

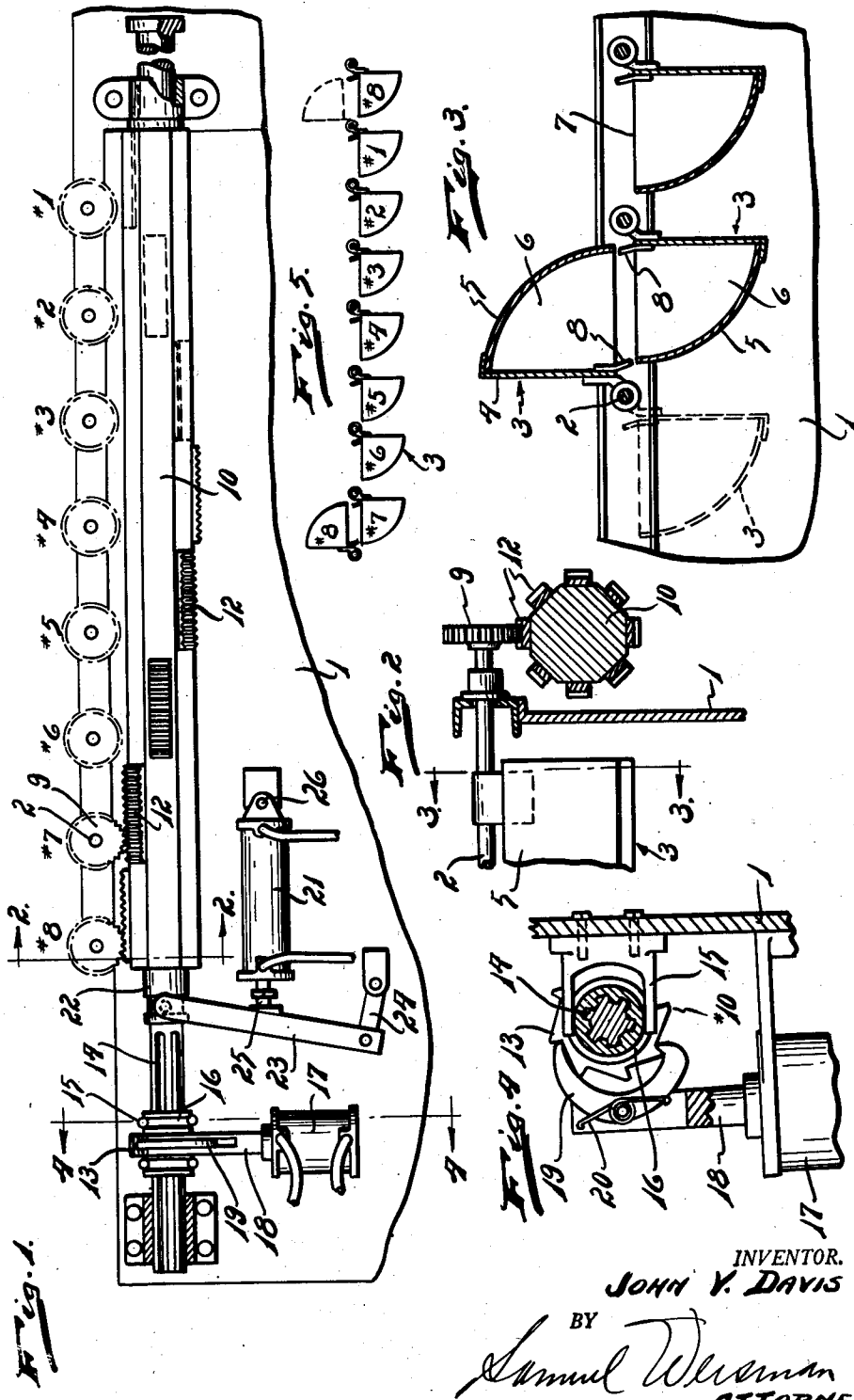
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J. V. DAVIS
CONVEYING APPARATUS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

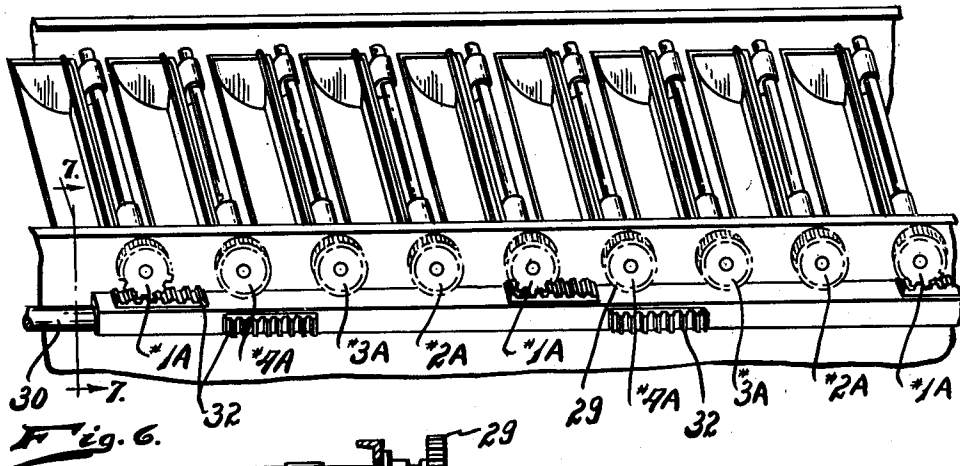


Fig. 6.

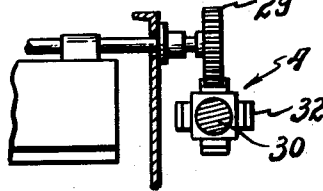


Fig. 7.

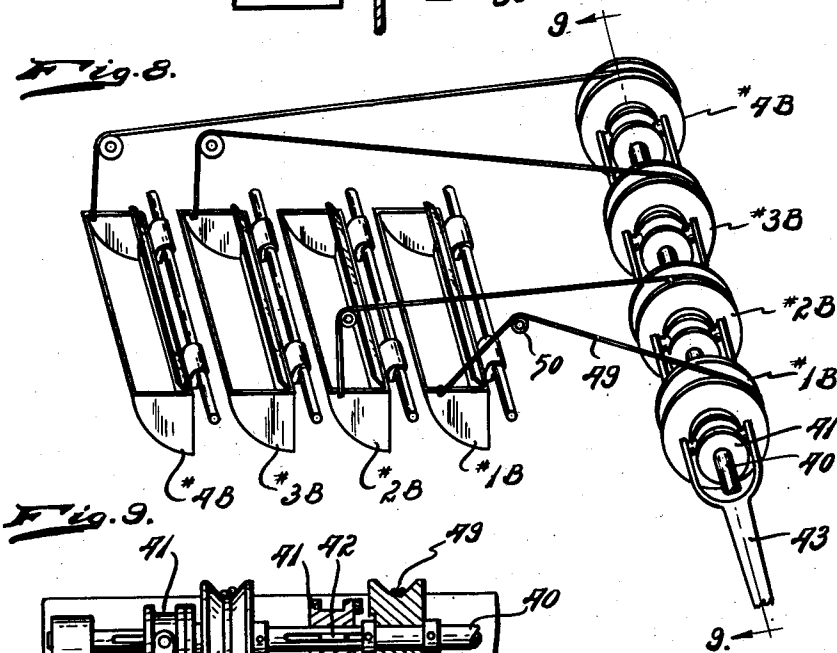


Fig. 8.

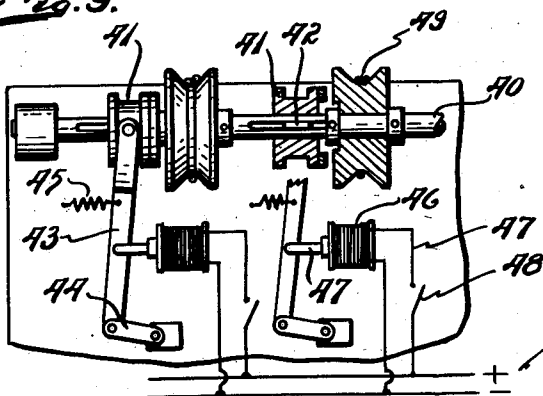


Fig. 9.

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CONVEYING APPARATUS

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2 Claims. (Cl. 198—218)

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The present invention pertains to a novel conveying apparatus and method useful particularly in electroplating and also applicable in other processes.

The invention relates to the basket type of conveyor consisting of a series of baskets mounted on parallel axes and adapted to empty one into the other. In such conveyors alternate baskets are emptied into the intervening baskets, and the intervening baskets are then emptied into the alternate baskets to move the work from one end of the conveyor to the other. It is apparent that only half of the baskets are filled at any given time and that the resulting waste of floor space is substantial.

The principal object of this invention is to provide an apparatus of this general character wherein considerably less than half of the total number of baskets are empty at any given time, so that the waste of floor space is correspondingly reduced. This result is realized by overturning only one basket at a time but in a particular sequence. This sequence is in the direction opposite to the flow of work along the conveyor.

In a series of eight baskets, for example, only one basket in eight need be empty, and the waste of floor space is thereby reduced from 50% to 12½% of the total space. In the case of a conveyor having a substantially larger number of baskets, the baskets are divided into groups of successive members, and each group is operated in the manner described, with corresponding members of the groups being actuated simultaneously.

In the preferred embodiment of the invention, each basket is provided with an axial gear, and the gears are engaged successively in the proper sequence by rack bars mounted spirally on a rotatably and slidably mounted rod. On intermittent rotation of the rod, the racks engage the gears successively in a sequence opposite to the direction of work travel. It is evident, however, that other means of actuating the baskets may be employed and one such alternative means is described herein.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which:

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Figure 1 is a side elevation, partly in section, of a mechanism according to the invention;

Figure 2 is a section on the line 2—2 of Figure 1;

Figure 3 is a detail longitudinal section on the line 3—3 of Figure 2;

Figure 4 is a section on the line 4—4 of Figure 1;

Figure 5 is a diagram of the baskets in end view;

Figure 6 is a perspective view of a modification;

Figure 7 is a section on the line 7—7 of Figure 6;

Figure 8 is a perspective of another modification, and

Figure 9 is a section thereof on the line 9—9 of Figure 8.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

In Figure 1 is shown a plating apparatus including a receptacle 1 which may be a single tank or a series of tanks as already known in the art. A number of spaced shafts 2 are journaled across the tank 1, and each such shaft carries a basket 3 having a flat wall 4 extending longitudinally of the shaft, a curved longitudinal wall 5 bent on an arc of 90°, end walls 6 and an open side 7. The side 7 is uppermost and horizontal when the basket is positioned in the tank 1 and is adapted to be brought over the open side of the adjacent bucket by a 90° turn of the corresponding shaft 2. Each basket carries an angular lip 8 at the longitudinal edge nearer its shaft 2, for the purpose of preventing spilling of the material in flowing from an overturned basket to the basket beneath it.

For operating purposes each shaft 2 carries a gear 9 at a given side of the tank 1. Adjacent to the gears is slidably mounted a multiple rack bar 10 in suitable bearings 11. The bar 10 carries a rack 12 for each gear 9 in a series of baskets, and the racks for a given series are spaced equally around the bar, as shown more clearly in Figure 2. For example, if there are eight baskets in a series, there are eight racks 12 spaced equally around the bar 10 and arranged lengthwise of the bar to mesh respectively with the cor-

responding gears on turning the bar, as will presently be shown.

In order to rotate the bar 10 in its bearings 11, there is slidably mounted on the bar a ratchet wheel 13 having equally spaced teeth corresponding in number to the baskets, gears and racks. The slidable mounting is accomplished by a spline connection 14 between the bar 10 and the ratchet wheel, and the latter is held against sliding movement by fingers 15 extending from the fixed structure into engagement with grooved hubs 16 on the sides of the ratchet wheel, as may be seen in Figures 1 and 4. Beneath the ratchet wheel 13 is mounted a vertical cylinder 17 having an upwardly extending piston rod 18. The latter carries a pivotally mounted escapement pawl 19 biased by a spring 20 to drive the ratchet wheel as the piston rod moves in a given direction and to hold the wheel at the end of such movement, while slipping idly over the wheel in the opposite direction, as well known in connection with this escapement device in other applications. It is evident that the operation of the cylinder 17 and piston rod 18 brings the racks 12 intermittently into engagement with the corresponding gears 9.

The sliding movement of the rod 18 to turn the rack-engaged gear 9 and the basket corresponding thereto is accomplished by a mechanism including a cylinder 21 suitably mounted on the apparatus as shown in Figure 1. A grooved collar 22 is fixed on the bar 10 and is engaged freely by the ends of a depending yoke 23. The lower end of the yoke is suitably articulated to the fixed structure by a linkage 24, and an intermediate point is attached to the piston rod 25 extending through an end of the cylinder 21. The opposite end of the cylinder preferably has a pivotal attachment 26 to the fixed structure of the apparatus in order to permit the required swivel movement in the operation of this mechanism. It is now apparent that pressure in the cylinder 21 may be utilized to shift the bar 10 first in one direction to overturn a given basket and then to shift the bar in the opposite direction to return the basket to its original position. The flow of fluid to the cylinders 17 and 21 is timed to turn the ratchet wheel 13 one notch and then oscillate the bar 10 in the manner described.

In Figures 1 and 3 the baskets and the corresponding gears are marked #1, #2, #3, #4, #5, #6, #7 and #8 from right to left. Regardless of the sequence of operation of the baskets, the work necessarily flows from left to right since the baskets turn from left to right in emptying. However, the sequence of operation of the baskets is in the direction opposite to the work travel or from right to left, as will now be shown. In Figure 1, gear #8 is in mesh with its corresponding rack 12. After the gear has been oscillated in the manner described, the rack bar 10 is given one-eighth turn clockwise by the ratchet mechanism, as may be seen in Figure 4. This movement brings a rack bar into mesh with gear #2. The operation is repeated to turn the baskets successively in a direction of sequence opposite to the direction of the work travel. There may be more than one group of eight baskets as indicated in Figures 1 and 3, and in this case the corresponding or like numbered baskets of each group will be actuated simultaneously, the provision of racks on the bar 10 being repeated according to the number of series. Also, the number of baskets in a series may be more or less than eight, as desired.

In the modification shown in Figures 6 and 7,

there are four baskets in a series, and several such series are provided. The members of each series are designated at #1A, #2A, #3A and #4A. The construction of the baskets and the gears 29 carried thereby is the same as previously described and need not be detailed again.

The slidably mounted rack bar 30, however, carries sets of four racks 32, spaced 90° apart around the bar 30, as shown in Figure 7. A set of four racks is provided for each set of four baskets. The rack bar is turned intermittently and oscillated by a mechanism similar to that shown in Figures 1 and 4. The baskets are operated in the sequence #1A, #2A, #3A and #4A, while the work necessarily flows in the opposite direction.

Figures 8 and 9 illustrate another mechanism for accomplishing the same result. The baskets #1B, #2B, #3B and #4B, are constructed and arranged in the manner already described. A shaft 40 is rotatably mounted lengthwise of the individual baskets or transversely of the series and carries loose pulleys #1B, #2B, #3B and #4B, corresponding respectively to the baskets. Adjacent to each pulley, a clutch member 41 is slidably keyed at 42 on the shaft 40. A shifter fork 43 is suspended from each pulley and has one end articulated at 44 to the fixed structure. Springs 45 normally hold the members 41 out of engagement with their respective pulleys. Adjacent to each fork 43 is mounted a solenoid 46 having an armature 47 connected to the fork and adapted to pull the latter against the tension of the spring 45, whereby to draw the clutch member 41 into engagement with its pulley. The circuit 47 of each solenoid is controlled by a switch 48. A cable 49 is secured to each pulley and connected to the corresponding basket, passing over a guide pulley 50 as shown in Figure 8.

A means (not shown) is provided for operating the switches 48 successively in order to actuate the pulleys and the baskets in the sequence #1B, #2B, #3B and #4B, while the work travels in the opposite direction as already set forth.

In each of the described embodiments, the baskets of each group are actuated in a sequence having a direction opposite to the flow of work. In the conventional basket type of conveyor, alternate baskets empty into the intervening baskets, and consequently only the alternate baskets or the intervening baskets are loaded at any given time. In other words, only half of the baskets are filled. The floor space occupied by the remaining half of the baskets represents a substantial economic loss.

In the present invention the corresponding loss for empty baskets is considerably less. In a typical group of eight baskets the loss is only 12½ percent. In a group of four baskets the loss is 25 percent; and in larger groups the loss is correspondingly smaller.

Although specific embodiments of the invention have been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention as indicated by the appended claims.

What I claim is:

1. In a conveying apparatus, a plurality of baskets pivotally mounted on parallel axes, each basket being adapted to empty into the next basket in a given direction, a gear on each of said axes, a rotatably and slidably mounted rod adjacent to said gears, rack bars arranged in a

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spiral series on said rod to engage said gears successively in a sequence opposite to the first named direction, and means for intermittently rotating and reciprocating said rod.

2. In a conveying apparatus, a plurality of baskets pivotally mounted on parallel axes, each basket being adapted to empty into the next basket in a given direction, said baskets being arranged in groups of equal numbers of successive baskets, a gear on each of said axes, a rod rotatably and slidably mounted adjacent to said gears, rack bars arranged in spiral series on said rod to engage corresponding members of said

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groups simultaneously and in a sequence opposite to the first named direction, and means for intermittently rotating and reciprocating said rod.

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The following references are of record in the file of this patent:

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