

Table III. shows the result of a test made by the operating company on the locomotive with blower, and a locomotive equipped with 115-h.p. motors without a blower. The load conditions were much more severe than on the original test and the latter locomotive was doing about 5 per cent. more work than the former.

Table III.

	Three 85-h.p. motors.	Three 115-h.p. motors.
Mine air at beginning of test	25 deg. C.	25 deg. C.
Motor frame	35 "	35 "
Motor armature	42 "	42 "
Mine air at end of day	25 "	25 "
Motor frame at end of day ..	75 "	93 "
Motor armature at end of day	97 "	121 "

The results shown in Table III. were obtained with the fan on the 24-ton locomotive operating considerably less than 50 per cent of the time. An inspection of the inside of the motors showed that they were much cleaner than the ones not using forced ventilation. The results of the tests show conclusively that the increased capacities that are being demanded can be economically met by the use of forced ventilation with standard motors if these motors are properly designed. This will prove quite a saving to the operators, since without forced ventilation new and expensive motors would have to be signed.

It is the intention now to install a blowing equipment on the other 24-ton locomotive and on both locomotives equipped with 115-h.p. motors. It is not probable that the 115-h.p. motor will receive as much benefit from forced ventilation as the 85-h.p. motor, due to the fact that the armature of the 85-h.p. motor is furnished with ventilating slots while the 115-h.p. motor is not.

MUNICIPAL USE OF NATURAL GAS.

The United States Bureau of Mines has just issued a pamphlet dealing with the chemical and physical properties of the natural gases used in twenty-five cities. In this paper, which gives the first comparative data of this kind ever published, the authors, G. A. Burrell and G. G. Oberfell, state that five of the samples contain methane only as the combustible gas. The others contain in addition to methane, higher members of the series of paraffin hydrocarbons. The heating values range from 735 to 1,312 B.t.u. per cubic foot at 0° C. and 760 mm. pressure. Some of the natural gas used in Texas has a heating value of about 740 B.t.u. per cubic foot at 0° C. and 760 mm. pressure. The natural gas used in Pittsburgh, Columbus, Cleveland, Cincinnati and many other places in the east is quite uniform in composition.

The explosive limits of mixtures of natural gas and air lie between about 5.00 per cent. gas, low limit, and 11.50 per cent. gas, high limit. For many of the natural gases listed, there is required about 10.0 cubic feet of air per cubic foot of gas for complete combustion.

According to Cady and McFarland and to Czako, helium may be present in natural gases to the extent of from traces up to 1.84 per cent. The ignition temperature of natural gases lies between about 550° C. and 750° C. The composition of the natural gas used in any one town may remain remarkably uniform for a long period of time.

Oxygen, carbon monoxide, hydrogen and olefine hydrocarbons are not present in such gas, except possibly in negligible traces.

COST DATA FOR ROAD WORK IN SASKATCHEWAN.

THE following tables have been carefully compiled by the Board of Highway Commissioners of the province of Saskatchewan for the use of municipalities engaged in road work. By their aid it is possible with a few minutes' figuring to ascertain very closely what any particular piece of road grading should cost, and also the sizes and capacity of the culverts necessary.

Table of Cost Data for Roads.

1½ to 1 side slope and 16 feet road bed.

Fill in feet	Cost per cubic yard in cents	Number of cubic yards per 100 feet length	Price per 100 feet	Length of culvert
1 foot	18 cents	65 cubic yards	\$11.70	19 feet
"	20 "	"	13.00	"
"	25 "	"	16.25	"
"	30 "	"	19.30	"
"	35 "	"	22.75	"
2 feet	18 cents	141 cubic yards	\$25.38	22 feet
"	20 "	"	28.30	"
"	25 "	"	35.28	"
"	30 "	"	42.30	"
"	35 "	"	49.35	"
3 feet	18 cents	228 cubic yards	\$41.04	25 feet
"	20 "	"	45.60	"
"	25 "	"	57.00	"
"	30 "	"	68.40	"
"	35 "	"	79.80	"
4 feet	18 cents	326 cubic yards	\$58.68	28 feet
"	20 "	"	65.20	"
"	25 "	"	81.50	"
"	30 "	"	97.80	"
"	35 "	"	114.10	"
5 feet	18 cents	435 cubic yards	\$78.30	32 feet
"	20 "	"	87.00	"
"	25 "	"	108.75	"
"	30 "	"	130.30	"
"	35 "	"	152.25	"
6 feet	18 cents	556 cubic yards	\$100.08	36 feet
"	20 "	"	111.20	"
"	25 "	"	139.00	"
"	30 "	"	166.80	"
"	35 "	"	184.60	"
7 feet	18 cents	687 cubic yards	\$123.66	39 feet
"	20 "	"	137.40	"
"	25 "	"	171.75	"
"	30 "	"	206.10	"
"	35 "	"	234.45	"
8 feet	18 cents	830 cubic yards	\$149.40	42 feet
"	20 "	"	166.00	"
"	25 "	"	207.50	"
"	30 "	"	249.00	"
"	35 "	"	290.50	"
9 feet	18 cents	983 cubic yards	\$175.94	45 feet
"	20 "	"	196.60	"
"	25 "	"	245.75	"
"	30 "	"	294.90	"
"	35 "	"	344.05	"
10 feet	18 cents	1,148 cubic yards	\$206.65	48 feet
"	20 "	"	229.60	"
"	25 "	"	287.00	"
"	30 "	"	344.40	"
"	35 "	"	401.80	"