Horsepower required for handling load on horizontal travel:—

Carriers with rigid buckets.

$$HP = \frac{W' \times f_1 \times V \times L}{33000 \times V} = \frac{33\ W \times 0.70 \times L}{33000} = \frac{70\ WL}{100{,}000}$$

Carriers with pivoted buckets.

$$HP = \frac{W' \times f_1 \times V \times L}{33000 \times V} = \frac{33\ W \times 0.20 \times L}{33000} = \frac{20\ WL}{100{,}000}$$

Horsepower required for elevating load:

All types of Bucket Carriers.

$$HP = \frac{33\ W \times H \times V}{33000 \times V} = \frac{100\ WH}{100{,}000}$$

Horsepower required for Reciprocating Feeder:—

Carriers with pivoted buckets only.

$$HP = \frac{9\ W}{100} \text{ (from experiment).}$$

Total horsepower required:—

Carriers with rigid buckets.

$$HP = \frac{(103\ L + 133\ H)W}{100000}$$ Formula XXII.

Carriers with pivoted buckets

$$HP = \frac{(28\ L + 108\ H)W}{100000} + \frac{9\ W}{100}$$ Formula XXII-a

The average bucket carrier is now pretty well standardized as to cost as well as in design, so that unless the buckets are of abnormal proportions or very complicated in design and the carrier chains are efficiently economical such a close relationship exists between the cost of the component parts of such a system and its size and length that an equation may be derived that will closely approximate the cost of any ordinary installation. As far as cost is concerned, the component parts naturally fall into four general groups: 1st, the chains which depend upon the total length of the bucket carrier and the weight of the load to be carried; 2nd, the buckets and attachments which also depend upon the total length of the carrier and the weight of the load; 3rd, the trough, gates, etc., for carriers with rigid buckets, or the rails, discharging devices, etc., for carriers with pivoted buckets, all of which depend upon the size of the buckets and the horizontal travel of the carrier in one direction; and 4th, the sprockets, drive, etc., which depend upon the size of the buckets, or size of carrier—to which must be added the cost of the reciprocating feeder for bucket carriers with pivoted buckets, which latter varies directly in cost with the square root of the product of the width and length of the buckets. As the weight of the load to be carried depends upon the size of the buckets and their spacing, it is possible to derive an equation for ascertaining the approximate cost of any system in which the variable factors are those of total length of bucket carrier, size of bucket and weight of material to be handled. Such an equation follows as Formulæ XXIII. and XXIII.-a, the results attained from the use of which will give very close approximations of the cost of any average standard type of bucket carrier equipment, including an allowance sufficient to cover the cost of a simple installation.

Initial Cost:—

C = Cost of Bucket Carrier equipment in dollars.
wl = Size of buckets in square inches = width x length.
H = Height (total) to which load is elevated in feet.
L = Horizontal travel (total) of buckets in one direction in feet.
S = Spacing of buckets in inches.
w' = Weight of material to be handled in lbs. per cubic foot.

Carriers with rigid buckets.

Average cost of chains $\dots\dots \frac{0.024\ wl(H + L)}{S} \times w'$

buckets $\dots\dots \frac{0.026\ wl(H + L)}{S} \times w'$

Average cost of trough, gates, etc. $\dots\dots 0.005\ wl\ L$

sprockets, drive, etc. $\dots\dots 15.25\ \sqrt{wl}$

$$C = \frac{0.05\ wl(H + L)}{S} \times w' + 0.005\ wl\ L + 15.25\ \sqrt{wl}$$ Formula XXIII.

Carrters wiih pivoted buckets.

Average cost of chains $\dots\dots \frac{0.025\ wl(H + L)}{S} \times w'$

buckets $\dots\dots \frac{0.045\ wl(H + L)}{S} \times w'$

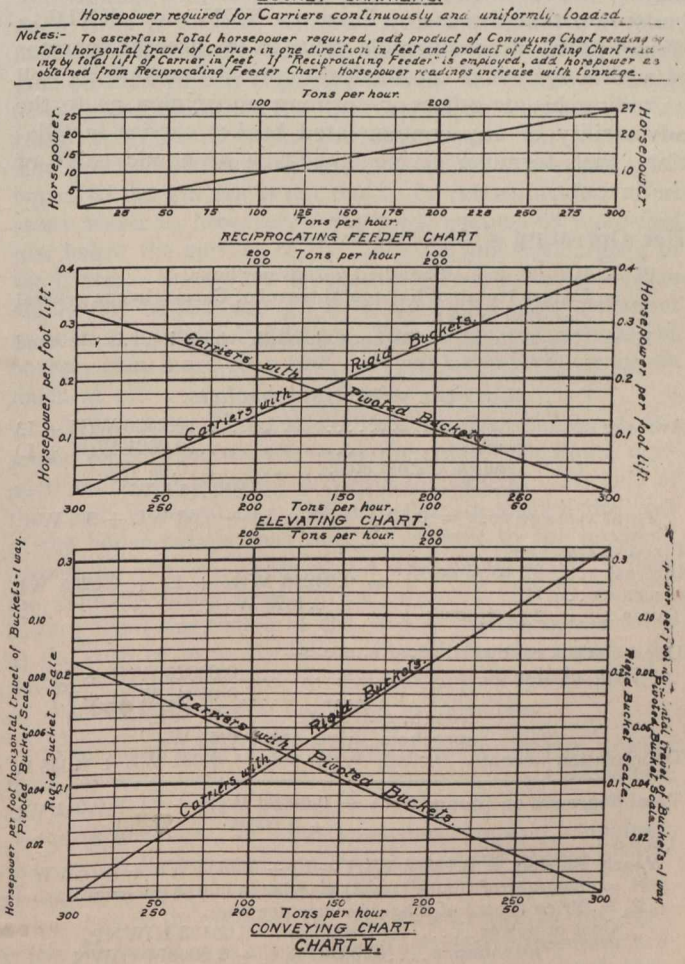
rails, discharging device, etc. $0.05\ \sqrt{wl}\ L$

sprockets, drive, etc. $\dots\dots 15.25\ \sqrt{wl}$

reciprocating feeder $\dots\dots 0.75\ \sqrt{wl}$

$$C = \frac{0.07\ wl(H + L)}{S} \times w' + 0.05\ \sqrt{wl}\ L + 16\ \sqrt{wl}$$ Formula XXIII-a.

The close relationship that exists between the carrying capacity of a bucket carrier and the size of its buckets (spacing of buckets depending almost entirely



upon their size and hence not varying greatly comparatively) allows the expression of cost of equipment in terms of tonnage handled (capacity) suitable for use when considering the factors that enter into the net operating cost. An error enters the initial cost of equipment as