

rate of \$6 per 8-hour day for team and driver; in case of a 6-in. snow the cost will be \$162, 48 horses being used.

#### Cost of Plowing Snow Off Drives Cleaned on the Second Day

	Per mile.	Per 1,000 sq. yd.	Per cu. yd.
For 4-in. snowfall .....	\$ 8.31	\$0.378	\$0.00340
For 6-in. snowfall .....	9.98	.453	.00272
Total cost (without overhead) for 4-in. snowfall			\$135.00
Total cost (without overhead) for 6-in. snowfall			162.00

Third Day (Nine Hours' Work).—One-half of the teams will plow snow to the sides on the following drives:

	Width, ft.	Area, sq. yd.	Length, miles.
66th and 67th Sts. (Jackson Park to Ashland) .....	28	67,518	4.10
*Normal Ave. ....	32	63,580	2.10
Other half of the teams will plow—			
Grand Blvd. (side drives) .....	†25	58,432	†4.00
Washington Park (rest of "outer" circle of drives) .....	40-50	45,000	1.60
		234,530	11.80

\*Cu. yd. of snow on drive: At 4 in., 26,060; at 6 in., 39,090. †Each. ‡Together.

At the rate of \$6 per 8-hour day for a team and driver, the cost of plowing a 4-in. snowfall, using 40 horses, will be \$135; for a 6-in. snowfall the cost will be \$162, 48 horses being in use.

#### Cost of Plowing Snow Off Drives Cleaned on Third Day

	Per mile of drive.	Per 1,000 sq. yd. of pavement.	Per cu. yd. of snow.
For 4-in. snowfall .....	\$11.44	\$0.576	\$0.00518
For 6-in. snowfall .....	13.74	.692	.00415
Total cost (without overhead) for 4-in. snowfall			\$135.00
Total cost (without overhead) for 6-in. snowfall			162.00

The above costs are based on a rate of 75 cents per hour—\$6 per 8-hour day—for a team and driver. They do not provide for finished cleaning over the various drive-ways of the South Park system, but cover primarily the clearing away of the "roughage" after snowstorms, such as can be accomplished by a single trip of the battery of plows over the different drives. Where two teams are used on a grader plow, the second driver operates the plow adjustments, so no laborers are necessary in such cases. As will be seen, the cost per mile for cleaning, outside of the downtown district, ranges from \$8.331 per mile as the minimum for a 4-in. snowfall to \$14.98 per mile as the maximum cost for a 6-in. snow, two teams being used on each grader.

In some instances but one team is used on a grader and then a laborer is required to man the plow. It has been found that this reduces the cost of a single trip, cleaning of a certain driveway, making it from \$5.40 per mile for a snow of 4 to 5 ins. to \$7.20 per mile for a fall of from 5 ins. to 1 ft., when the team hire is \$6 per 8-hour day and the rate for labor is 30 cents per hour.

Carefully kept records show that the work of cleaning snow off drives with tractors after ordinary snowfalls can be done at a cost somewhat less than with horse-drawn machines and with them the work progresses much more rapidly, too. In breaking up packed snow and ice the tractor outfits have proved themselves particularly adapted, while they are able to pile the snow over the curbing better than horse-plows, leaving the gutters open.

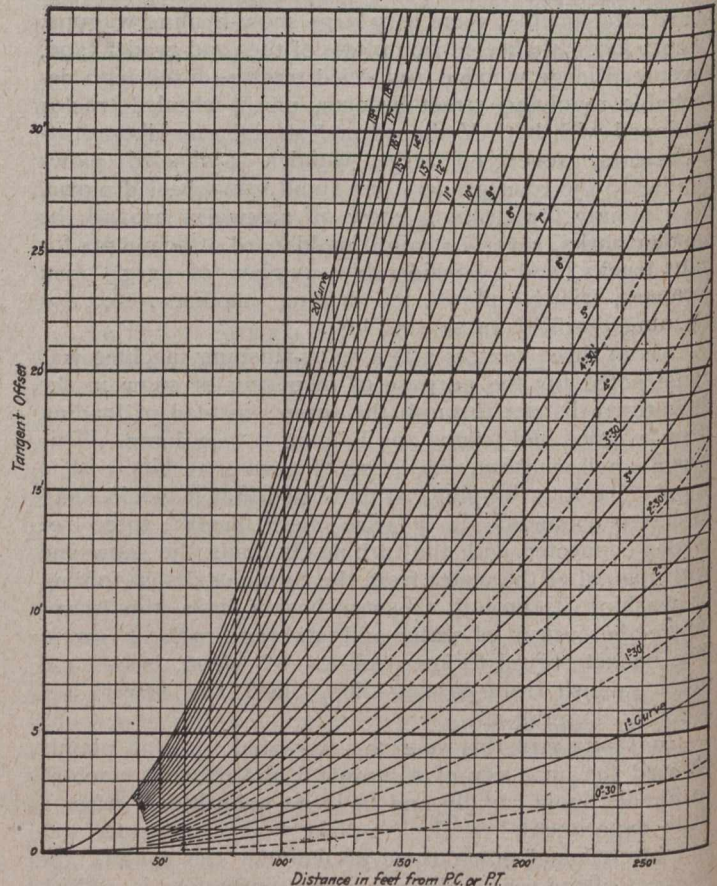
In a paper read before the Ottawa Branch of the Canadian Society of Civil Engineers on Thursday last, April 12th, Lieut. Edgar A. Jamieson brought out many interesting points in gun manufacture.

#### LAYING OUT CURVES BY TANGENT OFFSET\*

THIS chart is for the use of highway engineers, and is made a convenient size for pasting in the field book. When plotted to a larger scale, interpolation can more readily be made.

By use of the cross-section paper on which the chart is made and the scale that is adopted, each 10 ft. in distance and each 0.2 ft. in offset is readily taken from the chart and other distances can be interpolated.

It is not intended to discourage any accurate method of laying out curves, but in highway work the tangent offset method is sufficiently accurate in the majority of cases, and this chart is designed to save field calculations.



If used in connection with a well-arranged set of tables of the one degree curve, such as Table 30 in "Harger and Bonney's" handbook, it will practically eliminate figuring in the field and speed up the survey considerably.

The following instructions accompany the chart:

In measuring up to the P.I., leave temporary markers at stations and plus stations where the curve is to be located. From the newly located P. I. turn off the desired deflection angle. Determine the degree of curve necessary to fit the conditions from the external and tangent length and take from table the tangent and length of curve, and record the station of the P. C. and P. T. Make the curve correction for difference in length of the sum of the tangents and distance on the curve at the P. I., and start measurements along next tangent, leaving temporary markers up to the P. T. of the curve. To lay out curve, start at the station or plus station near the P. C. and measure along the curve, using standard chord lengths, and using the offsets from tangent as read from chart, which increases as the distance from the P. C. or P. T. increases.

\*"Engineering and Contracting," New York.