of crosswise steam piping in the bottom of the tank, resting on lengths of larger piping running

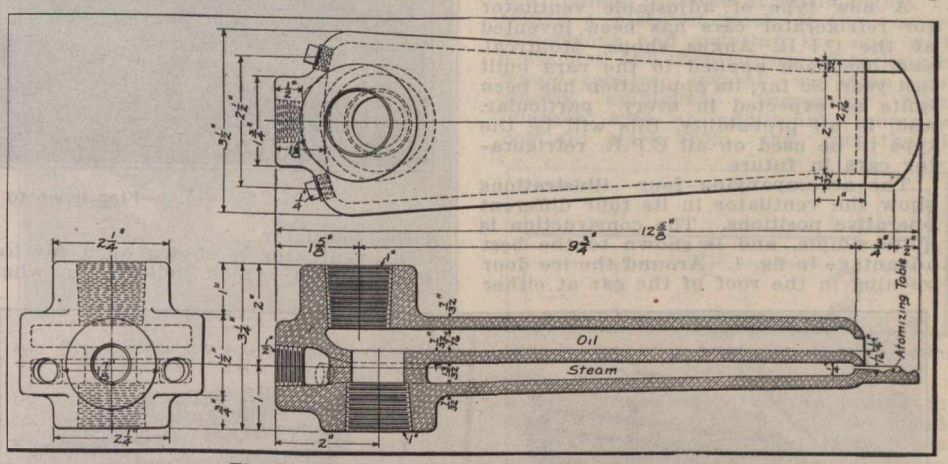

Fig. 7. The Burner for the Burning of the Oil.

at right angles. The steam connection is at the centre.

The oil standpipe for the filling of the tender tanks which is shown in fig. 8 resembles the standard water column very closely. The pit in which the standpipe is located is of concrete, and is covered over at the top, with a cold air opening down through this decking to the bottom of the pit. Around the central length of extra heavy 8 in. pipe there is a heating jacket, 12½ in. inside diameter, made of No. 22 galvanized