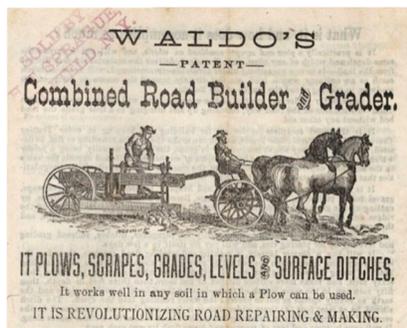


The early roads of Ogden: Pt 3 Evolving technologies for upkeep and construction

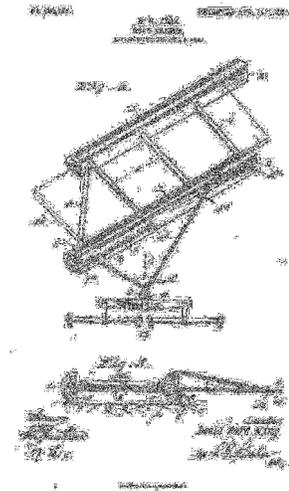
Pioneer roads were completed as cheaply and quickly as possible. They followed the general topography of the land with little attention to local gradient or drainage. The roads were built entirely by manual labour with little specialized equipment, beyond a yoke of ox, sturdy farm wagon, stone sled and a block and tackle for removing obstinate roots and boulders. Axes, picks, sledges, bars and shovels were the tools employed.

The first step in road “improvements” was to modify the earthworks¹ with cuttings, embankments, ditches and self-draining road surfaces. Horse-drawn equipment was increasingly utilized, including various ploughs, and specialized wagons (dump carts) for hauling materials to or from the road site.

In particular for dirt roads, the use of drag scrapers and pull-graders built better roads much faster than manual labour alone. Heavy farm wagons loaded with stone and with wide (>8”) steel-rimmed wheels, could compact where necessary the dirt roads and produce a smooth (albeit temporary) road surface.



1883 Waldo Combined Road Builder and Grader



Simple drag scraper

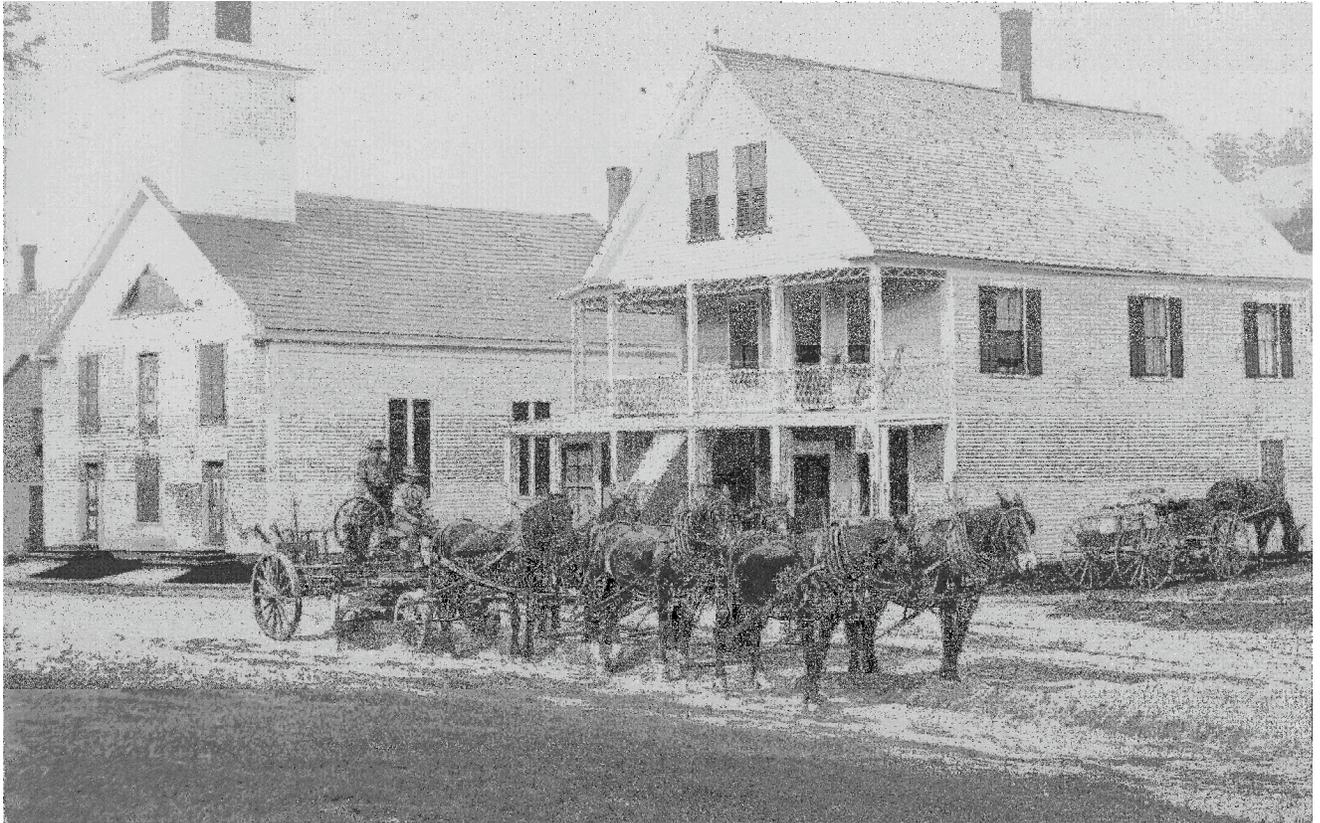


Early wood and steel pull-grader with blade height and angle adjustment by levers

¹ Earthworks refers to the preparation of the roadway prior to laying any road metal or gravel. This could include building up a road surface, grading a crown to the road, building ditches, making cuts through minor hillsides, building up and reinforcing embankments, putting in culverts, etc.



All steel pull-grader that uses wheels to adjust blade height and angle



Steel pull grader in Corinth, Vermont circa 1900 with a 6-horse team.

With the invention of the leaning wheel pull-grader, the ability to ditch on either side of a dirt road was significantly facilitated. The mechanics of grading were all there, all that remained was self-propulsion.



adjustable leaning wheel grader

At this point in our research, it is far from clear what particular pieces of equipment, the Township of Stanstead (and after 1932, the Municipality of Ogden) had available to them. Road building equipment helped to produce cheaper and more durable roads. However, such machinery was expensive and beyond the means of most township budgets. Two developments helped to make road equipment more accessible by 1900. Provinces started to make capital equipment grants available, and the growth of County road systems provided larger administrative units that could use the equipment efficiently.

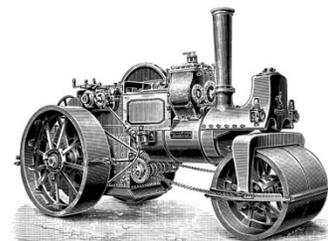
We know that in 1913, all of the roads within what would become Ogden were dirt roads, none were macadamized. Gradually all of them became gravel and/or crushed stone, and a few were even paved.



inches between rollings.

Horse rollers weighed up to 6-7 tons and were typically drawn by either two or four horses, but the ideal compaction weight to build a superior macadamized road was considered to be between 10 and 15 tons. This required the use of a steam roller (produced in England from about

Apart from access to sources of sieved gravel and crushed stone, a requirement for metalled roads is suitable mechanical compaction. Horse drawn rollers were first invented in France in 1834, as it became clear that the better the compaction, that is the greater the weight of the roller(s), the better the road surface and its ability to shed water. Compacting the subsoil beneath the gravel was also considered essential to a good road. The gravel or stone needed to be rolled and compacted as it was laid. Typically the material was applied in layers of 3-4



1867). In 1900 such rollers cost between \$200 to \$225 per ton, and a \$2500 outlay was well beyond the means of rural townships. Worse yet, a 10 ton roller would likely destroy every bridge and culvert in Stanstead Township! Prior to paving, were any of Ogden's gravel roads ever rolled?

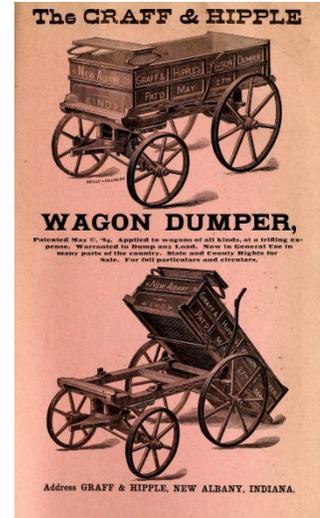
Most certainly they were rolled, or at least in the winter when the snow that accumulated on top of the roads was not plowed, but compacted by a large roller hauled by a four horse team.



Snow roller on Chemin Cedarville in Ogden, in front of Dasen farm. View towards east. Circa 1930's.

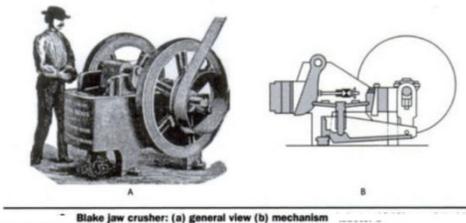
Interestingly, the cost of gravel road building was not so much in the earthworks as in the cost of hauling surface material. It required 3,129 yd³ of gravel to make a mile of new road 16 feet wide and eight inches deep. It was estimated that one team could haul seven cubic yards of gravel per day when the haul was not over 1 ½ miles. One cubic yard of gravel weighed from 1.3 to 1.7 tons. Obviously having a source of either gravel or crushed stone nearby was an important consideration.

The ability to dump road materials was a major step forward but the mechanical advantage of the simple lever mechanism seen on this Graff and Hipple 1884 dump wagon was minor, and loads of gravel would have had to have been small and balanced near the pivot point. Winches and then hydraulics in the early 20th century would solve this issue.



Until the introduction of mechanical stone crushers, rock was broken by hand. Manual stone breaking encouraged the use of softer stones. Where available, weathered limestone was used in preference to harder stones even though it did not last as long and produced dusty roads. One man could break about 1½-2 yd³ of stone per day. Even after the development of crushers, manual stone breaking was maintained, apparently as make-work projects. In 1908-09 the casual inmates of the House of Industry² broke 2,029 yd³ of stone; enough to make less than 1½ miles of nine foot wide macadam road.

Despite the importance of crushed materials, mechanical crushers were not common in the 19th century. The rock crusher was introduced into America around 1860. By 1900 both oscillatory and gyratory crushers were in use. A well designed stone crushing plant cost between \$1,500 and \$2,500 and could produce from 10 to 200 tons of crushed stone per day. Although a road surface could be



Blake jaw crusher: (a) general view (b) mechanism

constructed directly from "crusher run", this produced a surface of uneven quality and strength. It was much preferred to screen the stone before use and place the coarsest at the bottom and the finer on the top. As well, pit run gravel usually contained too much earthy matter for good road making. Screening removed large stones and earthy material.

Eli Whitney Blake patented the first truly practical mechanical rock crusher in 1858. His jaw crusher was of the oscillatory type, belt driven from a steam engine (not shown).

² The Toronto House of Industry was founded in 1837, and was a somewhat more humane Victorian workhouse for the poor. The House of Industry provided permanent and temporary lodging as well as food and fuel to the needy in the community, who often were required to do chores in return for help. It also assisted abandoned or orphaned children, often placing them as indentured servants in homes and farms in and around Toronto. It closed its doors in 1947.