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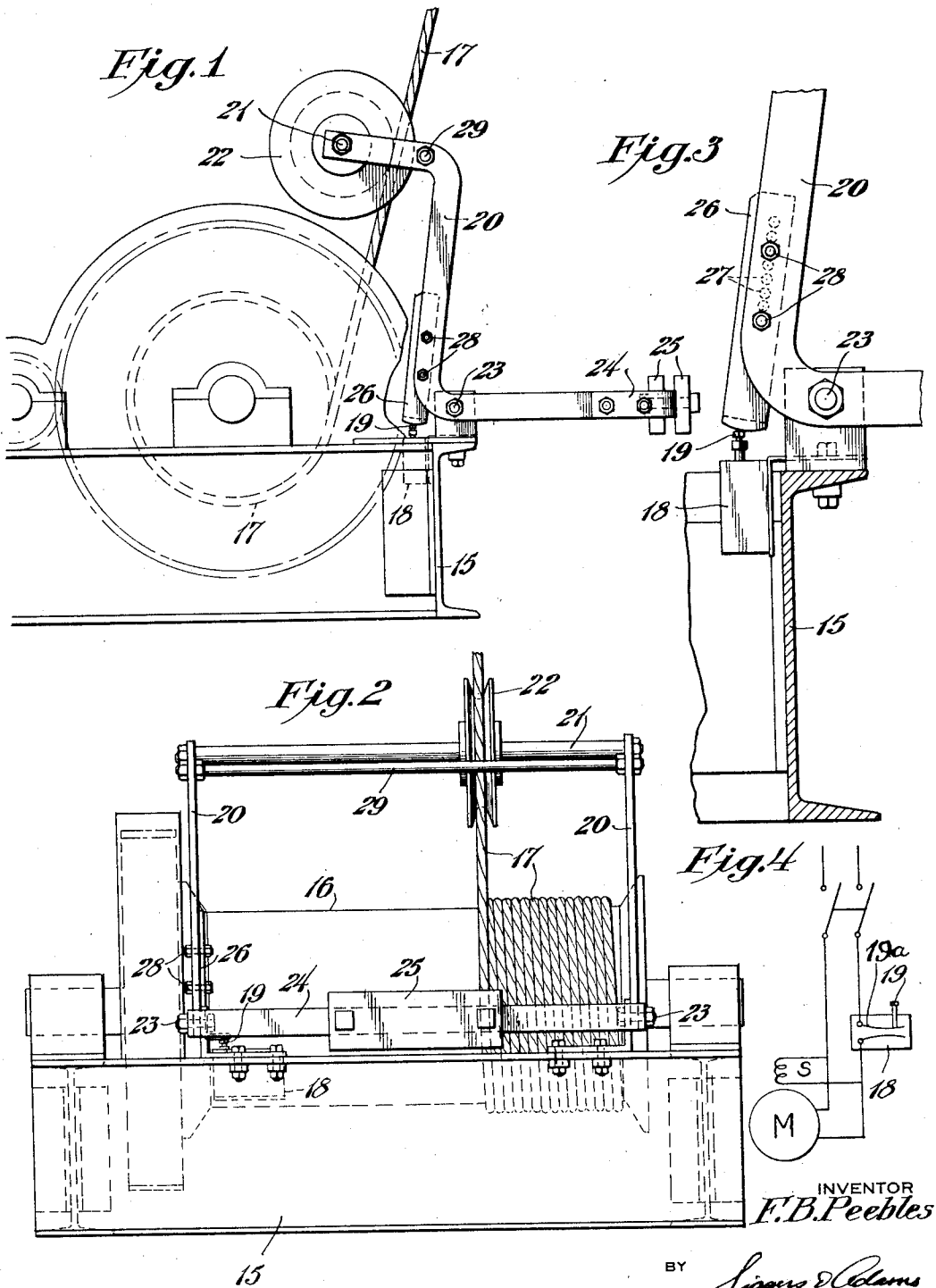
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SLACK CABLE SWITCH

Filed March 19, 1931

2 Sheets-Sheet 1



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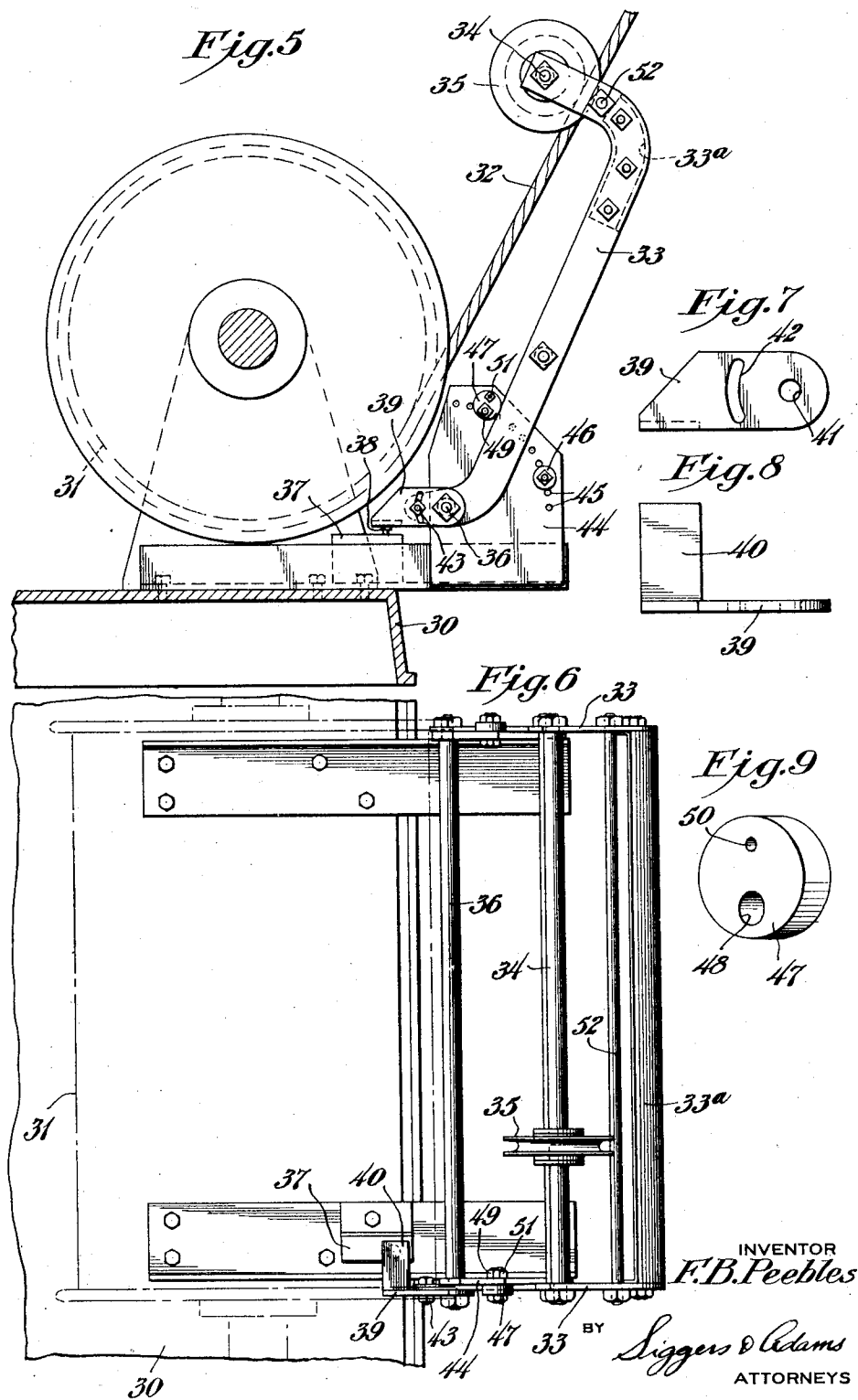
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UNITED STATES PATENT OFFICE

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SLACK CABLE SWITCH

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This invention relates to actuating mechanisms for controlling hoist motors upon slackening of the hoist cable, such mechanisms being commonly known as slack cable switches; and, among other objects, the invention aims to provide a simple and dependable construction which may be adapted for use with installations of many different types, both those already in use and new installations, particularly trolley bucket installations.

In the accompanying drawings showing two embodiments of the invention,

Fig. 1 is a side elevation of a hoist drum 15 showing the improved mechanism mounted adjacent thereto;

Fig. 2 is an elevation viewed from the right end of Fig. 1;

Fig. 3 is an enlarged vertical section showing particularly the adjustable foot piece on the swinging frame;

Fig. 4 is a simplified wiring diagram showing the manner in which the switch controls the motor circuit;

Fig. 5 is an elevation with parts in section showing another form of the invention;

Fig. 6 is a fragmentary plan view of the form of Fig. 5, the drum being shown in dot and dash lines;

Fig. 7 is a detailed elevation of the adjustable foot piece used in the form of Fig. 5;

Fig. 8 is a plan view of the same; and

Fig. 9 is a perspective view of the eccentric disk used as a stop in connection with the swinging frame of Fig. 5.

Referring particularly to Figs. 1, 2 and 3, there is shown the base 15 of a hoist unit which may be employed with a trolley bucket system, mine hoist or the like. Mounted in bearings on the base 15 is a drum 16 which is driven through gearing (indicated in dot and dash lines) by a motor M (Fig. 4). A hoist cable 17 has one end secured to the drum 16 and is wrapped around the same, as shown in Fig. 2, the hoist cable being guided by guide sheaves (not shown) to the bucket which is raised and lowered as the drum is driven in reverse directions.

Mounted on the base 15 is a switch 18 which, as shown in Fig. 4, is in the motor circuit and

is so arranged that it stops the motor when opened. Preferably, but not necessarily, the switch 18 is of the type having a plunger or contact member 19 projecting outside the switch member, as shown, the switch being normally opened by a spring 19^a but being closed whenever said contact member is pushed inwardly.

Pivotaly mounted on the base 15 adjacent the drum 16 is a frame which moves responsive to variations in tension of the hoist cable 17. This frame, as shown, consists of two side members 20 connected together by a rod or shaft 21 on which a sheave 22 is slidably mounted, said sheave being in contact with the hoist cable 17. The members 20 are pivoted about a rod 23 secured upon the base 15; and to cause the frame to hold the sheave 22 against the hoist cable 17, there is an extension frame 24 carrying a counterweight 25. The counterweight 25 is of such mass as to maintain constant pressure of the sheave against the hoist cable so that the hoist cable is constantly in the groove of the sheave. Thus the sheave 22 will travel longitudinally of the rod or shaft 21 as the cable 17 unwraps from the drum 16.

It will be clear that when the cable 17 slackens, the frame will rock in a clockwise direction, as viewed in Fig. 1, the weights 25 maintaining contact between the sheave and the cable whatever the position of the latter. It will also be obvious that a considerable slack will be created in the cable each time the bucket reaches the lower limit of its travel. At this time, the hoist motor should be stopped. Stoppage of the hoist motor is effected through the switch 18, whose contact member 19 is released by an adjustable foot piece 26 carried by the frame; the parts being so constructed and arranged that each time the cable slackens the foot piece is lifted relative to the contact member 19, whereupon the switch automatically opens. As soon as the switch opens, the motor stops because of the solenoid brake S, thus stopping the hoist drum and the bucket.

It will be observed that the adjustable foot piece 26 is longitudinally adjustable because of the series of holes 27 in said foot piece,

said holes extending longitudinally thereof and permitting the foot piece to be adjusted substantially vertically relative to contact member 19, adjustment being effected by the bolts 28.

5 When the bucket is suddenly stopped, the hoist cable 17 will whip back and forth and may even jump out of the groove and sheave 22 unless means are provided to control the movement of the cable. To prevent the cable
10 from jumping out of the groove of the sheave, a rod 29 is secured to the side members 20 of the frame and passes transversely across the frame adjacent the edge of the sheave, as
15 clearly shown. Thus the frame will move with the cable and the cable cannot jump out of the groove, which would make it impossible to operate the hoist unit as the switch 18 would remain open.

20 Referring now to the form of the invention shown in Figs. 5 and 6, there is a base 30, a hoist drum 31, a hoist cable 32 and a pivoted frame, including side members 33 and a connecting member 33^a. Extending be-
25 tween the free ends of the members 33 is a rod or shaft 34 on which is slidably mounted the sheave 35 having contact with the hoist cable 32, as shown. The frame is pivoted as
30 upon a rod 36 so as to swing responsive to fluctuations in the tension of the hoist cable.

The slack cable switch is indicated diagram-
matically at 37 and has a projecting contact
member 38 with which an adjustable foot
35 piece 39 is normally in contact. The adjust-
able foot piece, as shown in Figs. 7 and 8, has
a flange 40 for making contact with the con-
tact member and a bore 41 by which it is
mounted on the rod 36 to oscillate with the
40 frame member 33. The foot piece 39 also
has an arcuate slot 42 and a bore 43 passing
through said slot and through the end of the
member 33 on which the foot piece is mount-
ed. Thus, an angular adjustment of the foot
45 piece 39 relative to the member 33 is per-
mitted, so as to adapt the position of the foot
piece to the relative positions of the frame
member 33 and the contact member 38 with
which the flange 40 contacts.

To control the swinging movement of the
50 frame, stop members are provided on the
plate 44 supported by the base 30. The plate
44 has a series of perforations 45 arranged
in an arc whose center is the axis of the pivot
rod 36; and two stops 46, 47 are provided,
55 each being secured by a bolt in one of the
perforations 45 in such a position as to be
struck by the edge of one of the frame mem-
bers 33 as it oscillates responsive to fluctua-
tions in the tension of the hoist cable.

60 As the frame member 33 is normally in
contact with the upper stop member 47 and
as there is a certain normal position for said
frame, it is preferred that this stop mem-
ber be made adjustable so as to have an edge
65 contact with the frame member 33 when the

sheave 35 is resting lightly on the cable 32.
As the angle of the cable 32 varies with dif-
ferent installations, and as it is desirable to
hold the sheave 35 in constant engagement
with the hoist cable, a nice adjustment of
the stop member 47 is almost indispensable
and this is permitted in the preferred con-
struction by making the stop member 47 an
eccentric, best shown in Fig. 9, providing a
70 bore 48 through which a bolt 49 (Fig. 5) may
pass, the bolt 49 permitting the workman,
during erection of the hoist unit, to oscillate
the eccentric 47 about the bolt as a pivot to
bring the edge of the eccentric in proper en-
75 gagement with the edge of frame member 33.
When the proper engagement has been
effected, the workman will then drill the ec-
centric 47, as indicated at 50 (Fig. 9) at the
same time drilling the plate 44; and the ad-
justment will be made permanent by means
80 of a small bolt 51 passing through the two
holes so drilled. The eccentric 47 serves as a
stop to prevent such movement of the frame
as would break the switch and may be accu-
rately adjusted to insure, in conjunction with
the foot piece 39, proper operation of the
90 switch, that is, full movement of the contact
member 38. It will be obvious that by means
of the slot 42 and the holes 45 a very nice ad-
justment may be made to insure proper oper-
ation of the switch, irrespective of the angle
of the rope, and hence the device may be
adapted to all conditions met with in the
field. Furthermore, the mechanism is adapt-
ed to operate the switch when the rope be-
comes very slightly slack, or quite slack, as
100 may be desired for a particular installation,
and thus the invention provides an extremely
sensitive slack cable switch.

To prevent the cable from jumping out
105 of the groove of the sheave because of the
whipping action referred to above, a rod 52
extends between the members 33 adjacent
the periphery of the sheave 35, as shown in
Figs. 5 and 6.

Obviously, the present invention is not
restricted to the particular embodiments
thereof herein shown and described.

What I claim is:—

115 1. Slack cable switch apparatus compris-
ing, in combination, a hoist cable; a support;
a frame having a sheave at one end engaged
with the cable, said frame being pivotally
mounted on the support and extending on
120 both sides of its pivot; a counterweight on
the opposite side of the pivot from the sheave
and serving to press the sheave against the
cable; a self-opening switch mounted adja-
cent the frame and having a spring and a
125 contact member which is outwardly projected
by the spring; and an adjustable foot piece
on the frame engaging the contact member
to hold the switch closed; the parts being so
constructed and arranged that a slackening
130 in tension of the cable causes a swinging of

the frame to lift the foot piece off the contact member, thereby to effect opening of the circuit controlled by the switch.

2. Slack cable switch apparatus comprising, in combination, a hoist cable; a support; a frame having a sheave at one end engaged with the cable, said frame being pivotally mounted on the support so as to press the sheave against the cable at all times; a self-opening switch mounted adjacent the frame and having a spring and a contact member which is outwardly projected by the spring; and an adjustable foot piece on the frame engaging the contact member to hold the switch closed; the parts being so constructed and arranged that a slackening in the tension of the cable causes a swinging of the frame to lift the foot piece off the contact member, thereby to effect opening of the circuit controlled by the switch.

3. Slack cable switch apparatus comprising, in combination, a hoist cable; a support; a frame pivoted on the support and having a sheave at one end engaged with the cable, said frame having a shaft along which the sheave may slide and being pivotally mounted so as to press the sheave against the cable at all times; a hoist drum about which said hoist cable is wrapped; the frame being adjacent the hoist drum so that the sheave travels back and forth along the shaft as the cable is wrapped upon and unwrapped from the drum; means on the frame to hold the cable against jumping out of the groove of the sheave; a self-opening switch mounted adjacent the frame; and means on the frame to hold the switch closed; the parts being so constructed and arranged that a slackening in the tension of the cable causes a swinging of the frame, to effect opening of the circuit controlled by the switch.

4. Slack cable switch apparatus comprising, in combination, a hoist cable; a support; a frame having a sheave at one end engaged with the cable, said frame being pivotally mounted on the support so as to press the sheave against the cable at all times; a self-opening switch mounted adjacent the frame and having a spring and a contact member which is outwardly projected by the spring; stops adjustably mounted adjacent the frame in the path in which it swings to limit the arcuate movement thereof; and means on the frame engaging the contact member to hold the switch closed; the parts being so constructed and arranged that a slackening in the tension of the cable causes a swinging of the frame to release the contact member, thereby to effect opening of the circuit controlled by the switch.

5. Slack cable switch apparatus comprising, in combination, a hoist cable; a support; a frame having a sheave at one end engaged with the cable, said frame being pivotally mounted on the support so as to press the

sheave against the cable at all times; a self-opening switch mounted adjacent the frame; stops adjustably mounted adjacent the frame in the path in which it swings to limit the arcuate movement thereof, one of said stops being an eccentric disk, one edge of which engages a part of the frame, said disk being initially angularly adjustable to vary the extent to which said frame is movable in one direction and being rigidly secured in the adjusted position; and means on the frame engaging the switch to hold the switch closed; the parts being so constructed and arranged that a slackening in the tension of the cable causes swinging of the frame to release the switch, thereby to effect opening of the circuit controlled by the switch.

6. Slack cable switch apparatus comprising, in combination, a hoist cable; a support; a frame having a sheave at one end engaged with the cable, said frame being pivotally mounted on the support so as to press the sheave against the cable at all times; a self-opening switch mounted adjacent the frame and having a spring and a contact member which is outwardly projected by the spring; stops adjustably mounted adjacent the frame in the path in which it swings to limit the arcuate movement thereof; and an adjustable foot piece on the frame engaging the contact member to hold the switch closed, the parts being so constructed and arranged that a slackening in the tension of the cable causes a swinging of the frame to lift the foot piece off the contact member, thereby to effect opening of the circuit controlled by the switch.

7. Slack cable switch apparatus comprising, in combination, a hoist cable; a support; a frame having a sheave at one end engaged with the cable, said frame being pivotally mounted on the support so as to press the sheave against the cable at all times; a self-opening switch mounted adjacent the frame and having a spring and a contact member which is outwardly projected by the spring; and an adjustable foot piece on the frame engaging the contact member to hold the switch closed; said foot piece being longitudinally adjustable on that part of the frame to which it is attached and extending directly over said contact member; the parts being so constructed and arranged that a slackening in the tension of the cable causes a swinging of the frame to lift the foot piece off the contact member, thereby to effect opening of the circuit controlled by the switch.

8. Mechanism for actuating slack cable switches comprising, in combination, a support a frame swingably mounted on the support and having a sheave in contact with the cable whose slackening is to actuate the switch; a foot piece pivoted on the pivot axis of the frame and having an arcuate slot

whose center of curvature is said pivot axis and also having an extension for contact with the contact member of the switch; and means to secure said foot piece to the frame.

5 In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

FRANK B. PEEBLES.

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