cheaply by first dumping them than by lifting the material out over the side, but considering the case of wagons on a road at the same level as the track, I believe this cost of 31c. is quite usual.

I believe that no simple mechanical method has yet been found of unloading railway cars of stone from the top, and it would seem that when cars have to be unloaded from the top, the man with the shovel will long hold his own. One method, however, of making an economy on what must always remain an expensive operation, is the use of loading skips. These are fastened to the side of the car, or stand independent of it but close by, and hold about 1½ yds. Two or three may be used on one car. The skips are filled by the shovellers while the wagons are away discharging, and the wagon is very rapidly filled by tripping the skip, so that by a little arranging of the number of teams and shovellers, very little time is lost by either.

Mechanical Wagon-Loaders

A considerable improvement over the above methods is brought about by the mechanical wagon-loader, several of which are now on the market. One type in particular can be used to very good advantage from the stock pile, and another for unloading hopper-bottom cars.

These machines are portable and are of two distinct types. One, with a chain of buckets, digs into the pile, and the other, with a belt conveyor, requires that the material fall onto the belt or be placed there. Both types deliver at a height suitable for loading a wagon, truck or trailer.

Everyone knows the difficulty of shovelling into a pile of loose broken stone, and this is the difficulty which is presented to the bucket type of loader. It is a difficulty which increases with the size of the stone, and is very real when the pile consists of 4-in. and upwards, such as is used for base course road work. This type will load a wagon in upwards of a minute and a-half under favorable conditions and is operated by an 8 h.p. gasoline engine. Under the old rule of 1 pint per h.p. per hour, this would bring the cost of running to about $3.50 for gasoline per day of 10 hours. It would be unusual to run at full load for 10 hours, on account of the difficulty of having an empty wagon or truck always ready to take the place of a loaded one. It may, however, be considered that 1c. per ton is a fair cost for fuel. Having small gasoline engines, not usually requiring highly skilled operators, either of these types can be successfully handled at very little over ordinary unskilled wages. The bucket machine, undoubtedly, works better in gravel than in broken stone, and costs in the neighborhood of $1,800.

Belt Conveyor Type

The second type, with the simple belt conveyor, is a cheaper machine, costing about half the price of the former, but it requires considerably more feeding, as it does not dig into a pile but must have the material fed to it. It requires about 3 h.p., and is usually operated by a gasoline engine. Two men can, by the use of this machine, unload a 50-ton car of coal in about 4 hours. This type operates well under a hopper-bottom car, as the car can be dumped after the toe of the elevator has been set in under the pocket, and so long as the material runs to it, the elevator will automatically carry it away.

Owing, however, to the construction of hopper-bottom cars, the four pockets of the car have each a door; two of the four doors at one end of the car open simultaneously when dumped, and consequently, there is a gush of material which runs out onto the track for more than the full width of the car. It will thus be seen that with the elevator set in under the pocket on one side, considerable material will run out of the pocket on the opposite side. Moreover, when one pocket has discharged itself, the opposite side must be shovelled out by hand, and these contain on an average 5 tons. It will thus be seen that in unloading a 50-ton car, probably 10 tons have still to be shovelled by hand.

Speaking generally of these two types of wagon loaders, they are capable of a variety of applications, and have very real spheres of usefulness, not only in unloading cars but also in loading to and from stock piles and in gravel pits. The lack, however, of storage puts these machines in a different class from those which are operated in connection with a storage bin.

Slot, Elevator and Bin

The most economical method of handling stone from railway cars to wagons or trucks, so far as I know, is by the slot, elevator and bin method. A slot 4 ft. deep across the track is excavated 16 ins. wide between ties and is lined with ties one on top of the other. A plate some 9 ft. long by 16 ins. wide is set in this slot at a slope on which stone runs freely, i.e., 30 degs. from the horizontal The plate should be set so that the largest material will pass under the rail at the upper end, and the lower end so that it will discharge into the buckets of an elevator.

The elevator is set in a pit alongside of the track, with the centre of the lower tumbler about 5 ft. below base of rail. With this setting, a 30-ft. elevator, standing at 60 degs. from horizontal, will have sufficient length to fill a 55-ton bin.

The motor, consisting in this case of a 9-h.p. oil engine, is set under the elevator in a small portable house and provided with a clutch drive, by 6-in. belt, onto the jack shaft of the elevator. The elevator is of standard construction, 14 ins. wide and delivering about 120 buckets per minute.

Slide Door Controls Flow

The flow of stone onto the elevator is controlled by an ordinary slide door operated by a lever, and is set between angles fastened to two plates lining the side of the 16-in. slot at the lower end. The pit in which the elevator is set is made large enough for the operator to get down to the lower tumbler, and is timbered on the track side and decked over. A trap door is left in the deck so that the lever operating the stone feed may be accessible, and cover boards are provided for the slot across the track so that the whole may be left safe when not in operation.

The usual spacing of ties is about 20-in. centres, which leaves approximately 11 ins. space between ties. I found that railway companies would give permission on sidings for ties to be spread to an opening of 16 ins. if a piece of rail was put in under the running rails as an extra support. As they supplied the pieces of rail, this seemed easy to me, though it was necessary to sign an agreement with the railway companies relieving them from all responsibility for accident.

Three Cents per Ton

Two of these outfits were installed by the county of Brant last year and operated during the construction season. The cost of unloading cars and loading into wagons by this method was about 3c. per ton. The total kerosene, purchased at 20½c., for unloading 1,854 tons was 33 gallons, giving a cost for fuel of about four-tenths of a cent per ton. A 50-ton car can be unloaded in 2½ hours, though allowing for oiling and starting up, I figure 3 hours about a fair allowance. The operator in each case was an unskilled man paid 40c. per hour.

The bin used discharges through four 12 by 12-in. openings in the bottom, by means of any one of which a 1½-yd. wagon can be filled in 30 seconds. The height from the ground to bottom of bin is 6 ft. 8 ins., though this can be increased by lowering the roadway. The cost of unloading 50 tons may be taken as follows:—

3 hrs. time @ 40c.,	$ 1.20
50 tons @ $0.004 for fuel,	.20
Oil, waste and grease,	.10
Total,	$ 1.50

These outfits cost approximately $1,800, made up as follows:—

Engine and clutch,	$ 545
Elevator,	650
Lumber for bin and pit,	215
Ironwork for bin and slot,	225
Construction,	165
Total,	$1,800