D. S. REYNOLDS.

SKIP HOIST.

APPLICATION FILED MAY 17, 1919.

1,323,911.

Patented Dec. 2, 1919.

4 SHEETS—SHEET 1.

Fig. 1

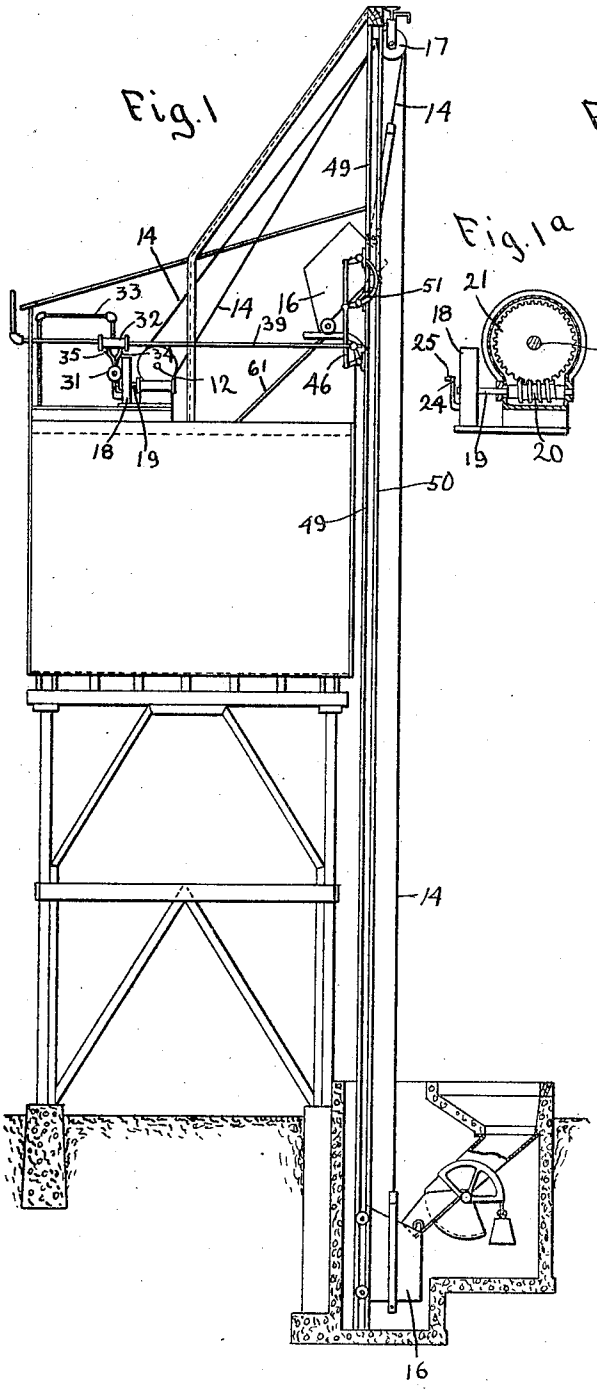
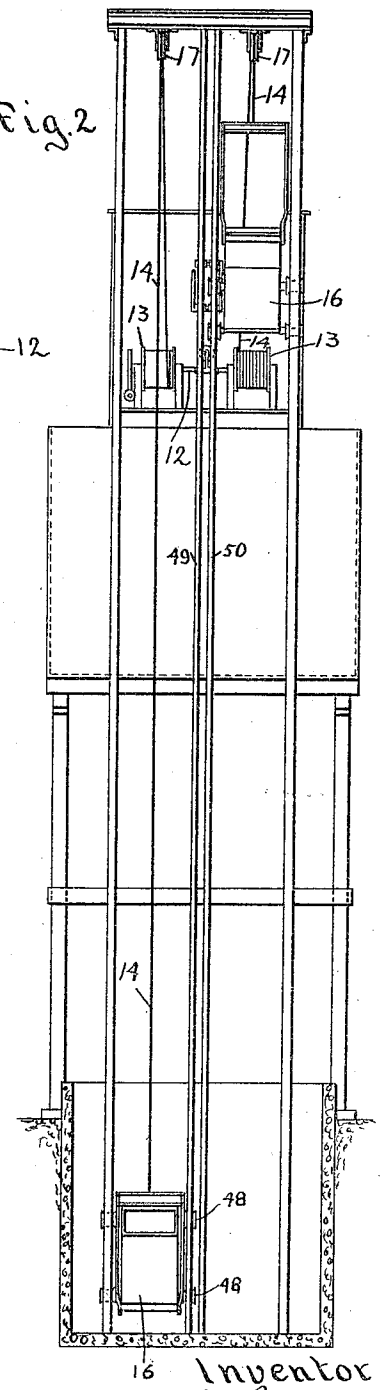


Fig. 1a

Fig. 2



Inventor
D. S. Reynolds
by Wright Brown Quinby & May
Attys

D. S. REYNOLDS.

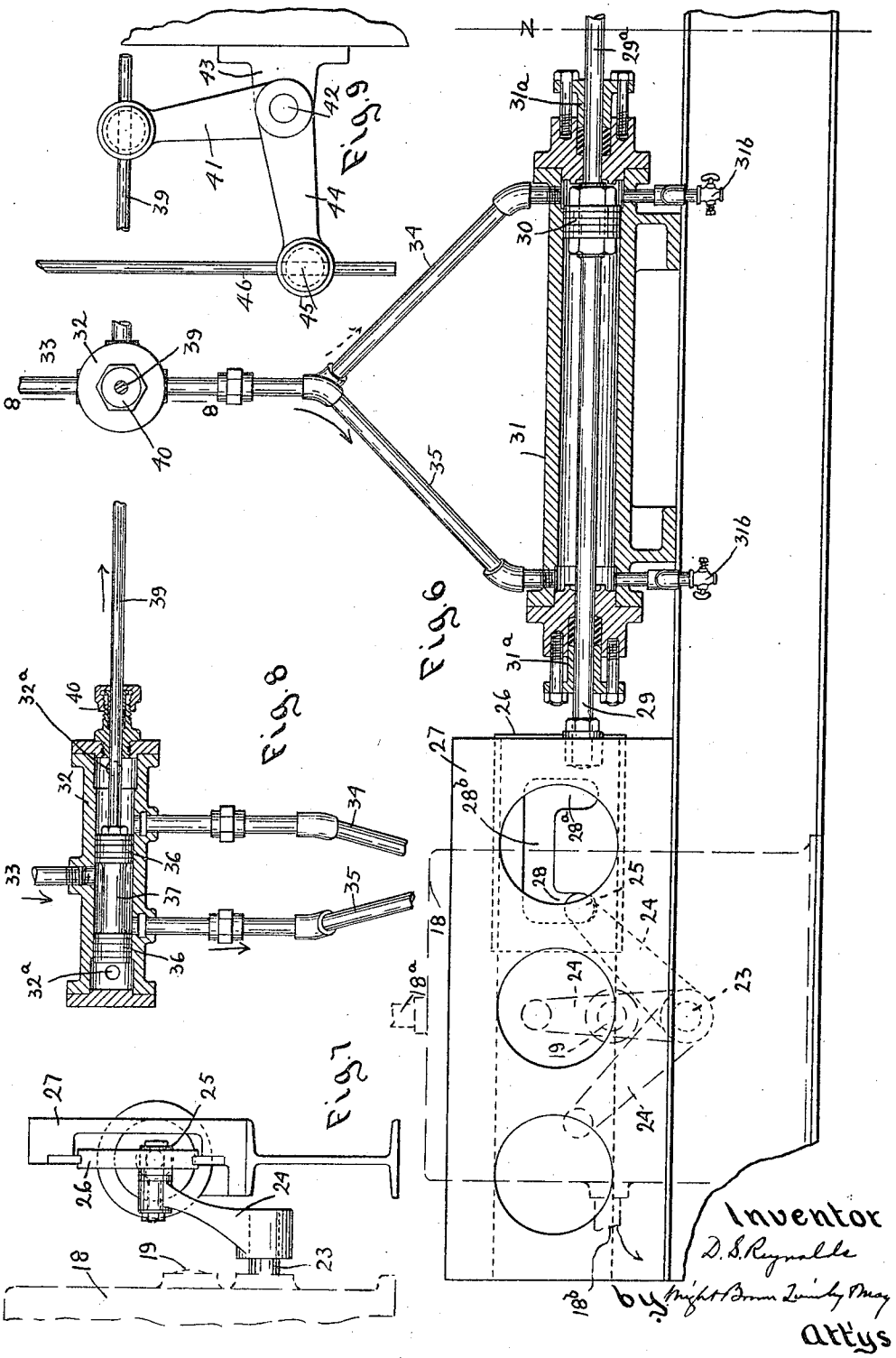
SKIP HOIST.

APPLICATION FILED MAY 17, 1919.

1,323,911.

Patented Dec. 2, 1919.

4 SHEETS—SHEET 2.



D. S. REYNOLDS.

SKIP HOIST.

APPLICATION FILED MAY 17, 1919.

1,323,911.

Patented Dec. 2, 1919.

4 SHEETS—SHEET 3.

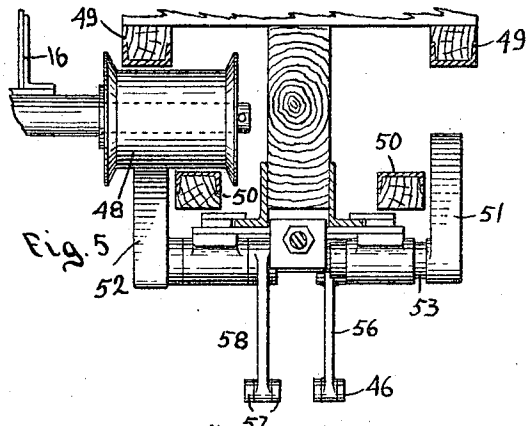


Fig. 5

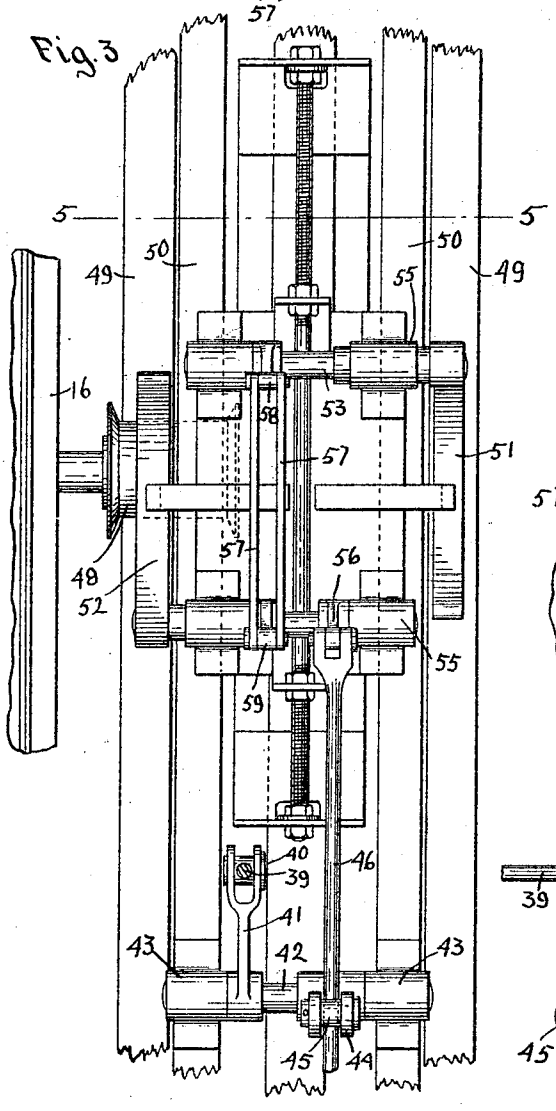


Fig. 3

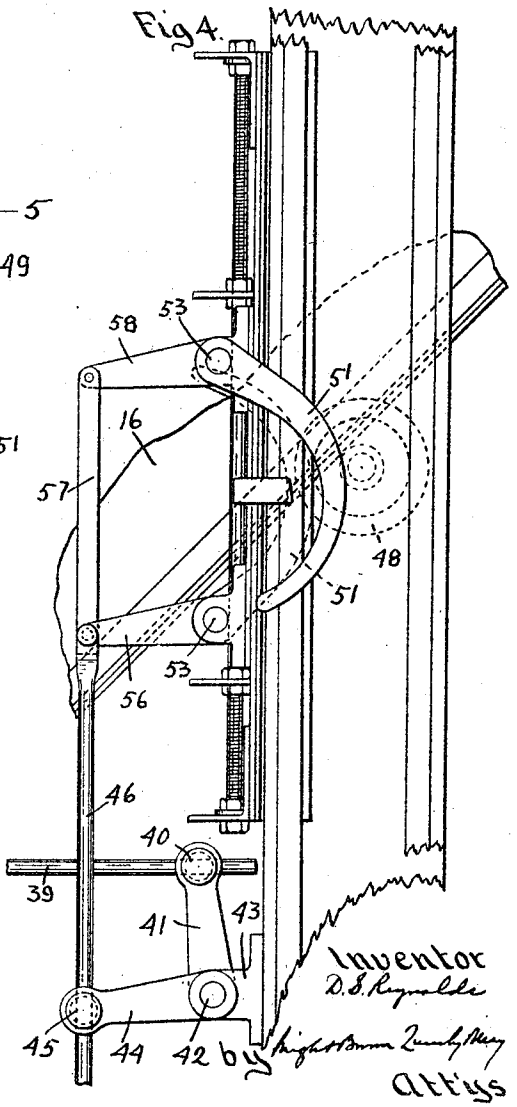


Fig. 4

Inventor
D. S. Reynolds
by Wright Brown Quinby & May
Attys

D. S. REYNOLDS.

SKIP HOIST.

APPLICATION FILED MAY 17, 1919.

1,323,911.

Patented Dec. 2, 1919.

4 SHEETS—SHEET 4.

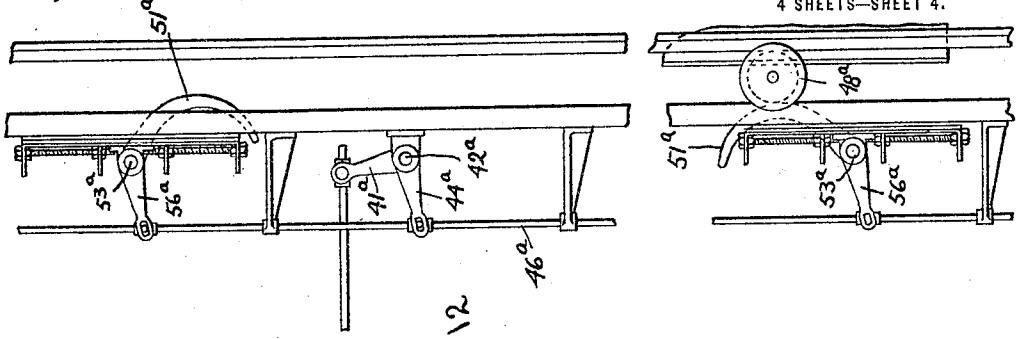


Fig. 12

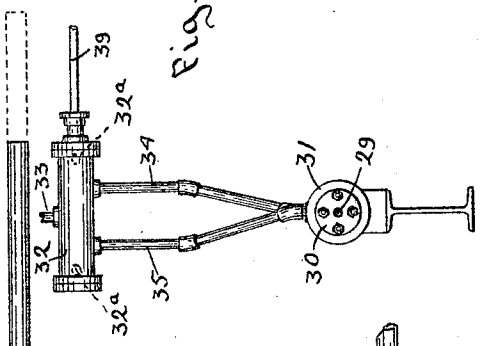


Fig. 11

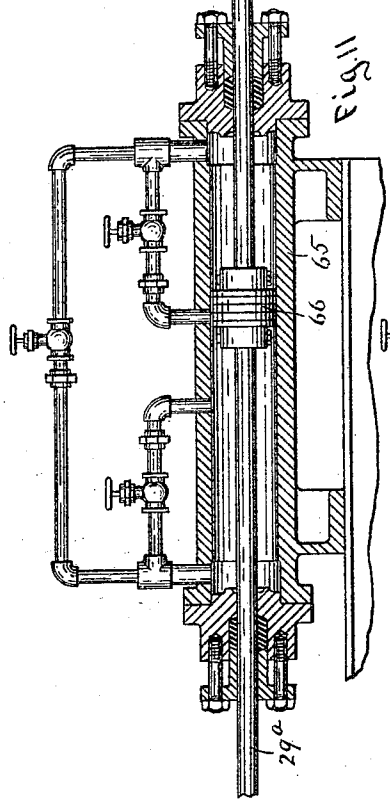
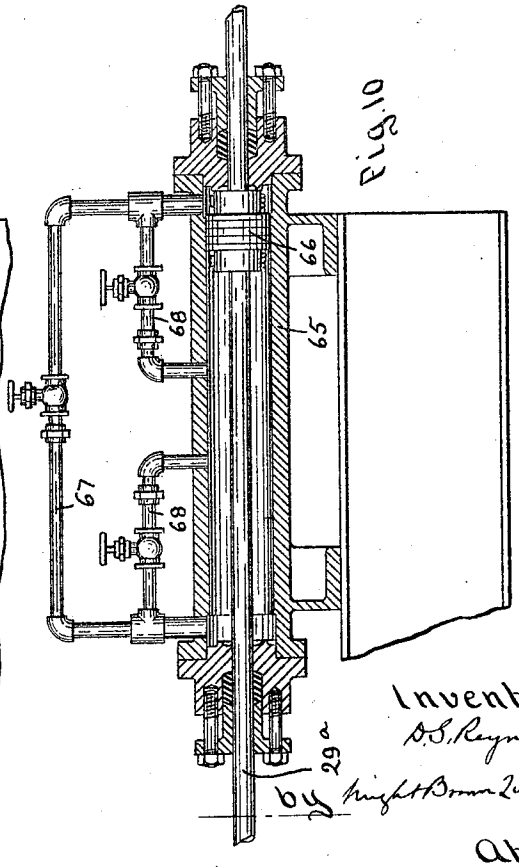


Fig. 10



Inventor

D. S. Reynolds

by Knight Brown Zuinkley & May

Att'ys

UNITED STATES PATENT OFFICE.

DAVID S. REYNOLDS, OF BOSTON, MASSACHUSETTS.

SKIP-HOIST.

1,323,911. Specification of Letters Patent. Patented Dec. 2, 1919.

Application filed May 17, 1919. Serial No. 297,874.

To all whom it may concern:

Be it known that I, DAVID S. REYNOLDS, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Skip-Hoists, of which the following is a specification.

This invention relates to means for raising charges of material such as coal, and dumping the same at an elevated point, comprising one or more buckets or skips, and a reversible steam hoisting engine.

The object of the invention is to provide improved automatic means for starting, stopping and reversing the hoisting engine in such manner as to automatically maintain a cycle of operations, the cycle including an automatic dwell or stoppage of the skip at each end of its vertical path, to afford time for loading and dumping, and an automatic reversal of the motion of the skip after each stoppage. This is accomplished by means embodying my invention without the employment of clutches and other complicated mechanism.

The invention is embodied in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings forming a part of this specification,—

Figure 1 is an elevation of one side of a steam skip hoist embodying the invention.

Fig. 1ª is a fragmentary view, showing parts of the torque-transmitting mechanism.

Fig. 2 is an elevation of another side of the same.

Fig. 3 is an enlargement of a part of the upper portion of Fig. 2.

Fig. 4 is an enlargement of a part of the upper portion of Fig. 1.

Fig. 5 is a section on line 5—5 of Fig. 3.

Fig. 6 is a view partly in section and partly in elevation showing parts of the actuating mechanism hereinafter described.

Fig. 7 is an end elevation of parts shown by Fig. 6.

Fig. 8 is a section on line 8—8 of Fig. 6.

Fig. 9 is an enlargement of the parts similarly designated in Fig. 4.

Figs. 10 and 11 are sectional views of the retarding device hereinafter described.

Fig. 12 is a fragmentary elevation illustrating modifications.

The same reference characters indicate the same parts in all of the figures.

In the embodiment of the invention shown by Figs. 1, 2, 3, 4, and 5, two skips are employed, each acting like the other to start, stop, and reverse a hoisting engine, through the actuating mechanism hereinafter described. 12 represents a shaft having the hoisting drums 13, to which are attached the cables 14, supporting the skips 16, said cables passing over the guiding pulleys 17.

The shaft 12 is driven by a reversible steam hoisting engine, preferably of the Dake type, shown by Letters Patent No. 363,368, May 24, 1887, and 395,039, December 25, 1888. The engine is shown conventionally by Figs. 1 and 1ª, in which 18 designates the casing, and 19 the shaft of the engine. The engine casing and its steam inlet 18ª and exhaust outlet 18ᵇ are shown by dotted lines in Fig. 6. Any suitable torque-transmitting connections may be provided between the engine shaft and the drum shaft. As here shown, these connections include a worm 20 on the engine shaft, and a worm gear 21 on the drum shaft.

My invention resides chiefly in the skip-controlled means hereinafter described for automatically starting, stopping and reversing the engine, and through the latter the drum shaft and the skip.

The operation of the engine is controlled by a movable external controlling member which, as here shown, is embodied in an arm 24 attached to a rock-shaft 23 and provided with a wrist-pin 25, said rock-shaft being connected with any suitable valve mechanism with which the engine is provided. Although I do not limit myself to a hoisting engine of the Dake type, this type is a suitable one, and since it is well known, I do not deem it necessary to illustrate the valve mechanism through which an external controlling member, such as the oscillatory arm 24, acts to start, stop, and reverse the engine. The arm 24 successively occupies the three positions shown by dotted lines in Fig. 6. When the arm is in the right hand position, the engine shaft is driven in one direction, and when the arm is in the left hand position, the engine shaft is driven in the opposite direction. When the arm is in the intermediate or neutral position, the engine shaft is at rest.

A terminal member which I call the inner terminal member, is employed as a part of the actuating mechanism hereinafter described, to act directly on the controlling member 24 and impart thereto the changes

of position above described. Said inner terminal member is preferably a slide 26 having an angular slot engaging the wrist-pin 25 of the controlling member and movable in a fixed guide 27. Said slot has two end portions 28 and 28[a] and an intermediate portion 28[b], as shown by Fig. 6. The slide is connected with a piston-rod 29, movable in stuffing boxes 31[a] at opposite ends of a steam cylinder 31, which I call the operating cylinder. A piston 30 having a sliding fit in the cylinder 31, is attached to the rod 29, and is reciprocated in the operating cylinder by steam admitted alternately at opposite ends of the operating cylinder by skip-actuated means hereinafter described. The slide 26 is reciprocated by the piston 30, and the angular slot causes the arm 24 to assume the different successive positions above described. The wrist-pin 25 occupies the slot portion 28 when the slide is at one end of its stroke. A movement of the slide to the left from the position shown by Fig. 6 causes the slot portion 28 to swing the arm 24 to its neutral position, and bring the wrist-pin 25 into the path of the slot portion 28[b]. The arm 24 then remains stationary and the engine shaft at rest, until the slot portion 28[a] reaches the wrist-pin, whereupon, the arm 24 is moved to the left hand position (Fig. 6). The length of the longitudinal slot portion is such that the arm 24 and the engine shaft are caused to dwell or remain stationary while a skip is being unloaded and loaded.

The skip-operated means causing the reciprocation of the piston 30 will now be described.

32 represents a valve cylinder which receives steam through a central conduit 33, and is connected by conduits 34 and 35 with opposite ends of the operating cylinder, the ends of the latter being provided with valved drip outlets 31[b]. Within the valve cylinder is a piston valve 36, composed of two spaced apart heads having a sliding fit in the cylinder, and a reduced intermediate portion 37 connecting said heads. The piston valve is fixed to a rod 39 movable in a stuffing-box 40, at one end of the valve cylinder. The cylinder 32 is provided at its ends with exhaust outlets 32[a] to the atmosphere.

The inner terminal member or slide 26, the operating cylinder 31, the piston 30, the piston rod 29, the valve cylinder 32, and the piston valve therein, constitute elements of an actuating mechanism for causing the controlling member 24 to start, stop, and reverse the engine, said actuating mechanism including also the outer terminal member hereinafter described, which is movable by a skip, and acts through suitable connections on the rod 39 of the piston valve 36.

The valve rod 39, as best shown by Figs. 1, 3 and 4, is connected at 40 with an arm 41 fixed to a rock-shaft 42 which is journaled in fixed bearings 43. An arm 44 fixed to said rock-shaft is connected at 45 with a vertical connecting rod 46, which is reciprocated by an outer terminal member directly acted on by a skip, to oscillate the arms 41 and 44 and reciprocate the valve rod 39. The skip is provided with flanged wheels 48 running between vertical guide rails 49 and 50. The skip-operated outer terminal member above mentioned is preferably embodied in a curved lever 51, normally standing in the path of a skip wheel 48, and attached to a rock-shaft 53 which is journaled in fixed bearings 55. To the rock-shaft 53 is fixed an arm 56, the outer end of which is pivoted to the connecting rod 46. In a double skip hoist two of the terminal members or levers 51 and two rock-shafts 53 are employed, one extending upward, and the other downward from its rock-shaft 53 as shown by Figs. 3 and 4. Said rock-shafts are connected and caused to rock in unison by links 57 pivoted to the outer ends of arms 56 and 58, on the rock-shafts, as best shown by Fig. 3.

The operation of the mechanism thus far described is as follows:

It is assumed that the engine is running and that one skip is loaded and rising, and the other empty and descending, the controlling member 24 being at one of the extremes of its movement shown by Fig. 6. When the ascending skip reaches its discharging position, it is automatically tipped, as usual in skip hoists, as shown at the upper portion of Fig. 1, its contents being discharged onto an incline 61. Just before the tipping of the skip, a skip wheel strikes the terminal member or lever 51 in its path, and displaces said lever from its normal position, thus causing a movement of the piston valve 37, to a position causing a movement of the piston 30 in the operating cylinder, and of the slide 26 connected therewith. The slide first moves the controlling member 24 to its neutral position and allows it to remain at rest in said position while the slot portion 28[b] is passing over the wrist-pin 25, so that the engine stops for a period determined by the length of the slot portion and sufficient to permit the discharge of the contents of the skip and the loading of the other skip before the engine is reversed by the slide, this reversal occurring when the slide reaches the end of its stroke. The reversal of the engine causes the skip to descend, the engine being again stopped by the means described while the skip is being charged.

Figs. 10 and 11 show a liquid-controlled retarding device connected with the steam-actuated means to suitably check or retard the movements of the piston 30 and slide 26. Said device comprises a dash-pot 65 alined

with the operating cylinder 31, and a piston 66 having a sliding fit in the dash-pot, the piston being attached to an extension 29ª of the piston rod 29. The dash-pot contains a suitable non-congealable liquid, which may be oil or other liquid, and is provided with a valved by-pass 17, connecting its ends and preferably with valved supplemental by-passes 68, connecting the by-pass 67 with points between the ends of the dash-pot, these by-passes permitting any desired regulation of the flow of liquid.

Fig. 12 shows a suitable arrangement of the skip-operated terminal members for a single skip hoist. In this modification two curved levers or terminal members 51ª are located at different heights in the skip guide and are connected by rock-shafts 53ª and arms 56ª with an elongated connecting rod 46ª. Said rod is connected by arms 44ª, 41ª and a rock-shaft 42ª with the valve rod 39. When the skip ascends it acts on the upper lever 51ª, and when the skip descends, it acts on the lower lever, the result of the displacement of each lever by the skip being as already described. The construction of the skips and their guides, and the means for tipping the skips involves nothing claimed by me.

As implied in the foregoing description and in the following claims, I am not limited to the specific mechanism of the preferred embodiment of my improvements shown by the drawings, except as otherwise required in certain of the more limited claims.

It is obvious that any suitable fluid under pressure, such as compressed air, may be used as the working agent.

The hoisting engine may be an electric engine, or any suitable reversible prime motor.

I claim:

1. A skip hoist comprising a reversible hoisting engine, having an external controlling member, a skip movable by the engine, and controlling-member-actuating mechanism actuated by fluid pressure and controlled by the skip, said mechanism including means adapted to successively move said controlling member to a position to start the engine in one direction, a position to stop the engine, and a position to reverse or start the engine in the opposite direction, said means having provisions for causing a dwell of the controlling member in its stopping position to afford time for loading and unloading the skip.

2. A skip hoist comprising a skip, a reversible engine connected with the skip, and including a movable external controlling member forming a part of the starting, stopping and reversing mechanism of the engine, and actuating mechanism organized to cause said controlling member to successively assume a position to start the engine in one direction, a position to stop the engine, and a position to reverse or start the engine in the opposite direction, and to maintain the controlling member in its stopping position for a predetermined period, said actuating mechanism including an outer terminal member, in the path of the skip and movable by the latter, an inner terminal member engaged with the engine-controlling member and adapted to move the latter to the said successive positions, pressure-actuated means for moving said inner terminal member, and pressure-directing means controlled by said outer terminal member whereby said pressure-actuated means is caused to reciprocate the inner terminal member.

3. A skip hoist comprising a skip, a reversible engine connected with the skip, and including a movable external controlling member forming a part of the starting, stopping and reversing mechanism of the engine, and actuating mechanism causing said controlling member to successively assume a position to start the engine in one direction, a position to stop the engine for a predetermined period, and a position to reverse or start the engine in the opposite direction, said actuating mechanism including a terminal member in the path of the skip and movable by the latter, a reciprocatory slide engaged with said controlling member and adapted to move the latter to said successive positions, pressure-actuated means for reciprocating said slide, and pressure-directing means controlled by said terminal member, whereby said pressure-actuated means is caused to reciprocate the slide.

4. A skip hoist as specified in claim 3, said slide being provided with an angular slot composed of end portions formed to engage and move said controlling member, and an intermediate portion formed to permit the controlling member to remain at rest in a neutral position for a predetermined period.

5. A skip hoist as specified by claim 3, said actuating mechanism including a piston rod attached to said slide, a piston in said rod, an operating cylinder in which said piston is movable, a valve cylinder having a centrally located pressure inlet, and exhaust outlets at its ends, conduits connecting the valve cylinder with opposite ends of the operating cylinder, a valve movable in the valve cylinder, a rod attached to said valve, and connections between said rod and the skip-operated terminal member.

6. A skip hoist as specified by claim 3, said actuating mechanism including a piston rod attached to said slide, a piston in said rod, an operating cylinder in which said piston is movable, a valve cylinder having a centrally located pressure inlet, and exhaust outlets at its ends, conduits connecting the valve cylinder with opposite ends of

the operating cylinder, a valve movable in the valve cylinder, a rod attached to said valve, an oscillatory lever normally in the path of the skip and movable from its normal position thereby, said lever constituting the said skip-operated terminal member, and connections between said lever and the piston valve rod, adapted to convert oscillatory movements of the lever into reciprocating movements of the rod and valve.

7. A skip hoist comprising a skip, a reversible engine connected with the skip, and including a movable external controlling member forming a part of the starting, stopping, and reversing mechanism of the engine, actuating mechanism causing said controlling member to successively assume a position to start the engine in one direction, a position to stop the engine for a predetermined period, and a position to reverse or start the engine in the opposite direction, said actuating mechanism including a terminal member in the path of the skip and movable by the latter, a reciprocatory slide engaged with said controlling member and adapted to move the latter to said successive positions, pressure-actuated means for reciprocating said slide, and pressure-directing means controlled by said terminal member, whereby said pressure-actuated means is caused to reciprocate the slide, and a liquid controlled retarding device connected with the said pressure-actuated means to retard the movements of said slide.

8. A skip hoist comprising a skip, a reversible engine connected with the skip, and including a movable external controlling member forming a part of the starting, stopping, and reversing mechanism of the engine, actuating mechanism causing said controlling member to successively assume a position to start the engine in one direction, a position to stop the engine for a predetermined period, and a position to reverse or start the engine in the opposite direction, said actuating mechanism including a terminal member in the path of the skip and movable by the latter, a reciprocatory slide engaged with said controlling member and adapted to move the latter to said successive positions, pressure-actuated means for reciprocating said slide, and pressure-directing means controlled by said terminal member, whereby said pressure-actuated means is caused to reciprocate the slide, a dash-pot constituting an element of a liquid-controlled retarding device, and provided with a by-pass, said dash-pot being in alinement with the operating cylinder, and the said piston rod being extended through the dash-pot, and a piston on said rod within the dash-pot.

In testimony whereof I have affixed my signature.

DAVID S. REYNOLDS.