

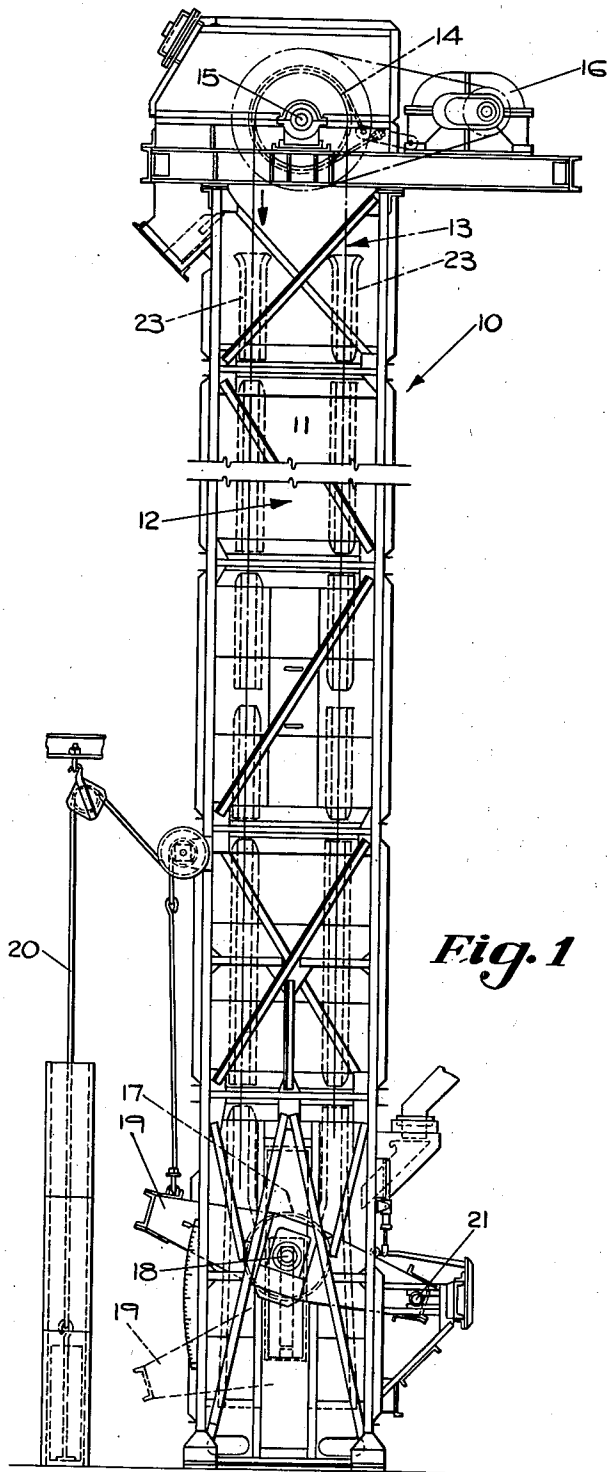
June 14, 1949.

S. M. MERCIER
SAFETY APPARATUS

2,472,914

Filed Aug. 19, 1944

3 Sheets-Sheet 1



INVENTOR;
STANLEY M. MERCIER,
BY *Harold H. Hutton,*
ATT'Y.

June 14, 1949.

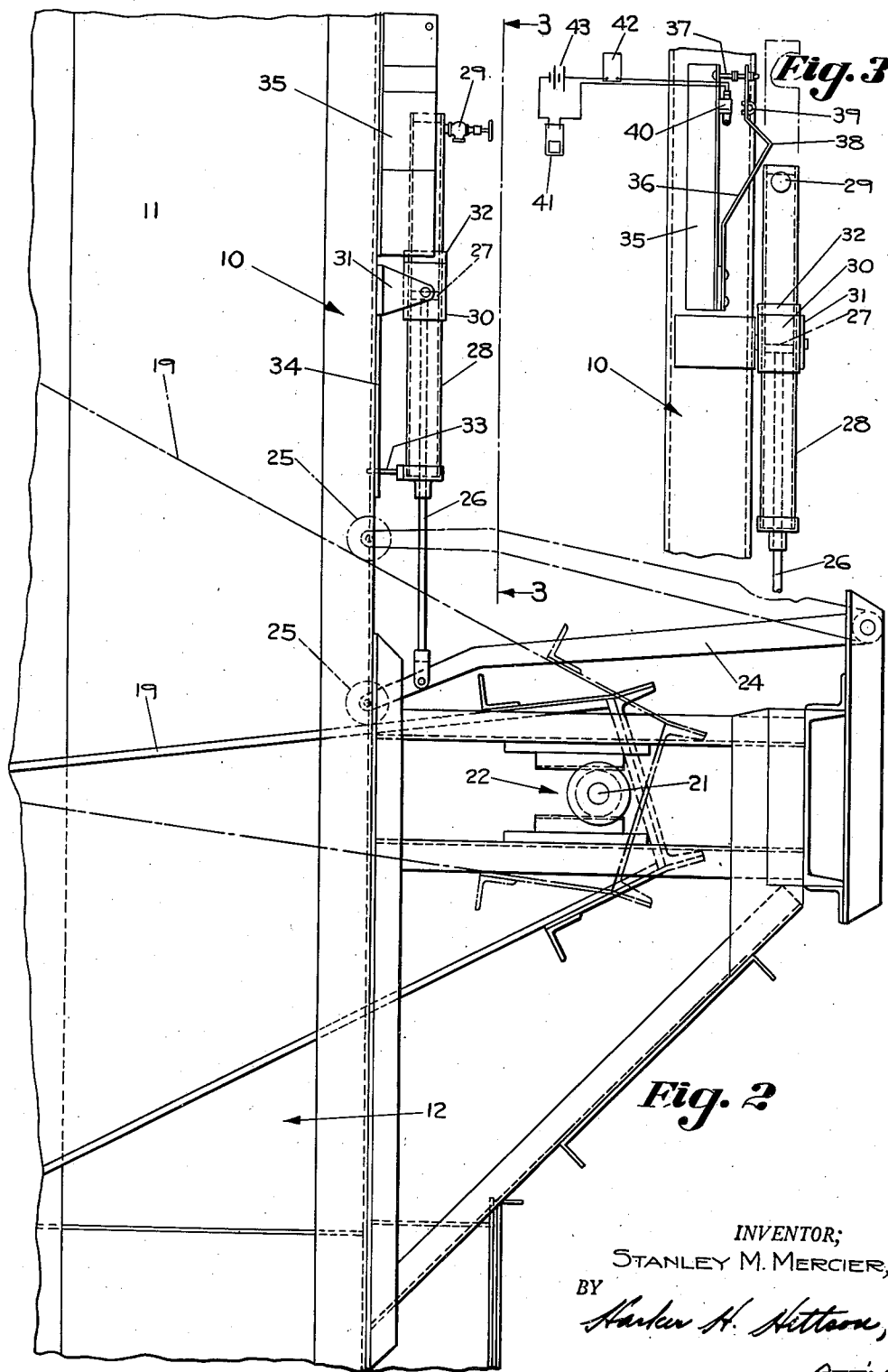
S. M. MERCIER

2,472,914

SAFETY APPARATUS

Filed Aug. 19, 1944

3 Sheets-Sheet 2



INVENTOR;
STANLEY M. MERCIER,
BY
Harlan H. Nittson,
ATTY.

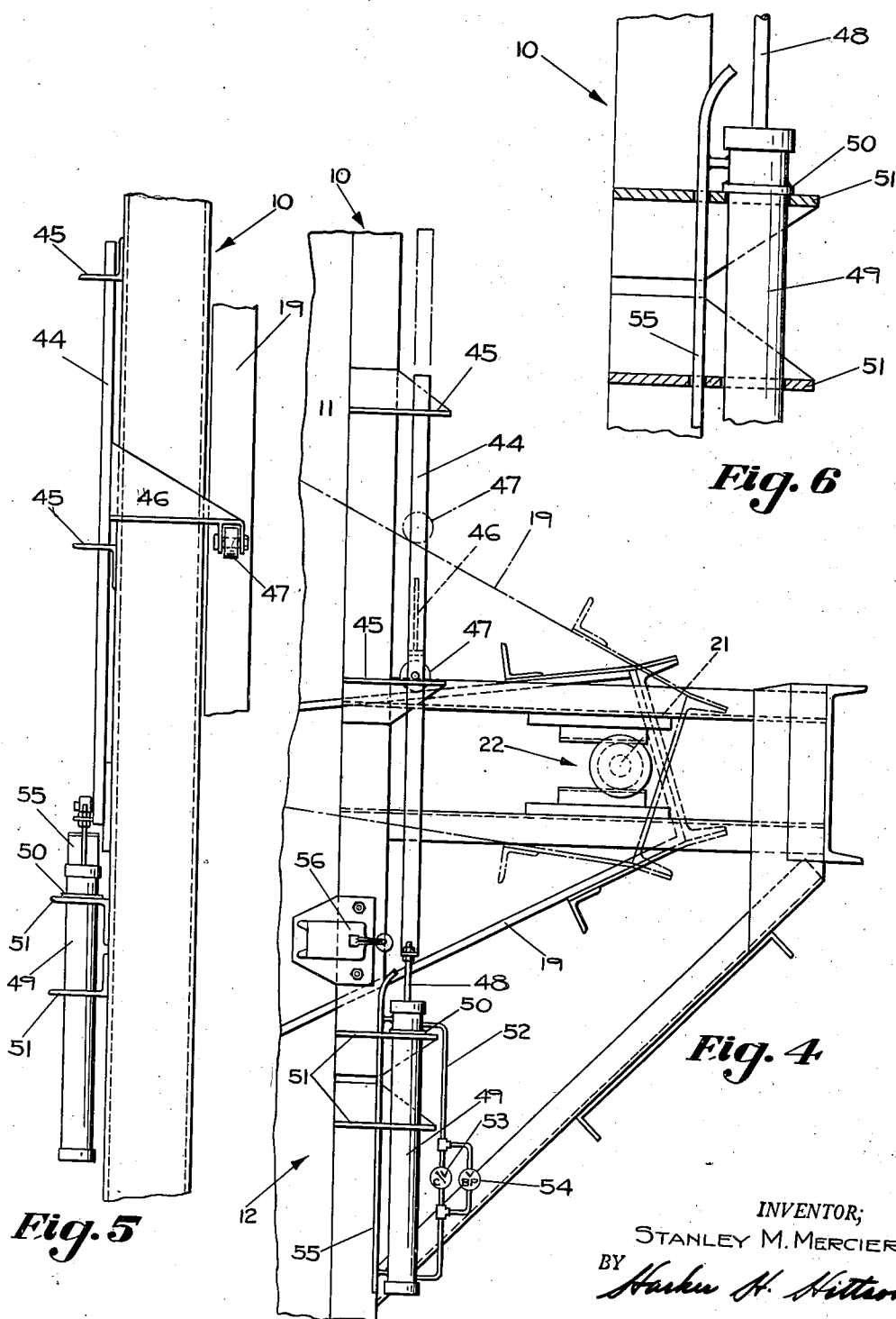
June 14, 1949.

S. M. MERCIER
SAFETY APPARATUS

2,472,914

Filed Aug. 19, 1944

3 Sheets-Sheet 3



INVENTOR;
STANLEY M. MERCIER,
BY *Harold H. Hutton,*
ATT'Y.

UNITED STATES PATENT OFFICE

2,472,914

SAFETY APPARATUS

Stanley M. Mercier, Bexley, Ohio, assignor, by
mesne assignments, to The Jeffrey Manufac-
turing Company, a corporation of Ohio

Application August 19, 1944, Serial No. 550,260

9 Claims. (Cl. 198—232)

1

This invention relates to safety apparatus and an object of the invention is to provide apparatus for giving an alarm or shutting off the driving motor of a conveyor in response to an undesirable accumulation of slack therein.

A further object of the invention is to provide improved alarm or control mechanism which will permit slow relative movement of a slack responsive device without operating the alarm or control mechanism but which will actuate said alarm or control mechanism in response to a rapid movement of the control device.

Other objects of the invention will appear hereinafter the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is an elevational view of a conveyor which incorporates the features of my invention;

Fig. 2 is an enlarged elevational view of a portion of the device of Fig. 1 showing particularly the alarm or control mechanism;

Fig. 3 is an elevational view taken on the line 3—3 of Fig. 2, looking in the direction of the arrows, showing the alarm or control circuit;

Fig. 4 is an enlarged view of a modified form of alarm or control mechanism;

Fig. 5 is another view of the apparatus of Fig. 4 taken at right angles thereto; and

Fig. 6 is an enlarged sectional elevational view showing certain structural details of the mechanisms of Figs. 4 and 5.

This invention was made to solve a problem which developed in connection with the hot catalyst elevator disclosed in my application, Serial No. 500,799, for an Elevator, filed September 1, 1943, and it is to be understood that unless a contrary fact is indicated, the elevator herein disclosed follows that of said application.

In certain broader aspects of this invention it relates to conveyors generally and a modification thereof is disclosed in my co-pending application, Serial No. 550,259, filed August 19, 1944, entitled Conveyor (issued March 16, 1948, as Patent No. 2,438,068).

Referring to the specific embodiment of my invention as disclosed in Figs. 1, 2 and 3 of the drawings, Fig. 1 thereof particularly illustrates an upstanding elevator including a main frame 10, preferably provided with enclosing panels 11 so as to provide a totally enclosing casing designated generally by the reference character 12. Within the casing 12 is an endless conveyor mechanism 13 in the form of a pair of laterally spaced endless conveyor chains mounted upon head sprockets 14 which are carried by a head

2

shaft 15 which is driven through reduction gearing 16 from an electric motor not shown. The head sprockets 14 and head shaft 15 comprise the drive sprockets and drive shaft, respectively, for the conveyor mechanism 13. The endless chains of the conveyor mechanism 13 extend downwardly through the casing 12 and around foot wheels 17 mounted on a foot shaft 18 which in turn is mounted on journal bearings in a pivoted walking beam 19 preferably provided with a counterbalancing mechanism 20. The walking beam 19 is pivotally mounted on opposite sides at 21 to rollers 22 which roll on appropriate guideways on the main frame 10 thereby providing for rectilinear up and down movement of the shaft 18 as the walking beam 19 pivots. The structure so far described is disclosed in more detail in my application, Serial No. 500,799, above identified.

It has been found in practice that sometimes the discharge chute of the elevator becomes plugged and the elevator therefore is unable to discharge its load. As a consequence the catalyst which is carried by the buckets of the conveyor mechanism 13 falls to the bottom of the elevator stack and builds up around the foot shaft 18. When this is built up to such an extent as to make the buckets try to dig into the discharged catalyst on their downward path, the driving motor for the conveyor becomes overloaded and stalls. This stalling can happen very quickly but while it is in the process of taking place and the motor is still running, the elevator foot shaft 18 being free to rise by swinging the walking beam 19 will do so and the head sprockets 14 will be paying off the conveyor chains into the down going strand or run. However, the conveyor chains are at a standstill where the conveyor buckets are resting on the catalyst at the foot shaft. As a result the excess chain paid off by the head shaft accumulates at the top of the down going strand and if enough accumulation occurs there is considerable danger of the conveyor chains and buckets becoming wedged on the discharge chute or on the tops of the chain guides which are seen at 23 in Fig. 1 of the drawings or possibly somewhere else. Such an accumulation of slack chain is apt to cause a wreck when the elevator is starting again after the improperly discharged catalyst has been removed from the bottom of the elevator or enclosing casing 12.

I have provided alarm and control mechanism which is effective to give an alarm and/or stop the driving motor of the conveyor or elevator whenever the condition above described occurs. In a more generic aspect of my invention the con-

3

trol and alarm mechanism is provided to operate whenever an undesired amount of slack builds up suddenly in any portion of the conveyor chain.

The alarm and/or control apparatus disclosed in Fig. 2 of the drawings comprises an arm 24 which is pivoted at one end to an angle member of the main frame 10 and at its free end is provided with a roller 25 which rolls on top of the walking beam 19. Pivotaly mounted to the arm 24 and extending upwardly therefrom is a piston rod 26 carrying a piston 27 at its upper end which extends into a cylinder 28 the upper end of which is closed and is provided with an adjustable valve 29. The cylinder 28 is slidably mounted in a sleeve 30 which is pivoted to a bracket 31 mounted on one of the upwardly extending channel members of the main frame 10. Welded or otherwise rigidly attached to the outside of the cylinder 28 is a ring 32 which normally rests on the sleeve 30, thus normally holding the cylinder 28 in the position illustrated in Figs. 2 and 3 of the drawings. At the bottom of the cylinder 28 there is a guide pin 33 which extends inwardly toward the main frame 10 and is adapted to slide over a plate 34 whenever the cylinder 28 moves upwardly as hereinafter described.

As best illustrated in Fig. 3 of the drawings, adjacent the upper portion of the cylinder 28 is an angle member 35 mounted on an upstanding channel member of the main frame 10. The outwardly extending web of the angle member 35 carries a bent bronze spring plate 36 which at its bottom is rigidly connected to the angle member 35 and which at its top is provided with an aperture through which a bolt 37 extends, said bolt 37 being provided with spaced stops against which the upper or free end of the spring 36 can move. The spring plate 36 has an outwardly extending bent portion 38 which extends into the path of the cylinder 28 so that if said cylinder 28 is lifted vertically it will strike the bent portion 38 and bend the spring plate 36 inwardly. The spring plate 36 carries a permanent magnet 39 adjacent its upper end which is located opposite a magnetic switch 40 carried by the angle member 35. The switch 40 controls an electric alarm and control circuit which includes a buzzer or alarm 41, a relay 42 and a source of voltage such as a battery 43. Whenever the spring 36 is bent inwardly in response to movement of the cylinder 28 the magnet 39 will approach the magnetic switch 40 and close its contacts whereby buzzer 41 and relay 42 will be energized. Relay 42 when energized will open the circuit to the driving motor of the conveyor mechanism 13 and thus stop the conveyor mechanism. The buzzer will simultaneously give a signal that the conveyor mechanism has been stopped.

As is disclosed in my application, Serial No. 500,799, the conveyor mechanism 13 is subject to temperature variations as well as to wear and as a consequence the length of the endless chains of the conveyor mechanism 13 will vary appreciably, particularly between the cooling of the mechanism and the heating thereof. The alarm and control mechanism which I have provided does not respond to these slow normal changes in the length of the conveyor chains or, in other words, does not respond to slow or relatively small movements of the walking beam 19 between the two extreme conditions illustrated in Fig. 2 of the drawings. This is because of the fact that any slow movement of the piston 27 in the cylinder 28 will not cause the cylinder 28 to move upwardly since the valve 29 is slightly open and

4

thus permits relative movement between the piston 27 and cylinder 28 at its slow rate. However, should the elevator become clogged as above described or more generically should any part or portion of the conveyor chains develop slack which is not taken up by the slack take-up mechanism, namely the beam 19, the result would be a rapid shortening of that portion of the chain between the head sprocket and the foot sprocket which was under tension. This, of course, would produce a rapid upward movement of the foot shaft 18 and the associated take-up mechanism since the take-up mechanism is free to move a limited amount. This rapid movement of the take-up mechanism or walking beam 19 is, of course, transmitted to the piston 27 through the piston rod 26, arm 24 and roller 25 having an abutting connection with said beam 19, as above described. The bleeder valve 29 is set so that it is not able to bleed off the air in the cylinder 28 when the piston 27 moves rapidly under these conditions and consequently the cylinder 28 is elevated or moves upwardly or in opposition to its normal restoring force which in this instance is provided by gravity, thus sliding through the sleeve 30. In its upward travel the cylinder 28 strikes the bent portion 38 of the spring 36 and moves the magnet 39 toward the magnetic switch 40 closing its contacts and energizing the motor relay 42 and the alarm 41.

In Figs. 4, 5 and 6 of the drawings I have illustrated a modified form of control and alarm mechanism which operates substantially the same as that above described. In this device an upstanding rod 44 is carried in guide brackets 45 mounted on a channel member of the main frame 10. Extending laterally of and carried by the rod 44 is a bracket 46 which at its outer end carries a roller 47 which rides on top of the walking beam 19. The lower end of the rod 44 is connected to a piston rod 48 at the lower end of which there is a piston, not shown, within a cylinder 49. The cylinder 49 is provided with a rigidly attached ring 50 at the outside thereof which is adapted to rest on a top guide bracket 51, there being two such brackets 51 provided with holes through which the cylinder 49 loosely extends, as clearly illustrated in Fig. 6 of the drawings.

Interconnecting the top and bottom of the cylinder 49 is a pipe 52 which contains a check valve 53 and a variable by-pass valve 54. The cylinder 49 may be filled with any fluid such as air or a liquid. The check valve 53 allows free downward movement of the piston but it will not by-pass any fluid as the piston moves upwardly in the cylinder 49. The by-pass valve 54 is adjusted to permit slow upward movement of the piston in the cylinder 49 without lifting said cylinder. However, in response to rapid upward movement of the piston in the cylinder 49, the cylinder 49 will be lifted. Said cylinder 49 carries a cam 55 which operates whenever the cylinder 49 is lifted a predetermined amount to close a switch 56 which actuates an alarm or relay circuit, for example, similar to that disclosed in Fig. 3 of the drawings, which will give an alarm and/or open the circuit of the motor which drives the conveyor.

The fundamental action of the control mechanism of Figs. 4, 5 and 6 is essentially the same as that of Figs. 2 and 3 and therefore no further description is believed necessary to understand its operation.

Obviously those skilled in the art may make various changes in the details and arrangement

of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. Conveyor mechanism including a drive shaft, means including a conveyor chain driven by said shaft, take-up means associated with said chain to take up the slack therein, mechanism including a cylinder and a piston, the latter being movable by said take-up means as it changes position, means associated with said cylinder and piston to provide for their relative movement when said piston moves slowly relative to said cylinder in response to gradual changes of the chain length while preventing rapid relative movement between said piston and cylinder, means mounting said cylinder for free movement by rapid movement of said piston, and control mechanism operated by movement of said cylinder.

2. Conveyor mechanism including a drive shaft, means including a conveyor chain driven by said shaft, take-up means associated with said chain to take up the slack therein, mechanism including a cylinder and a piston, the latter being movable by said take-up means as it changes position, and means associated with said cylinder and piston to provide for their relative movement when said piston moves slowly relative to said cylinder in response to gradual changes of the chain length while preventing rapid relative movement between said piston and cylinder.

3. A conveyor including endless chain means, a drive sprocket for said chain means, movable mechanism operative to maintain said chain means under tension, means controlled by movement of said movable mechanism to operate a control operating means whenever said movable mechanism moves rapidly while providing for relatively slow movement thereof without operating said control operating means, said control operating means including a cylinder mounted for free movement, a piston therein, and valve means providing for slow movement only of said piston relative to said cylinder, and control means operated by movement of said cylinder.

4. A control device including a cylinder mounted for movement but urged to one position, a piston in said cylinder, means for moving said piston, valve means for said cylinder providing for slow movement of said piston relative to said cylinder, said piston moving said cylinder whenever it moves rapidly, and control means operated by movement of said cylinder in response to rapid movement of said piston, said control means including a control switch.

5. A control device including a cylinder mounted for movement but urged to one position, a piston in said cylinder, means for moving said piston, valve means for said cylinder providing for slow movement of said piston relative to said

cylinder, said piston moving said cylinder whenever it moves rapidly, and control means operated by movement of said cylinder in response to rapid movement of said piston.

6. A conveyor including endless chain means and a drive sprocket, slack take-up mechanism for said chain means, means associated with said slack take-up mechanism including a cylinder having a piston therein, means operating said piston in response to movement of said slack take-up mechanism, and a valve for said cylinder providing for slow movement of said piston in said cylinder but preventing fast movement between them in one direction.

7. A conveyor including endless chain means and a drive sprocket, slack take-up mechanism for said chain means, means associated with said slack take-up mechanism including a cylinder having a piston therein, means operating said piston in response to movement of said slack take-up mechanism, and a valve for said cylinder providing for slow movement of said piston in said cylinder but preventing fast movement between them.

8. Conveyor mechanism including a conveyor chain, drive means for said chain, take-up means associated with said chain to take up the slack therein, mechanism including cylinder and piston members one of which is moved relative to the other by a connection with said take-up means as it changes position, a control device, means providing for slow relative movement of said cylinder and piston members without operating said control device, said mechanism being constructed and arranged whereby said control device is operated thereby whenever the member connected to said take-up means is moved rapidly.

9. Conveyor mechanism including a conveyor chain, drive means for said chain, take-up means associated with said chain to take up the slack therein, mechanism including a pair of members one of which is moved relative to the other by a connection with said take-up means as it changes position, a control device, means providing for slow relative movement of said pair of members without operating said control device, said mechanism being constructed and arranged whereby said control device is operated thereby whenever the member connected to said take-up means is moved rapidly.

STANLEY M. MERCIER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,663,344	Lennard	Mar. 20, 1928
1,682,052	Radcliffe	Aug. 28, 1928
1,714,431	Lissen	May 21, 1929
1,728,283	Fisher	Sept. 17, 1929
1,888,309	Cramer	Nov. 22, 1932