speed, excluding stops, 20.6 miles per hour; size of exhaust nozzle, 4.25 in.; 1 h.p. average, 441.1; diagram water rate, 24.05 lbs.; actual water rate, 30.01 lbs.

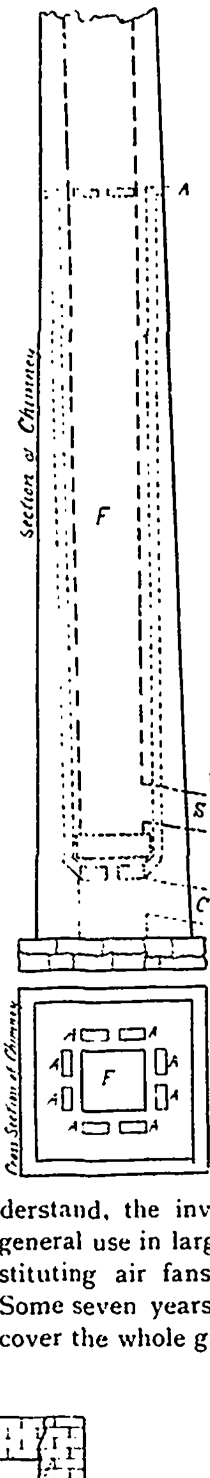
Trip No. 2 could scarcely be taken as a representative test, as the locomotive was handicapped by excessive loading, poor coal, and an exhaust nozzle too large for good steaming. The grades also were heavier than are usually met with. The taking of results also was interfered with owing to the engine having stalled twice. We will therefore pass on to the results of the third run.

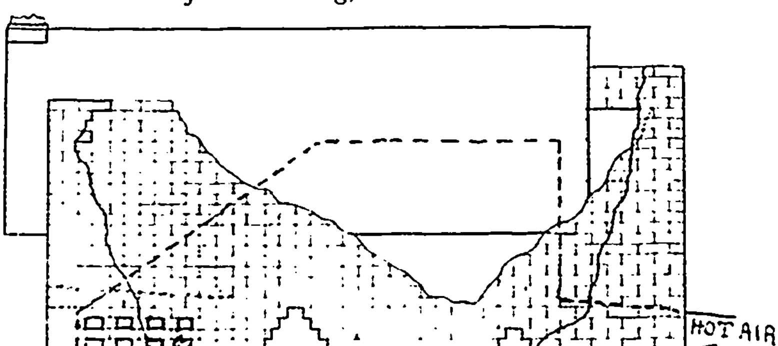
Run No. 3.—Distance run, 101.4 miles; distance of actual steaming, 77 06 miles; time on road including stops, 5 hrs 53 mins.; time of actual running, 297 mins.; number of cars, plus van, 22; weight of train back of engine and tender, 687.15 tons; weight of train, engine and tender included, 773.15 tons; ton-miles of train, 69,677 ton-miles of train, engine and tender included, 78,397; coal used, 8,907 lbs.; coal used in hauling train, 8,719 lbs.; coal used per ton-mile of train, ·111 lbs.; coal used per square foot of grate per hour, 63.6 lbs (a), 91.2 lbs. (b); coal used per mile travelled, 87.8 lbs.; water used, 58,468.5 lbs.; water evaporated on trip, 58,398.35 lbs; water used in hauling train, 57,198 lbs.; water used per ton-mile from and at 212°, .8,615 lbs.; evaporation per pound of coal at boiler pressure, 6.56 lbs.; evaporation per pound of coal from and at 212°, 7.75 lbs.; evaporation per pound of combustible from and at B.P., 7.6; evaporation per pound of combustible from and at 212°F., 9.01; average speed, including stops, 17.2 miles per hour; average speed, excluding stops, 21.1 miles per hour; size of exhaust nozzle, 4.25 in.: 1 h p. average, 507 8; diagram water rate, 23.5 lbs; actual water rate, 27.8 lbs.

In conclusion, the authors are of opinion that the C.P.R. engine tested by them gives a very favorable showing on the score of economy, even in comparison with such well-known locomotives as the Baldwin.

IMPROVED BOILER SETTING.

The accompanying drawing is from a steam boiler in use at the Georgetown paper mills. The design of the inventor, J. R. Barber, was to furnish hot air to the boiler furnace, and to heat that air from the waste gases passing up the chimney. This may be considered an improvement on the Jarvis setting, which robs the grate bars of the heat which it transmits to the current of air. As the sketch shows, the air on its way to the furnace passes into the chimney twenty-five feet above the foundation, through eight openings (A) in the outer wall of the chimney. The smoke flue F is in the centre of the chimney as usual, and is separated from the air flue by one brick, or say four inches. Each opening has a corresponding flue passing down the chimney until they all meet in a common chamber, C, in the chimney below where the smokestack enters. From this chamber the air passes into the hollow wall of the boiler setting as shown, cross flues allowing one-half of it to pass over to the other side of the boiler. Twenty-four openings under the grate bars—two by four inches—allow the heated air to pass from the hollow walls up to feed the fire. The effect of this system of setting has never been critically tested, but in working a day of twenty-four hours the fireman claimed to raise as much steam with a half ton of coal less per day than could be raised in another boiler of the same capacity set in the old way. Aside from any economy in coal, the change in the temperature of the boiler house both in summer and winter was very marked. The effect of this setting goes to keep the boiler house cooler in summer and warmer in winter. Formerly the boiler house door or a window had to be left open in winter to give the furnace sufficient air. Now the air to feed the fire comes down the chimney, and goes direct to the fire, freeing the floor of the boiler room from cold drafts. *In summer the opposite effect is* produced. The air from outside, passing through the casing, keeps it always at a much lower temperature than formerly, and no heat is discharged into the room excepting by the front plate and fire doors. Where manufacturers are putting in a single boiler and building a new chimney, this plan is certainly worthy of adoption. Mr. Barber is, we understand, the inventor of the plan now coming into general use in large boiler plants, namely, that of substituting air fans to give draft instead of chimneys. Some seven years ago the plans were first drawn, and cover the whole ground much more completely than do the best yet attempted. In the complete plan all of the heat is taken out of the waste gases and made to heat both the water for the boilers and the air to feed the furnaces. None of the plants yet erected make any attempt to heat the air. The best example of the idea in Canada is to be seen at the Riordon paper mills, where the plant has been in use over two years, and is effecting a large saving in fuel. The best in the United





Boiler Setting