tion, a belt conveyer may be installed in almost any position, including horizontal, inclined, inclined with horizontal stretches of conveyer and with the belt rising in a gradual curve from a horizontal to an inclined plane. The latter arrangement is theoretically limited to the curve that would be assumed by a fully loaded belt supported only at points of tangency with the horizontal and inclined planes of the conveyer when the tension in the belt is that necessary for the satisfactory operation of the conveyer—the pull required to draw the loaded belt along at the proper speed. This curve would be a parabola, but in practice such extreme refinement of curve is not practicable and the troughing idlers for the curved section of conveyer are usually mounted so that the conveyer belt resting on them will follow the arc of a circle of about 300-foot radius. This proportion is usually satisfactory for belts of any ordinary width and the conveyer fully loaded with the average class of material usually handled by belt conveyers—the fully loaded belt will then rest on the troughing idlers, though the belt of an empty conveyer will frequently not touch them.

It is in the consumption of power that the belt conveyer has a decided advantage over the types of conveyers already discussed, and with its comparatively large carrying capacity, due to the high speed at which it can be run, when handling ordinary classes of material in bulk, it becomes one of the most valuable and economical of labor-saving devices. As in the case of any mechanical type of conveyer, power is required for three distinct operations when operating the system: 1st, for running the conveyer itself, i.e., the power required to operate the driving machinery, pull the belt over the idlers—neglecting all load other than the weight of the moving parts—etc.; 2nd, for conveying the load itself; and 3rd, for elevating the load, should the conveyer be an inclined one. The power required to pull the belt over the idlers varies with the construction of the troughing and return idlers and is naturally considerably less in conveyers with ball-bearing idlers than in conveyers employing less economical mechanisms, but this item of power is in reality but a comparatively small percentage of the total power required and when the inefficiencies and loss of power in the driving mechanisms—usually consisting of a train of gears—is taken into consideration the power requirements for running an empty conveyer really have comparatively little effect upon the total amount of power that must be supplied and may be considered with safety as bearing some definite relation to the width of the belt and the weight of the moving parts. The second demand for power, that for moving the load itself, is not so much effected by the refinements of idler construction and varies practically with the speed of the conveyer and the load handled, irrespective of size of conveyer, etc. Power necessary to elevate the load is very nearly that theoretical amount that would be required to raise the specified load through a vertical distance equal to the difference in elevation between the point at which the conveyer is loaded and the highest elevation to which the load is carried—for practical purposes, the difference in elevation between the two ends of the conveyer—as no appreciable increase in resistance to the movement of load takes place in an inclined conveyer other than the overcoming of the force of gravity. In the derivation of the following formula (Formula XIV.) conservative values for all variable factors—values obtained from numerous experiments and examination of data from a large number of efficient installations of belt conveyers—are employed and the results from its use agree very closely with the power demands for the ordinary efficient installation. Exceptional installations are found that discount this formula but the inefficiencies of the ordinary driving mechanisms make dependence on other formulæ for ascertaining horsepower requirements that give smaller results dangerous. Formula XIV. gives the total horsepower required to drive the average efficient belt conveyer when continuously and uniformly loaded to its capacity, but does not allow for the additional power requirement for trippers or fixed dumps. Such discharging devices all consume approximately the same amount of power, irrespective of load carried, and Formula XIV.-a gives values that should be allowed for each discharging device of such type for conveyers from 12 to 36 inches in width, the average range of sizes found in practice. For conveyers narrower than 12 inches, an allowance equal to that for a 12-inch conveyer should be made for each discharging device and for conveyers of over 36 inches in width the allowance for 36-inch conveyers is usually ample, unless the conveyer should be one of exceptional size. Chart III. gives the same data as Formula XIV. in a convenient form for rapid calculations and sufficiently accurate results are attainable from its use for all practical purposes.

Horsepower:

W = Weight of load handled in tons per hour (capacity).
V = Velocity (speed) of Conveyer in feet per minute.
L = Length of Conveyer in feet—distance between end pulleys.
H = Height to which load is elevated in feet (incl. Conv.)
= Difference in elevation in length of Conveyer.
w = Width of belt (Conveyer) in inches.
W' = Weight of load handled per minute per foot of Conveyer in lbs.
= $2000\ W/60\ V$.
W_b = Weight of moving parts of Conveyer (belt) per foot in lbs.
= $0.7425\ w$.
f_s = Speed factor.
= $0.004\ w$—from experiment.
f_l = Load factor.
= 0.080—from experiment.

Horsepower required to run Conveyer empty :—

$$= \frac{W_b \times f_s \times V \times L}{33{,}000} \quad \frac{0.00009\ w^2VL}{1000}$$

Horsepower required to convey load :—

$$= \frac{W' \times f_l \times V \times L}{33{,}000} = \frac{0.08\ WL}{1000}$$

Horsepower required to elevate load :—(Inclined Conveyer)

$$= \frac{2000\ W \times V \times H}{60\ V \times 33{,}000} = \frac{WH}{1000}$$

Then, total horsepower required :—

$$HP = \frac{(0.00009\ w^2V + 0.08\ W)L + WH}{1000} \qquad \text{Formula XIV.}$$

Additional horsepower required for each tripper or fixed dump :—

$$HP = \frac{(w-10)}{8} \qquad \text{Formula XIV-a.}$$

(Conveyers 12″ to 36″ inclusive)

Though exceedingly economical in the consumption of power, belt conveyers are expensive as far as first cost is concerned if satisfactory wear and freedom from the annoyance of break-downs are to be obtained and the true economic value of the equipment realized. That is, all apparatus should be of the highest grade; particularly the belt, which should be, as previously stated, of duck-rubber construction with a suitably thick resilient cover of rubber to withstand the abrasive wear of the load moving on its carrying surface—a certain readjustment in position of load on the belt being unavoidable in even the best designed and most carefully installed conveyers. Owing to the extreme simplicity of construction, the cost of the various component parts of a belt conveyer vary closely either with the width of the belt, as for conveyer