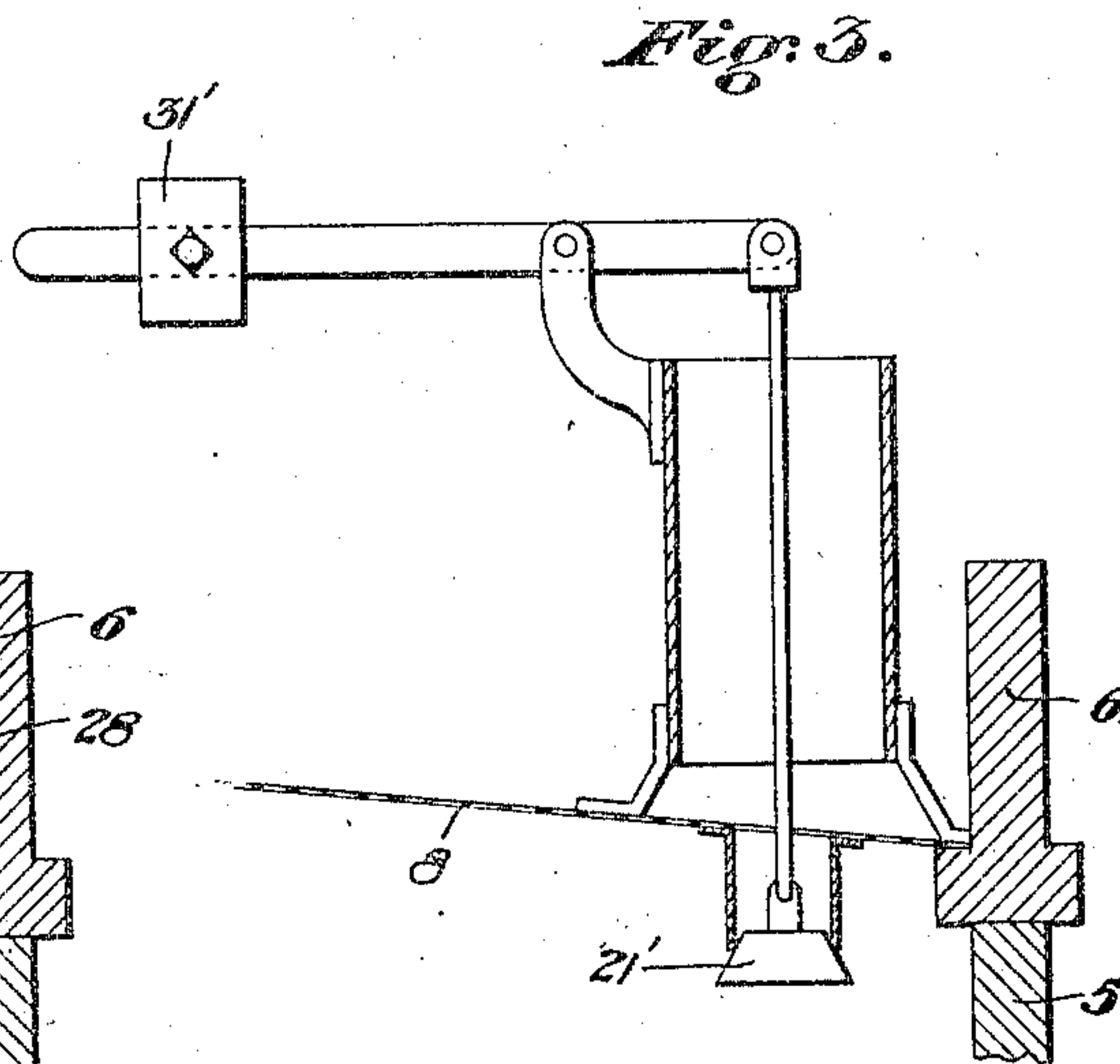
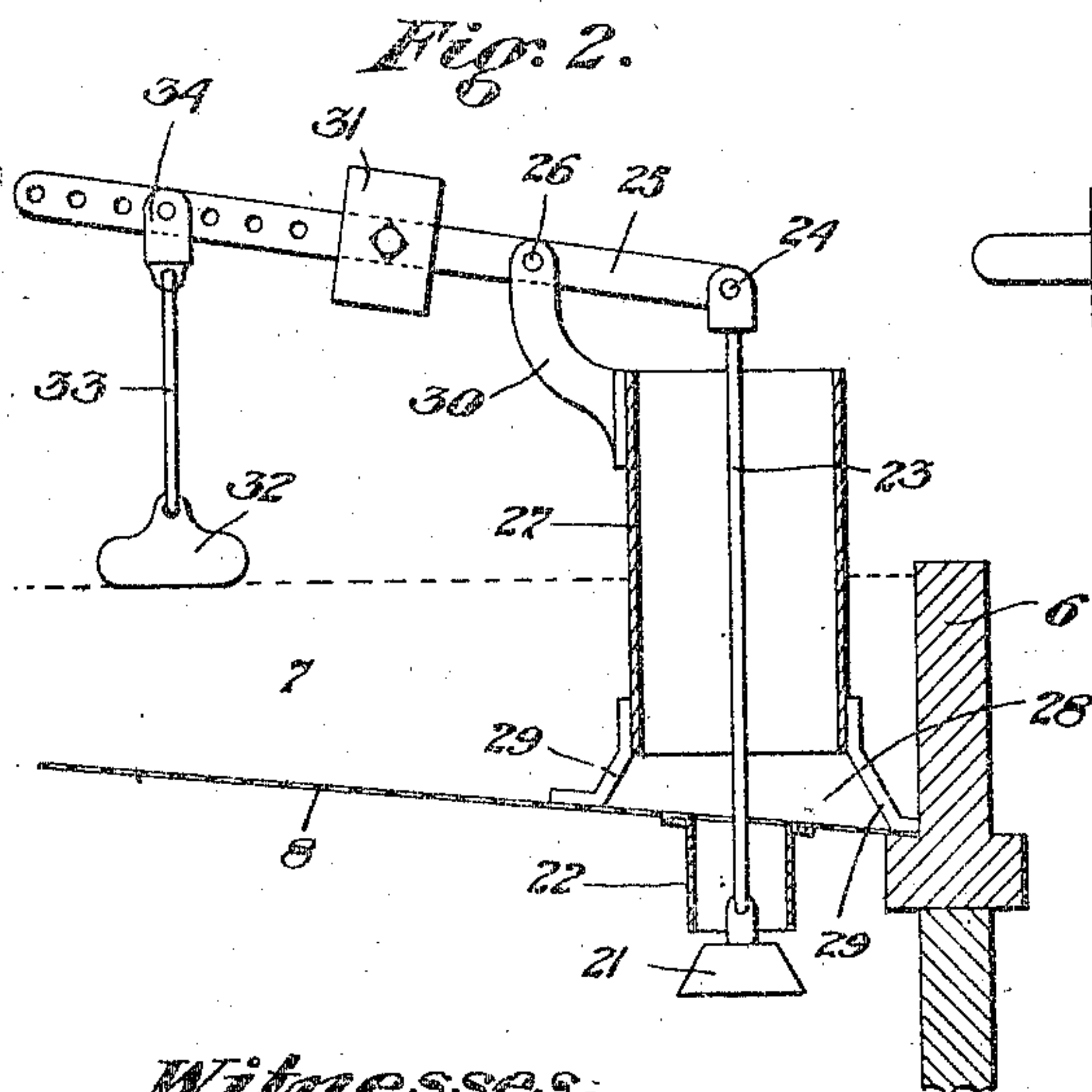
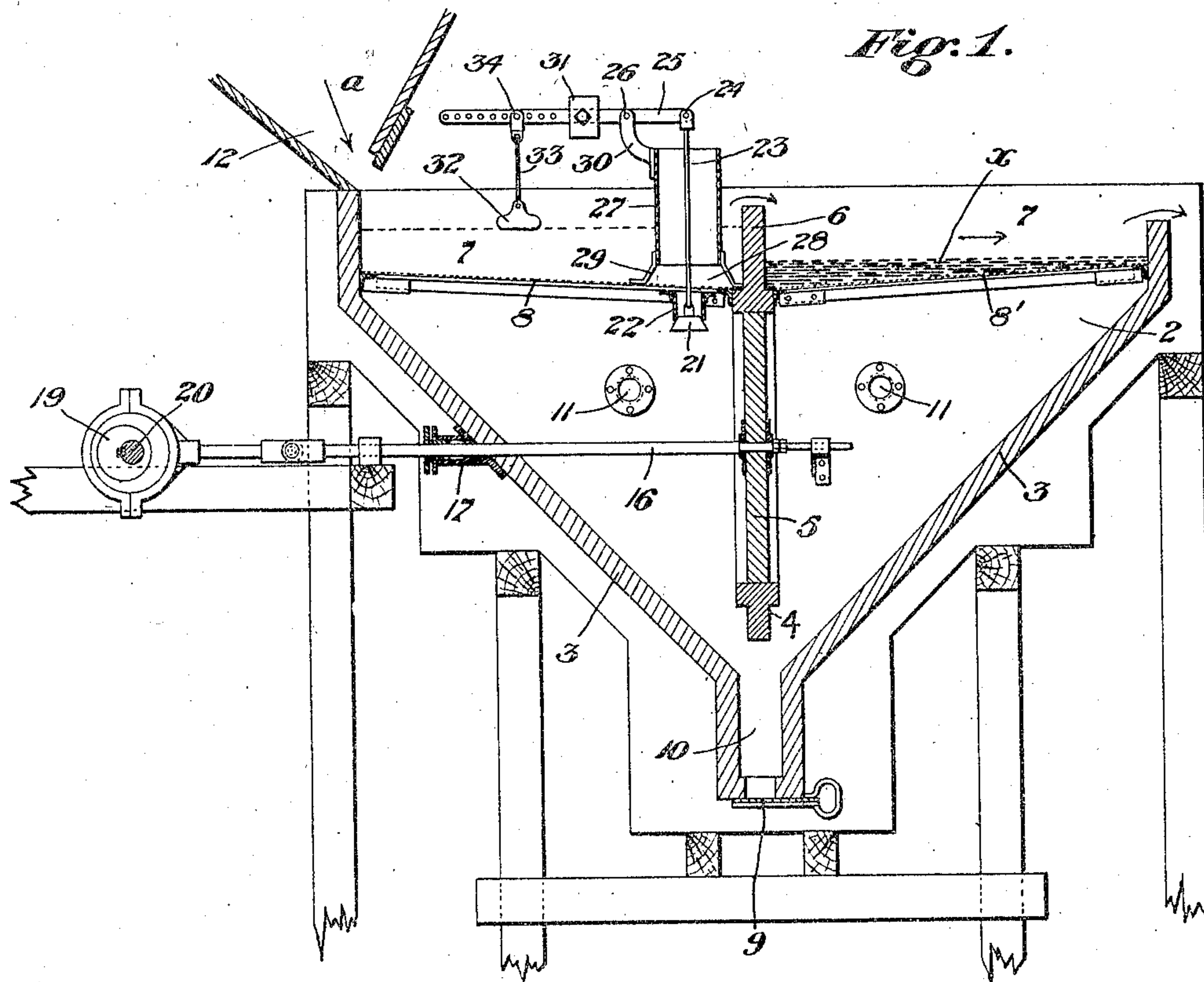


H. CORY.
COAL WASHING APPARATUS.
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963,519.

Patented July 5, 1910



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UNITED STATES PATENT OFFICE.

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COAL-WASHING APPARATUS.

963,519.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HARVEY CORY, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Coal-Washing Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention refers to improvements in washing apparatus for coal or other minerals and for the separation of impurities by gravity and the buoyant effect of water, and relates particularly to an improved construction of valve mechanism adapted to discharge portions of the slate and other impurities as they accumulate above the screen, automatically depended upon said accumulation.

In carrying out my invention, I use a lever-supported valve mechanism provided with an adjustable counterweight and in the preferred form, a controlling float adapted to rise and fall with the level of the impurities and to actuate the pivoted lever to open and close the valve.

In the drawings illustrating the invention:—Figure 1 is a longitudinal vertical sectional view through a washing apparatus, showing the valve in closed position. Fig. 2 is a similar sectional view enlarged, of the valve mechanism, showing the valve lowered for discharging the impurities. Fig. 3 is a similar detail view showing the lever provided with an adjustable counterweight only.

The washing apparatus shown in the drawings is similar in construction and mode of operation to that illustrated in prior patent of William A. Knoyer No. 906239, dated December 8, 1908, and comprises a jig tank 2, preferably rectangular in form, having inwardly and downwardly sloping ends 3, 3, and a middle transverse partition framework 4 in which is mounted a reciprocating plunger 5. Extending upwardly beyond the partition 4, which constitutes a plunger housing, is a transverse partition 6, arranged to divide the upper portion of the tank in two equal burden-containing compartments 7, 7, of substantially the same size and capacity.

The upper portion of the tank cavity is divided from the main lower portion by transversely arranged screens 8, 8', of per-

forated plate metal, wire netting, or other suitable construction, adapted to support the mineral to be washed and to provide for free upward travel of the water.

In use, the second stream 8', which, like screen 8, is preferably arranged at a slight angle as shown, is covered with a layer of feldspar or other suitable material α of sufficient specific gravity to rest upon the perforated screen bottom, preventing the downward passage of the finer particles of the coal or other light minerals while permitting of free upward circulation of the water under the impulses imparted to it by plunger 5, and of downward passage of the heavier but smaller impurities carried over from the first screen.

9, 9, represent any suitable slate gates or outlets for the accumulated impurities which pass downwardly through both screens and accumulate in the terminal boxes 10, 10, at the bottom of the tank, and which may be emptied from time to time.

Water is supplied to the interior of the tank by pipes 11, 11, leading from any suitable source of supply, while the coal or other mineral to be washed is discharged into the jig from a hopper or other source of supply 12, preferably located at one end. The circulation of the washed coal is indicated by the arrows, the opposite end of the jig tank being somewhat lower than the inlet end, thereby causing the coal to travel outwardly along the entire length of the jig during the washing operation, thus effecting thorough separation of the impurities, before the washed coal is finally discharged.

The plunger 5, which may be of any desired form in cross section, is so mounted in transverse partition 4 as to make a substantially fluid-tight joint therein. Motion is imparted to plunger 5 by one or more rods 16, preferably two, passing outwardly through stuffing boxes 17 in the ends of the tank, and actuated through any suitable actuating mechanism as eccentrics or cams on shaft 20. The mechanism as thus constructed is adapted to operate somewhat rapidly, say one hundred and eighty-five strokes per minute, the strokes being comparatively short say one-half to one and one-quarter inches in length, depending on local conditions or other factors and by these means it will be seen that a constant

series of impulses will be imparted to the water within each end compartment of the tank, resulting in a practically constant upwardly pulsating flow through the screens 8 and 8' and their sustained burden, to effect the desired separation.

I have found in practice that by imparting to the coal a continuous series of rapid pulsations, effecting a constant intermittent flow of water under pressure, the finer particles of coal and impurities may be very thoroughly separated, due to the gentle continuous agitation of the intermittent upwardly traveling current. This result is due to the comparatively short strokes and high velocity of the plunger, operating alternately on the oppositely located bodies of water beneath the screen, whereby two continuous currents are forced upwardly to effect the washing operation.

Any other suitable construction or arrangement of screens and means for producing a flow upwardly therethrough of the water may be utilized, and the invention, which resides particularly in the means for discharging the impurities downwardly into the interior of the jig tank 2 below the screens, is in no way limited to the specific construction of the washing apparatus itself.

As the impurities are separated from the coal by the buoyant effect of the water passing upwardly through the first screen, all of the impurities, slate, etc., gradually settle upon the bottom of the screen and must be discharged therefrom. For such purpose I provide an opening and closing valve 21 seated underneath the downwardly extending coping or any suitable valve seat 22 the opening through which passes through the screen 8, valve 21 being suspended by a flexible connecting element 23 from the end 24 and lever 25 pivoted at 26.

27 is an enlarged shell spaced upwardly above screen 8, as at 28, upon supporting legs 29, so as to prevent passage to the valve outlet of the upper strata of coal, but to permit a lower strata of impurities to flow downwardly to said valve outlet.

Pivotal mounting 26 of lever 25 is in a supporting bracket arm 30 which may be conveniently secured to the upper end of the shell 27, lever 25 extending outwardly and being provided with an adjustable counterweight 31 and a flotation device 32. Said flotation device is preferably connected with the lever at the desired position by flexible connection 33 and an adjustable terminal 34 by which it may be set to suit the conditions of use. Flotation device 32 is preferably of a specific gravity adapted to bear such a relation with the specific gravity of the impurities that it will at all times conform to the level thereof, rising and falling with their varying levels, as indicated by the dotted line in Fig. 1.

In operation, the raw coal is discharged upon the screen as indicated by the arrow *a* and is separated from its impurities by operation of the plunger, the washed coal passing over the partition 6 to the next adjacent screen, and impurities not sufficiently heavy to fall to the bottom of the first screen pass over with it and being of such small size as to readily pass through the meshes of the second screen. As the impurities accumulate in the first screen and upon valve 21, which is so balanced as to cause the valve 21 to fall when sufficiently loaded, it will fall at the proper time, discharging the impurities downwardly into the jig tank, the action being assisted by the upwardly rising effect of the flotation device 32. Upon a certain portion of the impurities being discharged, the level thereof as in the tank, will fall, the flotation device likewise falling, valve 21 rising to again close the outlet opening until the impurities have again accumulated sufficiently above it, or until the flotation device is sufficiently raised to again open the valve. The operation will continue automatically during the operation of the machine.

If desired, flotation device 32 may be omitted and valve 21' will fall due to the mere lowering effect of gravity of the impurities when accumulated above it, closing again by reason of the action of counterweight 31', as indicated in Fig. 3. The operation with the flotation device will however, render the mechanism more sensitive and reliable, although fairly good results may be had without it.

Having described my invention, what I claim is:—

1. The combination with a washing apparatus provided with a supporting screen having an outlet opening vertically therethrough and a surrounding depending valve seat, a bodily movable valve opening and closing against said seat and subject to the weight of mineral above the screen and within the valve seat, and a pivoted lever connected with said valve and provided with a flotation device adapted to rise and fall with the rise and fall of the mineral on the screen and to correspondingly actuate the lever and valve, substantially as set forth.

2. The combination with a washing apparatus provided with a supporting screen having an outlet opening therethrough and a surrounding valve seat, a valve opening and closing against said seat and subject to the weight of mineral above the screen, a pivoted lever connected with said valve, and an upwardly extending protecting shield spaced above the screen and concentrically surrounding the outlet opening and the connection between the valve and lever, substantially as set forth.

3. The combination with a washing appa- 130

3 ratus provided with a supporting screen hav-
ing an outlet opening therethrough and a
surrounding valve seat, a valve opening and
closing against said seat and subject to the
5 weight of mineral above the screen, a piv-
oted lever, a flexible connecting element be-
tween the valve and lever, and an upwardly
extending protecting shield spaced above the
screen and concentrically surrounding the
10 outlet opening and said flexible connecting
element, substantially as set forth.

4. The combination with a washing appa-
ratus provided with a supporting screen hav-
ing an outlet opening therethrough and a
15 surrounding valve seat, a valve opening and
closing against said seat and subject to the
weight of mineral above the screen, a piv-
oted lever, a counterweight therefor, a flexi-
ble connecting element between the valve
20 and lever, and an upwardly extending pro-
tecting shield spaced above the screen and
concentrically surrounding the outlet open-

ing and said flexible connecting element, sub-
stantially as set forth.

5. The combination with a washing appa- 25
ratus provided with a supporting screen hav-
ing an outlet opening therethrough and a
surrounding valve seat, a valve opening and
closing against said seat and subject to the
weight of mineral above the screen, a piv- 30
oted lever, a flotation device connected with
the lever, a flexible connecting element be-
tween the valve and lever, and an upwardly
extending protecting shield spaced above the
screen and concentrically surrounding the 35
outlet opening and said flexible connecting
element, substantially as set forth.

In testimony whereof I affix my signature
in presence of two witnesses.

HARVEY CORY.

Witnesses:

C. M. CLARKE,
CHAS. S. LEPLEY.