J. T. HALL.

SAFETY APPLIANCE.

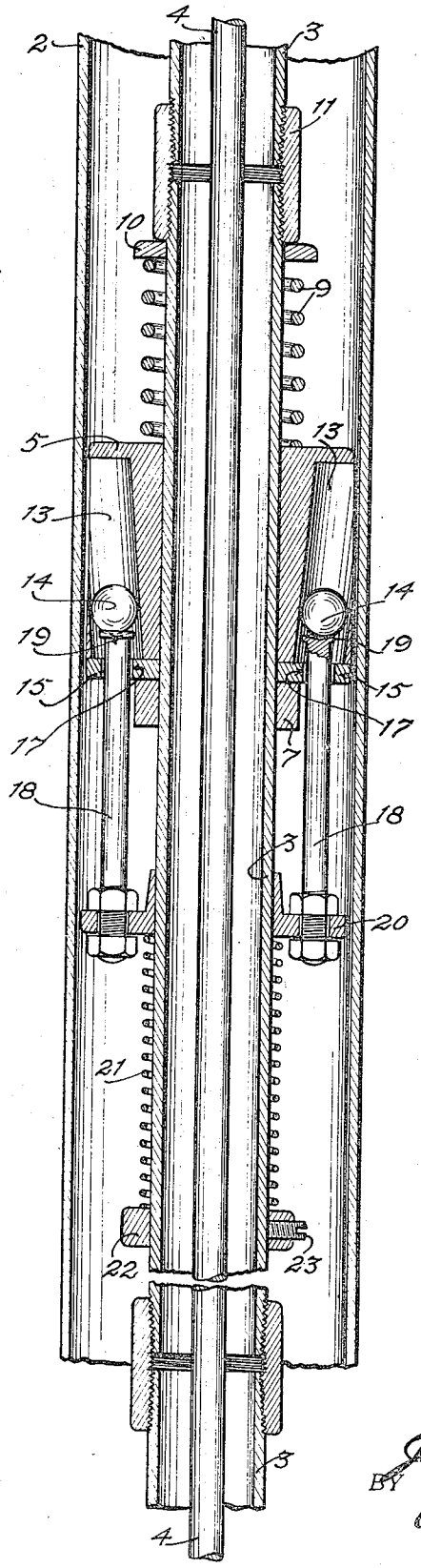
APPLICATION FILED MAR. 17, 1915.

1,195,463.

Patented Aug. 22, 1916.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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2 SHEETS—SHEET 2.

Fig. 2.

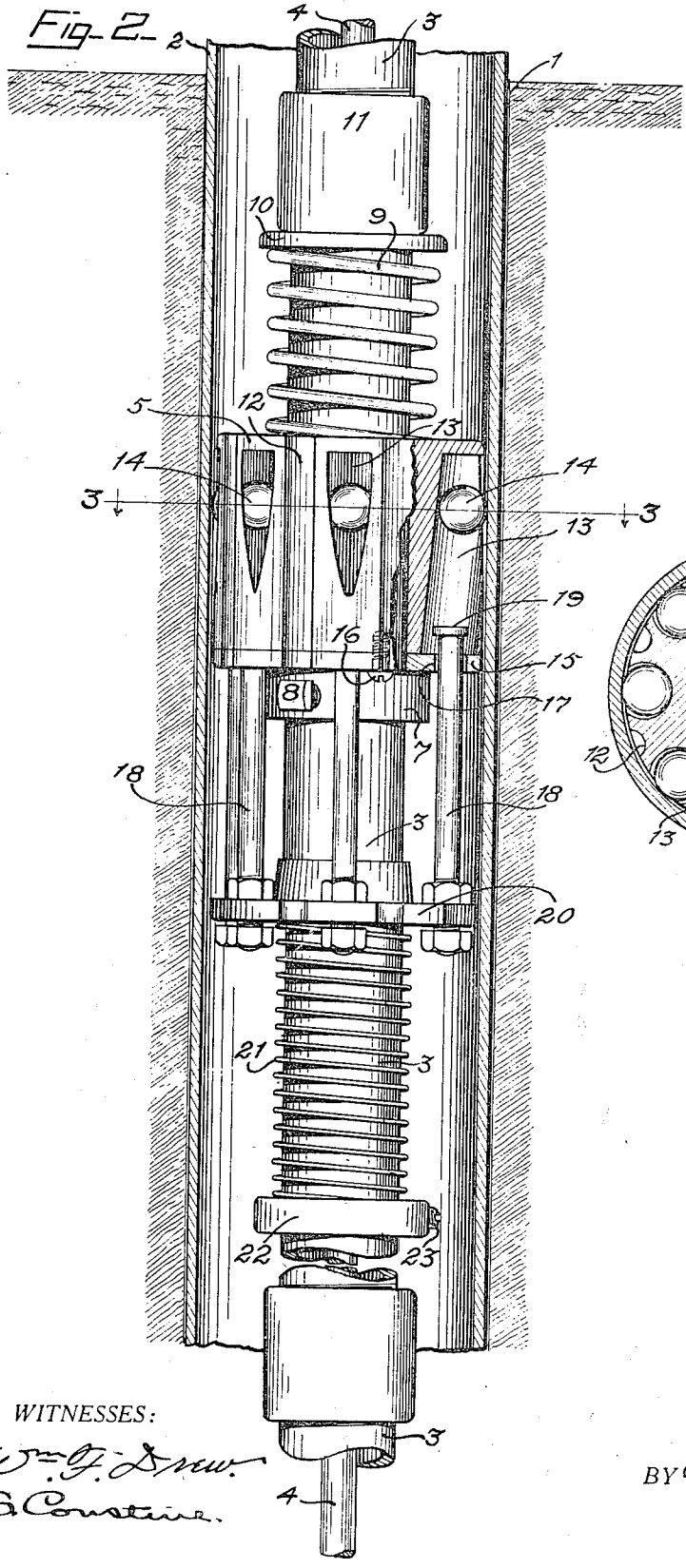
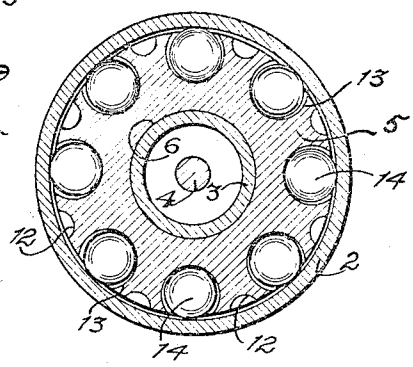


Fig. 3.



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UNITED STATES PATENT OFFICE.

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SAFETY APPLIANCE.

1,195,463. Specification of Letters Patent. Patented Aug. 22, 1916.

Application filed March 17, 1915. Serial No. 15,106.

To all whom it may concern:

Be it known that I, JAMES T. HALL, a citizen of the United States, residing at Coalinga, in the county of Fresno and State of California, have invented certain new and useful Improvements in Safety Appliances, of which the following is a specification.

The hereinafter described invention while applicable for use in connection with all forms of devices wherein the falling or dropping of a member—such, for instance, as an elevator—to any appreciable extent is provided against in case of a breakage of its supporting means, is more particularly designed for use in connection with the pump tube of an oil well pump, and for convenience the invention is illustrated for use in oil wells, although in no manner so restricted or confined.

In oil wells, as well understood, the well is protected by means of a well casing composed of a series of sections connected one to the other so as to extend approximately the entire depth of the well, and within the casing, adjacent the bottom of the well, is situated the oil pump, which pump is supported in position by means of the oil pump tube through which is extended and works the sucker-rod for actuating the pump; the said pump tube being supported within the well casing by suitable means located above the well.

As the oil pump is lowered into the well, it is necessary to lengthen the tubing and the sucker-rod by uniting one section onto another, until the pump has reached its proper position within the well, which may be one or more thousand feet below the surface of the ground. For repair purpose it is required that the pump tubing and sucker-rod be raised from within the well, suitable mechanism being employed for the lowering and raising of the pump and its associated parts.

It is during the operation of lowering and raising the pump that means are required to provide against the dropping of the pump in case of a breakage occurring either in its supporting member or in the tubing itself, for unless the dropping thereof be provided against the same will fall to the bottom of the well, perhaps a distance of several thousand feet, with the result that the well tubing is twisted, mashed and bent to such an extent as to render the same worthless for pumping purposes, and the same becomes, by reason of its weight, so jammed in the well casing as to render its removal by fishing tools an exceedingly difficult and expensive operation.

Various means have been heretofore employed for providing against the dropping of the pump tube, due to accident or a breakage thereof, but such devices generally act against the well casing in such a manner as to cause a weakening of its wall, which under certain conditions gives to the pressure placed thereon and results in a leaky well.

The object of the present invention is to provide against the dropping or falling of the well tube to any appreciable extent within the well casing on the breaking of the same or removal of the support therefor, and by so doing avoiding injury to the well casing, which does take place where the tubing is permitted to fall for any distance before being brought to a state of rest, due to the fact that the momentum gained by the falling line of tube is such that when the locking means are brought into action against the wall surface of the well casing, the same bite therein to such an extent as to either materially weaken the casing at such point or cause the puncturing thereof.

To comprehend the invention reference should be had to the accompanying sheets of drawings, wherein—

Figure 1 is a broken sectional view of an oil well with the invention applied thereto, the safety device being illustrated in a non-locked position relative to the well casing. Fig. 2 is a similar view illustrating the safety device in locked position relative to the well casing, the position assumed on a breakage of the well tubing or support for the oil pump. Fig. 3 is a cross sectional plan view taken on line *x*—*x*— Fig. 2 of the drawings.

In the drawings, the numeral 1 represents an oil well and 2 the casing fitted therein. Within the casing is located the pump tube 3 of considerable less diameter than the well casing and which at or adjacent its lower end carries any well known form of an oil pump, not shown. Through the well or pump tubing 3 extends the sucker-rod 4,

which actuates the oil pump for raising oil from the well into the tubing 3, as is usual in oil well pumping.

To the well or pump tube 3, either above or below the pump is secured the improved safety attachment for locking the tube against falling or dropping during the lowering or raising of the tube within the well.

The safety attachment in the present case comprises a cylindrical block 5 provided with a central longitudinal bore 6 through which extends the lower section of the pump tube 3, the said block resting on a collar 7 secured to the lower pump tube section by means of a set screw 8. The block 5 is slidably mounted on the pump tube and held onto the collar 7 by means of the compression spring 9 which is held in place on the tube by the collar 10 which is held against the coupling union 11 by the pressure of the said spring, the pressure of the spring thus acting against the slide block 5 and the collar 10. In diameter the slide block 5 is slightly less than the interior diameter of the casing 2 and in the face thereof is cut a series of vertical channels 12, which permits of the flow of oil between the slide block and the well casing as the same is moved downward within the body of oil during the lowering of the pump tube into the well.

In the face of the slide block 5 intermediate the vertical ways or channels 12 there is cut or formed circumferentially a series of vertical grooves or race-ways 13, which gradually increase in depth from their upper end to their lower end, and in each of said grooves or race-ways is loosely fitted a friction ball 14, which normally lie within the lower section or end of the grooves or race-way and are held therein by the end plate 15 united to the lower end of the slide-block by the set screws 16. Through vertical bores 17 in said end or face 15 in registry with the grooves or race-ways 13 work the rods 18, each being held therein by the enlarged head or end 19, on which rest the friction balls 14.

The rods 18 at their lower end are connected to a plate 20, slidably mounted on the oil pump tube. The weight of the balls 14, rods 18 and slide plate 20 is compensated for by the spring 21 secured in place on the pump tube by means of the collar 22, adjustably held to the tube 3 by the set screw 23. While the spring 21 is not absolutely essential to the working of the friction balls, it nevertheless compensates for the weight thereof and of their associated parts and thus holds the same in a floating condition and renders the same exceedingly sensitive as to action, and to this extent more effective and responsive than perhaps they would otherwise be. By simply raising and lowering the adjustable collar 22 relative to the pump tube 3, the tension of the spring 21 is increased or decreased with respect to the floating plate 20, thereby adjusting the position of the friction balls within the race-ways of the slide block 5.

During the operation of lowering the pump tube, sucker-rod and pump within the well casing, the safety attachment descends therewith. So long as the support of the pump tube is maintained, the safety device remains inactive, the air and oil within the casing passing slowly but freely through the channels 12 above the slide block 5. However, should a rupture of the supporting means for the pump tube take place, the same suddenly drops within the casing, which dropping destroys the equilibrium of the safety device, with the result that the friction balls 14 are quickly raised within the grooves or race-ways 13 and are gradually brought into frictional contact with the face of the well casing and lock therewith, due to the fact that the bearing surface of the friction balls is gradually increased as the balls move along the decreasing inclined portion of the grooves, channels or race-ways 13. The pump tube is thus gradually locked to the well casing before material momentum has been obtained, and thus gradually brought to a state of rest without injury to the well casing.

While the spring 21 renders the action of the friction balls more sensitive than they otherwise would be, still without the employment of said springs the pressure against the under face of the slide plate 20, produced by the falling of the pump tube, will serve to force the same upwardly and through the medium of the connecting rods 19 raise the balls 14 within the grooves, channels or raceways 13 for gradually placing the same into frictional engagement with the well casing.

The shock of the falling body as brought to a state of rest is absorbed by the spring 9 interposed between the collar 10 and the upper end of the slide block 5, thereby removing all strain from the oil well casing.

It will thus be seen that any sudden change of upward pressure exerted on the slide plate 20 will serve to throw into action the friction balls 14 for moving the same into frictional engagement with the well casing, the said balls being actuated, due to difference in pressures of falling bodies.

By the use of the described safety attachment, the falling body is brought to a state of rest before appreciable momentum is attained and positively locked to the fixed member without injury thereto, which is an extremely important factor where the fixed member comprises the casing of an oil well.

As previously stated the described inven-

tion is not restricted in its application to oil well pumping, but may be successfully employed wherever a member to be held against falling or dropping is associated with a fixed member within which it moves.

I am aware that various changes may be made in the details of construction of the herein described safety appliance without creating a departure from the scope of the invention, and do not wish to be understood as limiting or confining the invention to such details of construction, but on the contrary wish to be understood as claiming as broadly as the state of the art will permit the application of pressure actuated frictional locking means as applied for locking a movable member against dropping or falling relative to a fixed member within which the same moves, said means being thrown into locking action, due to differences in the pressures of falling bodies, on a rupture of the supporting means for the movable member.

Having thus described the invention what is claimed as new and desired to be protected by Letters Patent is:—

1. A safety appliance for locking a movable member against falling relative to a fixed member within which it moves, the same comprising a block carried by the movable member, a plurality of freely movable engaging devices carried by the block, means actuated by a difference in pressures of falling bodies for moving said freely movable engaging devices into locked engagement with the fixed member on a rupture of the supporting means for the movable member, and means for permitting a yielding movement upwardly of the block on the movable member on the engagement of the engaging members with the fixed member.

2. A safety appliance for locking a pump tubing against falling relative to a well casing within which it is positioned, the same comprising a block formed in its peripheral edge with a plurality of longitudinally disposed race-ways increasing in depth toward one end, a friction engaging ball in each of said race-ways, a rod associated with the underside of each ball for forcing the same toward the shallow end of said race-ways, a plate connecting said rods, and a spring actuated by the difference in pressure of falling bodies for actuating said rods to move said balls into locked engagement with the well casing on a rupture in the supporting means for the pump tubing.

3. A safety appliance for locking a pump tubing against falling relative to a well casing within which it is positioned, the same comprising a block surrounding a section of said pump tubing and movable thereon, a collar on which said block rests, a spring under pressure for normally maintaining said block seated on said collar, said block provided on its periphery with a plurality of longitudinally disposed open faced race-ways open at one end and tapering in depth toward one end of said block, a friction ball in each of said race-ways and adapted as forced toward the shallow end thereof to project beyond the peripheral edge of said block, a plunger operating through the open end of each of said race-ways and associated with the underside of each of said balls for forcing the same toward the shallow end of said race-ways, a plate connecting said rods and surrounding said pump tubing, and a spring actuating said rods to move said balls into locked engagement with the well casing on a rupture in the supporting means for the pump tubing.

4. A safety appliance for locking a pump tubing against falling relative to a well casing within which it is positioned, the same comprising a block surrounding a section of said pump tubing and movable thereon, a seat carried by said tubing and on which said block rests, a spring for normally maintaining said block seated on said seat, a plurality of ball engaging means carried by said block and freely movable relatively thereto, and means carried by said tubing and actuated by the difference in pressures of falling bodies for actuating said ball engaging means and moving the same into locked engagement with the fixed member on a rupture in the pump tubing or the supporting means therefor.

5. A safety appliance for locking a pump tubing against falling relative to a well casing within which it is positioned, the same comprising a block carried by the tubing, and a plurality of engaging devices carried by said block, said engaging devices being mounted for independent sliding movement relative to said block and freely movable at all times, means freely movable at all times relative to said tubing for operating said engaging devices independently of the movement of said block relative to the well casing, and a spring operated by a difference in pressure of falling bodies and actuating said operating means to cause the engaging devices to move relative to said block into frictional engagement with the well casing on a rapid descent of the pump tubing relative to the casing.

6. A safety appliance for locking a pump tubing against falling relative to a well casing within which it is positioned, the same comprising a block mounted on the tubing and formed on its surface with a plurality of longitudinally disposed race-ways, a frictional engaging member in each of said race-ways, each of said frictional engaging members being freely movable at all times longitudinally of said race-ways, and means freely movable at all times relative to said

tubing and actuated by the difference in pressure of falling bodies for moving said frictional engaging members within said race-ways and into locked engagement with said well casing on a rapid descent of the pump tubing relative to the casing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES T. HALL.

Witnesses:
JOHN TAYLOR,
H. R. CROZIER.