This invention relates to improvements in chain and bucket excavators, and particularly to the type employed for excavating land for the recovery of precious metals by means of an excavator including an endless chain and a line of buckets, the buckets being frequently required to work through mud or wet earth and this substance, which action of the buckets operates to compress therein, frequently fails to gravitate from the buckets as these pass around the upper tumbler of the excavator. The employment of one or more attendants has heretofore been required to effect dislodgment of the sticky material when the same fails to gravitate freely from the buckets.

The present invention has for its general object the provision of means for automatically scavenging the buckets of a chain and bucket excavator, as the buckets successively pass around the upper tumbler of the excavator.

The above and other objects are accomplished by instrumentalities pointed out in the following specification.

The invention is clearly defined in the claims.

A satisfactory embodiment of the invention is illustrated in the accompanying drawings forming part of the specification and in which—

Figure 1 is a vertical cross section taken in the direction of the length of the boom of a chain and bucket excavator, showing the upper tumbler and several of the buckets of an excavator constructed in accordance with the present invention.

Figure 2 is a view taken at right angles to Figure 1 and approximately on the line 2—2 of that figure and looking in the direction of the arrows.

Figure 3 is a view taken at right angles to Figure 2, and on the line 3—3 of that figure; and

Figure 4 is a detail plan showing a portion of the upper tumbler and one of the faces thereof.

In the drawings 5 and 6 indicate the upper end portions of the boom. 7 is a transverse shaft having its ends mounted in oppositely disposed bearings in the upper end of the boom and extending through and forming a bearing support for the hub 8 of the upper polygonal tumbler a which is rigidly secured to the transverse shaft 7. A centrally disposed radial web 9 formed with hub 8 is peripherally provided with a plurality of angularly disposed yokes 10 which form supports for the links 13—13 of the chain and the intervening buckets 15 as these parts move around the tumbler a. The links 13 of the opposite chains are connected by the usual pintles 14 and are suitably secured as by rivets 16 to the opposite end walls 17 of the buckets 15, all of which is shown in Figures 1 and 2 of the drawings. The shaft 7 has an axial bore or passage 18, the outer end of which is connected to the inwardly directed end of a water supply pipe 19 which extends through a packing box 20 to prevent leakage around the pipe when the shaft rotates. The inner end of passage 18 extends to the central portion of shaft 7 and terminates in a lateral extension 21 opening through the side of the shaft and communicating with a port 22 in the hub 8 which extends into a circular chamber 23 in the central portion of the hub. The web is bored transversely at spaced intervals to provide a series of chambers indicated by 24 in Figures 1 and 2. Each chamber is provided with a valve seat, indicated by 25 in Figure 2, and a valve 26 controls communication between one end portion of the chamber and a port 27 located in the opposite end of the chamber and extending into the circular chamber 23. 28 in Figures 1 and 2 indicates a series of pockets extending inwardly through the hub from the outer face of the bases 29 of the yokes. The inner ends of the pockets respectively communicate with the transverse chambers 24. The pockets are provided for the reception of a plurality of hollow cylindrical gaskets 30 which extend beyond the bases 29 of the yokes and through wear plates 31 for the buckets which are secured to the outer faces of the bases 29 in any preferred manner as by screws 32 as indicated in Figure 4.

The straight back plates 33 of the buckets 15 are provided adjacent their inner sides with relatively small inlet openings 34 which are disposed so as to align substantially axially with the hollow cylindrical gaskets 30, when the buckets are disposed around the tumbler a. The outer ends of the cylindrical gaskets are open as shown in Figures 1 and 2, and the inner ends are provided with ports 35 which approximate
in size, the ports 34 and are less than the outer end openings of the gaskets 30. The outer end portions of the buckets are counterbored as at 36 so as to provide shoulders which form bearing surfaces for exteriorly disposed collars 37 on the gaskets which operate as stops to limit inward movement of the gaskets. The stems of valves 26, one of which is shown in Figure 2 and indicated by 38, are adapted to be operated reciprocate in passing upon and over a cam 39, herein shown as being formed with the inner face and upper end portion of the side 6 of the boom, the cam extending forwardly and downwardly as shown in Figures 2 and 3. Each of the stems 38 extends through a guide 40 secured to one face of web 9, the outer end of the stem being provided with a roller 41 which rides upon the cam 39 in the rotation of the upper tumbler a. Compression springs, one of which is shown in Figure 2 and indicated by 42, are disposed between the valve seats 25 of the valves 26 and the inner ends of the guides 40, a pin 43, or its equivalent, being secured to each valve stem and operating to compress the spring when the stem is moved inwardly in the opening of the valve and during the time the roller 41 is passing over the cam 39.

In the operation of the device, those of the valves 26 whose rollers 41 are out of contact with the cam 39, are seated within the seats 25 so that communication between the transverse chambers 24 and the annular chamber 23 is interrupted. Water under pressure is at all times within the water supply pipe 19 and within the annular chamber 23, so that in the turning of the upper tumbler and when the roller of the stem moves into contact with the cam 39 and causes the valve 26 thereof to move to the position shown in Figure 2, water flows from annular chamber 23 through port 27 and into transverse chamber 24 and then through port 25 and through gasket 26 and inlet passage 34 and into one of the buckets 15. The cam 39 is so disposed and proportioned as to effect the operation of a valve at the time that a bucket passes the high point of the boom and begins to descend and occupy the lower run of the bucket chain. The length of the cam is such as to cause the valve of the same bucket open only such time as the position of the bucket is completely inverted. It is obvious that the water under pressure entering the bucket through the inlet passage 34 operates to detach the earth that adheres to the inner surface of the bucket and to liquefy the earthy contents of the bucket to a great extent, so that when the bucket moves into a substantially inverted position, the discharge of its contents is provided for not only by the action of the water flowing into the bucket, but by the weight of the content of the bucket. When the bucket moves beyond cam 39, spring 42 operates to close the valve 26 whereupon the water supply to the bucket is cut off. At about this time the succeeding upwardly moving bucket is in position to be operated upon by cam 39 and to have its contents operated upon by water as described for the first mentioned bucket.

It will be noted that inlet passage 34 of each bucket is considerably smaller than the outer ends of gaskets 30. This is to provide for alignment at all times between the ports of the buckets and the gaskets, regardless of the usual slight amount of lateral displacement, that is invariably had on the part of the buckets in moving around the upper tumbler. The provision of the relatively small inlet ports, 33 at the inner ends of the gaskets provides for obtaining sufficient pressure on the inner ends of the gaskets so as to insure a tendency on the part of the buckets to move outwardly and into tight contact with the back plates 38 of the buckets, and thereby prevent leakage and loss of pressure on the part of the water in passing into the buckets.

Although I have shown and described one embodiment of my invention, it is to be understood that the same is susceptible of various changes; and I reserve the right to employ such as may come within the scope of the appended claims.

I claim:

1. In a chain and bucket excavator, a support, a tumbler shaft carried by the support and having an open-ended fluid passage, one end of which is adapted to be connected to a fluid supply pipe to a tumbler chamber carried by the shaft and having a plurality of water passages extending outwardly from the water passage of the shaft and opening through the side faces of the tumbler, an endless bucket line including a plurality of buckets trained around the tumbler and having back portions provided with inlet openings disposed so as to register with the outer ends of the water passages of the tumbler as the buckets move around, the tumbler, valves disposed in the water passages of the tumbler for controlling the passage of water thereto from the buckets, and means connected to the support for operating the valves to open successively in the turning of the tumbler.

2. In a chain and bucket excavator, a support, a tumbler shaft carried by the support and having an open-ended fluid passage, one end of which is adapted to be connected to a fluid supply pipe, a polygonal tumbler carried by the shaft and having a plurality of water passages extending outwardly from the water passage of the shaft and opening through the side faces of the tumbler.
tumbler, an endless bucket line including a plurality of buckets trained around the tumbler and having back portions provided with inlet openings disposed so as to register with the outer ends of the water passages of the tumbler as the buckets move around the tumbler, self-closing valves disposed in the water passages of the tumbler for controlling the passage of water therefrom to the buckets, said valves having valve stems extending laterally outward from the tumbler, and means connected to the support for operating the valve stems successively to open the valves in the turning of the tumblers.

3. In a chain and bucket excavator, a support, a tumbler shaft carried by the support and having an open-ended fluid passage, one end of which is adapted to be connected to a fluid supply pipe, a polygonal tumbler carried by the shaft and having a plurality of water passages extending outwardly from the water passage of the shaft and opening through the side faces of the tumbler, an endless bucket line including a plurality of buckets trained around the tumbler and having back portions provided with inlet openings disposed so as to register with the outer ends of the water passages of the tumbler as the buckets move around the tumbler, valves disposed in the water passages of the tumbler for controlling the passage of water therefrom to the buckets, means connected to the support for operating the valves to open successively in the turning of the tumbler, gasket members disposed in the outer end portions of the fluid passages of the tumbler and responsive to fluid pressure in the said passages and adapted to move outwardly and into contact with the buckets when the valves are opened.

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