Volume 25 Toronto, Sept. 4, 1913

Contents of this issue on page 405

The Canadian Engineer

A weekly paper for engineers and engineering-contractors

SPIRAL OR SCREW CONVEYERS

SPECIALLY REQUIRED FOR CONVEYANCE OF CERTAIN MATERIALS —GENERAL DESCRIPTION—CAPACITY UNDER VARIED LOADING HORSE-POWER REQUIRED — NET OPERATING COST.

By REGINALD TRAUTSCHOLD, M.E.,
Consulting Engineer, New York City.

IN many industrial plants, whether power houses, cement mills, or of other types, certain operations frequently require the more or less continuous handling of materials that are often of such nature as not to permit efficient use of carriers of the flight conveyer type or of any type in which the load carried is exposed to possible disarrangement by air currents, etc. Then, too, the required capacity is frequently relatively small, making the installation of a system of large capacity of questionable economy, owing to the intermittent service that would be required from such apparatus. In such cases, a popular and sometimes very desirable equipment is the screw or spiral conveyer, a conveyer that possesses the advantages of relatively low first cost and of extreme compactness. This type of carrier consists of a suitable metal ribbon wound spirally about a shaft to form a screw which, enclosed in a box or trough, pushes the material handled forward as the screw is revolved. At intervals, gates or openings may be made in the bottom of the trough through which the material conveyed is discharged or else the material may be carried to the end of the trough, which is invariably left open, and there dumped out. The diameter of the trough may be only slightly larger than that of the screw, in which case practically all material fed to the conveyer is propelled forward as the screw revolves, or the trough may consist of a relatively large box surrounding the screw, which gradually fills with material until the screw forms its own trough and pushes forward the additional material fed to the conveyer. The first type of trough is usually found in installations for carrying fine coal, grain, small cement clinkers and other "fines," while the latter is almost always limited to installations for handling ashes, etc., which may be temporarily stored in the conveyer trough or box and subsequently removed through gates in the bottom of the storage box. Naturally only fine materials can be efficiently handled by such a conveyer, and while these materials need not be necessarily homogeneous in character they should contain no lumps more than a few inches in size, the maximum allowable size of lump depending somewhat upon the diameter of screw, i.e., size of conveyer. The screw conveyer is at its best when handling fine and light substances, materials that could not be carried by any other type of conveyer without a great deal of spill. This is particularly noticeable in cement mills where screw conveyers are often employed to handle fine cement clinker containing a great deal of air. In such installations the squeezing action of the helical ribbon of the conveyer also tends to compress the clinker and displace much of the air contained on its receipt from the kilns. The efficient length of screw conveyers is also limited for, though the flight is interrupted every few feet to accommodate supporting bearings for the screw shaft, the torsional strain on the screw shaft becomes unduly severe if the conveyer is more than about 100 feet in length, unless the material handled is very light and has a small angle of repose—such as grain.

The size of screw conveyers (diameter of screw) is usually limited to about 24 inches, though conveyers have been built and successfully operated that were upward of 3 feet in diameter, and, as the speed at which they can be efficiently operated is also limited to about 250 revolutions per minute, their carrying capacity must therefore be relatively small. Actually three conditions govern the capacity of screw conveyers; 1st, the diameter of the screw; 2nd, the pitch of the screw; and 3rd, the speed at which it is run, i.e., revolutions of the screw; but the question of mechanical efficiency of the apparatus—the mechanical efficiency being at a maximum with a screw pitch of 45 degrees—has led to the universal practice of making the pitch of the screw about the same as its diameter, so that only speed and size of conveyer need be considered for a standard equipment. The speeds usually employed are from 100 to 250 revolutions per minute, the higher speeds for conveyers of small size, irrespective of either character or weight of material conveyed. Table III. gives the average capacity of various standard sizes of screw conveyers when operated at their respectively most economic speeds, expressed in terms of bushels handled per hour. Table IV. gives similar data expressed in terms of tons of material weighing 100 pounds per cubic foot handled per hour. Material of other weight or carried at different conveyer speeds vary directly proportionally as the weight and speed. The carrying capacity of screw conveyers is further dependent upon the depth of material in the trough, or rather the proportion of the screw that would be submerged in the material should it be possible to push the material forward with no agitation, and this is limited to a depth equivalent to about one-third the diameter of the screw, so it is possible