With this outline of materials and their properties, consideration will be given to the types of conveyors for which these and similar materials may be used and are commercially available. These conveyors are as follows:

1 Steel belt conveyors:

(1) Woven wire: Woven of almost any material that is available in wire form.

(2) Doormat type: The choice is not as wide here, as the material must be available in both strip and wire form. The wearing qualities of this type are beyond expectation from a casual inspection of the design. The stretch is small, and all that is needed is good alignment and a good-sized, many-sided polygon for its pulleys.

(3) Swedish iron: This is an imported solid-steel conveyor belt that is not soluble in fruit or fatty acids, but which, when clean, will rust in clear water and air after the fashion of cast iron. (The author has used this conveyor with good success for trimming out cocoanut meats, for trimming fat and lean pork, and for conveying bacon from the slicing machine in front of the packers, as well as for the filling and cooling of canned lard.) The fundamental requirement here is, however, accuracy of alignment. This was particularly noticeable in the case of the cooling conveyor, Fig. 1, where the range in temperature was about 150 deg. and the speed was less than 1 ft. per min. (As the pulleys are practically uncrowned, it is necessary to have efficient scrapers on them.)

2 Apron and pan conveyors:

(1) A typical installation of a pork-cutting table is shown in Fig. 5. The frame is hot-dipped galvanized after fabrication and before assembly, and the flights are made of Monel, with rivets of the same material. As a matter of cleanliness, return rolls must be used to support the lower run. To minimize rust, malleable-iron chains are used, their size being determined by the amount of material and the area exposed to rust and wear, instead of by listed strength. The large knife in the foreground revolves in the same direction as the table and slightly faster, cutting in the groove between the two conveyors, which are kept in accurate alignment by V-shaped blocks on every flight and continuous V-shaped guides. The short right-hand conveyor is driven from the take-up of the main conveyor, and the shoulder is cut off by the knife and delivered over the end of the short conveyor. After the hams, shoulders, loins, and ribs are removed, the sides are flattened out under the heavy double roller shown at the left. The same motor drives the rolls and the conveyor, insuring synchronism.

(2) Fig. 6 shows the latest type of beef-viscera table. This is 5 ft. wide, so that the operators can stand on it, and is synchronized with the overhead chain carrying the carcasses. The moving part of the table passes through a continuous sterilizer on the return run at the take-up end. The flights are of $^1/_2$-in. firebox steel, with the edges planed, jigged, hot-dipped, and wiped. Neither zinc nor ordinary steel seems to be able to withstand the action of blood. It is the expectation of the designer of this table that, at the end of ten years, there will not be more than $^1/_4$-in. deterioration through rust of the $^1/_2$-in. hot-dipped galvanized firebox steel. The extremely heavy malleable-iron combination chain has the same life expectancy. The top-vent sterilizer is shown at the left. The overhead synchronized cattle chain brings the carcass in contact with the near side of the flight at the sterilizer, with the head projecting under the flights, but not touching the framework or stationary part of the conveyor, which is not subject to continuous sterilization. The operators ride the conveyor with the carcass and walk back on the platform shown on the far side. The overhead conveyor, with the carcass, turns away from the table near the middle of the picture, where the frame straightens up and the guard rail begins. The government inspectors operate from here on. Both runs are supported throughout on self-lubricating rollers and never touch any stationary part of the conveyor. The underlying patent on the sterilizing and synchronizing features has been dedicated to the public.

(3) A hog-viscera table is usually made of either 18-8 steel or Monel, with pans. There is a patent on trays and another on pans. The trays or pans are made 3 ft. wide and 3 in. deep on two strands of malleable-iron chain. Half of the pans are 30 in. long and half are 6 in. long, alternating. There are six double sets of K2 attachments under the long pans, with two pairs of plain links between. Only the center pairs of these attachments are riveted; the others merely support the loaded pan in the horizontal position.

3 Screw conveyors:

(1) These can be and have been made in both 18-8 steel and Monel. From the nature of the screw action the 18-8 is to be preferred, provided the purchaser will agree to accept the odd diameters that the manufacturers' standard equipment for rolling helical flights will turn out in this material.

4 Bucket elevators:

(1) Bucket elevators are made in these materials, but as the buckets are comparatively few in number and usually bolted in place, it is generally satisfactory to regalvanize or retin these when required, except in a few special cases, such as fancy table-salt and certain special cosmetic items.

(2) Any of these materials that are available in wire form may be used in the elevator type of self-cleaning screens which are standard for water intakes and sewage-disposal plants.

5 Various other forms of conveyors can be obtained in rust-resisting materials, such as scraper conveyors, gravity roller conveyors, etc., but it is so difficult to keep these types mechanically clean that there is less occasion to justify the added expense.

In conclusion, the author believes that future progress along these lines will be rapid as soon as the patent and licensing situation is straightened out on a tonnage production basis and the metallurgists learn to produce 18-8 steel from the chrome ore direct. Until something of this sort is accomplished, it will be economically impractical to make general use of 18-8 for rolled shapes and shafting, attractive as the idea is to the food-products manufacturing plant.

Discussion

S. Craig Alexander.[2] The author's statement on the order of cost, taken with the table on the first page, is likely to prove

[2] San Francisco, Calif.

misleading. Comparing, for example, Monel metal and the 18-chromium–8-nickel steel, it is not brought out that Monel metal weighs about 0.320 lb. per cu. in. against about 0.283 for the 18-8 steel, thus giving a percentage difference in weight in favor of the 18-8 steel of a little over 13 per cent. Taking two pieces of the same size and thickness, the Monel metal would weigh over 13 per cent more than the 18-8, thus affecting the cost to this extent were the two priced exactly the same per pound.

There would be no occasion for using a greater thickness of the 18-8 steel than of the Monel metal, because the elastic limit and modulus of elasticity are higher in the 18-8 steel than in the Monel metal, while the resistance to wear or the abrasion resistance of the chromium-nickel steel alloy similarly is superior to that of the nickel-copper alloy. If anything, the thickness of the design could be reduced with the 18-8 steel over the same design in Monel metal without sacrifice of safety and service.

Author's Closure

The two points brought out by Mr. Alexander and a third fact (that 18-8 is more expensive to work than Monel) were carefully considered, and the manufacturing costs of a concern which advertises its willingness to furnish either Monel or 18-8 at the same price were checked over a year's period before this table was passed.

This table is just as correct in the final analysis as in its more obvious interpretation.