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MINE ROOF AND TIMBERING JACK

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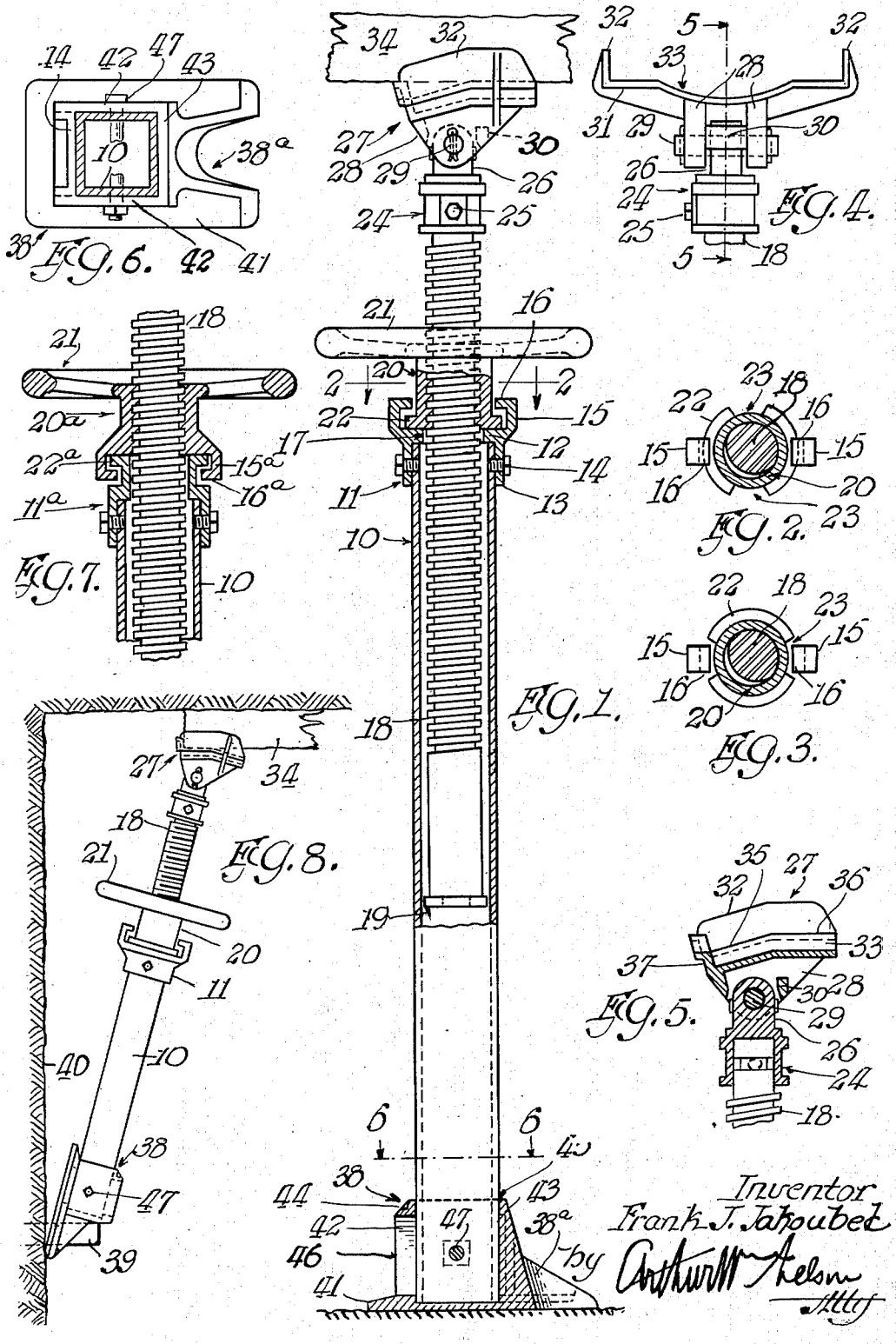


FIG. 6.

FIG. 4.

FIG. 7.

FIG. 2.

FIG. 1.

FIG. 3.

FIG. 8.

FIG. 5.

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MINE ROOF AND TIMBERING JACK

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8 Claims. (Cl. 254—100)

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This invention relates to improvements in mine roof and timbering jacks and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

Jacks of this kind are used as temporary roof supporting columns in the immediate mining areas and haulage ways, as in coal mines. In such areas and ways, the jacks are installed in a generally upright position, with the base thereof resting on the mine bottom and with the head engaged with a cross timber. In haulage ways, which are relatively narrow, such jacks are often displaced by derailed mine cars or locomotives. When such jacks are so displaced, the mine roof supporting timbers, formerly held in place by such jacks, fall and often produce serious injury to operators riding the cars or locomotives.

Mine roof and timbering jacks, as heretofore constructed, generally include a standard, a base, a screw and associated nut, as well as a cross timber engageable head. The nut turns on that end of the standard opposite the base, and wing nuts or slide handles are associated with the nut for turning the same step by step to produce an extension or a retraction of the screw relative to the standard in jacking operations. When the standard is of a height approximating the height of an operator, the wing nuts and slide handles become dangerous to operators in the vicinity of the jack installations. Reports from the field indicate that lacerations have occurred to miners, for failure to notice the projecting wing nuts and slide handles.

When the vein being mined is relatively high so that operators have difficulty in reaching such nuts and slide handles, the jacks are usually inverted, end for end, so that the wing nuts or slide handles are located toward the bottom of the jack and are in such a position as to cause tripping accidents to operators in the vicinity of the same.

In such jacks, as heretofore constructed, the screws are relatively long and embody no provision for a quick extension thereof in adjusting the jack to that approximate length necessary for a particular jacking operation. Therefore, to approximate the adjustment as to length, the operator must turn the nut step by step until the desired extension of the screw is approached. Therefore, where a screw extension of say 15'' is required in the approximate setting of a jack, in those jacks having wing nuts or slide handles for turning the screw, such nuts must be turned from 45 to 60 turns, according to the pitch of the threads of the screw. In this respect it is

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pointed out that the usual practice is to make such screws either with a .333 pitch thread (3 threads per inch) or with a .250 pitch thread (four to the inch). To extend such screws by turning the nut from 45 to 60 turns requires considerable time and in mining operations time is a costly item, which concerns both labor and management. From labor's viewpoint, to reduce jack installation time for roofing or timbering, means higher take-home pay, because mineral products are generally mined on a tonnage incentive basis.

Because of labor disabling accidents in mine haulage ways, due to derailed mine locomotives or cars, displacing cross timbering jacks, there has been introduced into the mining industry a so-called "pin-up" jack system, wherein special bases or feet for the jack are used to operatively engage a bottom support in the form of a pin so disposed in the side wall of the haulage way as to project therefrom at a distance above the bottom of said way. When in use, a pin-up jack stands at an angle to the perpendicular and therefore with jacks as heretofore constructed, a special base and a special head must be applied to the standard and the screw. This entails either the extra expense of removal of the standard bases and heads and the substitution of the special bases and heads, or the purchase of jacks made for this purpose.

One of the objects of the present invention is to provide an improved mine roof and timbering jack which, though light in weight for easy one-man handling, is exceedingly strong and safe in use, may be speedily adjusted to approximate the length of jack required for a particular jacking operation and which eliminates the turning of the nut, step by step, upon the screw in making such adjustments.

Another object of the invention is to provide, in a jack of this kind, a base which may be used for either a conventional or a pin-up jack operation and a timber engaging head which snugly engages the roof or cross timber so that it cannot slip therefrom during either of such jacking operations.

Furthermore, it is an object of the invention to so correlate the screw engageable nut and the nut retainer on the standard, that while the nut is confined against accidental displacement relative to the retainer or housing on the standard, it may be released therefrom to afford a freeing of the screw from the standard and a quick "running" of the nut into the desired position thereon and a quick reapplication of the nut to the re-

tainer and this without requiring the use of extra tools of any kind.

The above mentioned objects of the invention, as well as others, together with the advantages thereof, will more fully appear as the specification proceeds.

In the drawing:

Fig. 1 is a view partly in elevation and partly in longitudinal vertical section of a mine roof and timbering jack embodying the preferred form of the invention, when used conventionally in a cross timbering operation, as a temporary timber post or a temporary mine roof safety post.

Fig. 2 is a horizontal sectional view through a part of the jack as taken on the line 2—2 and on the scale of Fig. 1, and more particularly shows the disposition of coacting parts on the standard and on the nut respectively which prevent longitudinal movement therebetween.

Fig. 3 is a view similar to Fig. 2 showing the disposition of the coacting parts on the standard and on the nut respectively, when they have been turned relatively to permit the longitudinal movement therebetween.

Fig. 4 is a view in elevation of the timber engageable head and associated collar of the jack when viewed at an angle of 90° from that appearing in Fig. 1.

Fig. 5 is a vertical sectional view through the parts appearing in Fig. 4, as taken on the line 5—5 of Fig. 4.

Fig. 6 is a horizontal vertical sectional view through the bottom end portion of the jack as taken on the line 6—6 of Fig. 1.

Fig. 7 is a view showing a modified form of jack structure, providing the separable connection between the standard and the nut, and which will be more fully referred to later.

Fig. 8 is a view in elevation on a scale reduced from that of Fig. 1, showing the improved jack in use as a so-called "pin-up" jack.

Referring now in detail to that embodiment of the invention illustrated in Figs. 1 to 6 inclusive of the drawing, the improved jack includes a hollow standard 10 which is made of a length of tubing of any desired cross sectional shape. Preferably, said tubing is made of an aluminum alloy, whereby though it is light in weight, it is exceedingly strong and will resist severe endwise compressive stresses without buckling or bending.

A housing 11 is disposed upon the top end of the standard. It includes a radial top end bearing flange 12 against which the top end of the standard has an end thrust bearing engagement and a depending annular skirt or flange 13 engaged with the four sides of the standard and operatively secured thereto by two opposing screws 14—14. Rising from opposite sides of the flange 12 are upright lugs 15, each of which terminates in an inwardly extending hook or retaining flange 16 and centrally in the flange 12 is a screw opening 17. The parts just described best appear in Fig. 1.

Associated with the standard is a lifting screw 18 of a diameter to freely pass through the opening 17 in the flange 12 of the housing. At the bottom end of the screw, which is normally disposed within the standard, is a stop collar 19, of a diameter greater than that of the flange opening 17 to prevent the screw from being withdrawn longitudinally from the upper end of the standard.

Threaded upon the screw 18 is a nut 20 having a hand wheel 21 at the top for turning the same and having a radial flange 22 at the bottom, which has bearing engagement upon the flange 12 of the housing 11. In opposite sides of the flange 22 are recesses 23 (see Figs. 2 and 3) of a width greater than the width of the hook flanges 16 so that said flanges 16 may pass therethrough when in register therewith. When said hook flanges are out of register with the recesses, said flanges overhang the flange 22 of the nut 20 and prevent the displacement of the nut from the housing 11.

On the upper end of the screw 18 is an adapter or cap 24 which is so attached to the screw by a cap screw 25 as to have a swivelled connection with said screw 18, so that while it can turn relatively thereto, it cannot be accidentally displaced therefrom. On the upper end of the adapter 24 and extending centrally across the same is a flat lug 26 upon which is mounted a timber engageable head 27. On the bottom of said head is provided a pair of depending ears 28—28 laterally spaced to be disposed one upon each side of the lug 26. A pin 29 passes through said lug and ears 28 to afford an operative pivotal connection therebetween, whereby the head 27 is capable of a tilting movement with respect to the adapter or cap 24. Said ears 28—28 are connected together by a tie or bridge 30, which is so disposed as to engage one of the end edges of the lug 26 and thus limit the tilting movement of the head 27 in one direction.

The head 27 includes a timber engageable top plate 31, (see Fig. 4) which is provided at opposite sides with upright flanges 32 and a centrally arranged shallow channel 33. The top plate made as described, will effectively engage with either a flat bottomed mine roof or cross timber 34 or a round bottomed one and this without permitting a lateral escape of the timber from the head 27.

One end portion 35 of the plate 31 is disposed at an angle to the other end portion 36 of said plate, which two portions 35—36 best appear in Fig. 5 and this angle corresponds to the angle through which the head 27 can tilt on the adapter or cap as limited by the engagement of the bridge 30 with the edge of the lug 26. At that end of the portion 35 opposite the end where it joins the portion 36, is provided an upwardly extending right angled flange 37, which terminates at the top in the plane of the plate portion 36. The bottom portion of this flange is adapted for engagement with another edge of the lug 26 to limit the counterclockwise tilting movement to substantially the position shown in Fig. 1.

At the bottom end of the standard is a base 38, which in one position on or relative to the standard, forms a flat footing for engagement upon a mine bottom or floor and in another position, on or relative to the standard, affords a supporting engagement with a pin-up supporting pin 39 (see Fig. 8) projecting laterally from an upright wall 40 of a mine haulage way or the like.

Said base has a flat botttom 41, upright side walls 42—42 and a front wall 43, the upper rear corners of the side walls being joined by the bridge 44. The front wall 43 and front part of the bottom 41 coact to define a pin-up pin recess 38a, as in Fig. 6. The upper end of the side walls 42 and the front wall 43, along with the bridge 44 coact to provide a top opening 45 and the rear part of the side walls 42 and a part of the bottom along with the bridge 44 define side opening 46. The front and side openings are each of the size and shape to correspond with the cross sectional

shape of the end of the standard and both open into the interior of the base, as is obvious from Fig. 1. After the bottom end of the standard has been inserted into either opening 45—46 into the interior of the base, it is operatively but detachably secured in place thereon by means of a bolt 47 that passes through both side walls of the base and through opposite sides of the standard and which both best appear in Figs. 1 and 6.

In Fig. 7 is illustrated a modified construction by which the nut, which is therein indicated by the numeral 20*a*, is operatively but detachably engaged with the housing, indicated by the numeral 11*a*. In this construction the top end of the housing is made to provide a radial flange 22*a* and beneath the same is an annular groove, the bottom end of the nut 20*a* is provided with oppositely disposed depending lugs 15*a*, each of which terminates in an inturned hook. In the flange 22*a* are recesses (not shown) similar to the recesses 23 in Figs. 2 and 3 for the passage of the hooks 16*a* in the separation of the nut 20*a* from the housing 11*a*. Thus, in this construction, the parts are disposed in a manner opposite to that appearing in Fig. 1, but functions in the same manner.

In Fig. 1 the improved jack is shown in its conventional upright position for supporting a mine roof or similar timber 34 from the mine bottom or floor. In this position the bottom end of the standard passes through the opening 45 of the base into the interior thereof with the extremity of said end engaged on the bottom of the base. In this position one pair of opposite sides of said end of the standard engage opposite sides of the base and the other pair of sides of said end of the standard are engaged with the wall 43 and the bridge 44 respectively of the base and said parts are held in this position by the removable bolt 47. Thus, the base is firmly secured to the standard.

The timber 34 is shown as resting firmly on the surface portion 36 of the head and upon the top end of the flange 37. By turning the hand wheel 21 in the proper direction, the nut 20 is rotated on the housing and this extends the screw upwardly so that the head firmly engages the timber 34 to support the same in the manner of a well fitted post.

In a preliminary step prior to the setting of the jack for a jacking operation, the operator approximates the distance between the timber 34 and the mine bottom. At this time the jack may be in its "down" position for easy handling, wherein the nut 20 may be turned to bring its recesses 23 into register with the lugs 16 on the housing flange 12. When this has been done, the nut 20 and screw 18 may be withdrawn outwardly from the housing 11 to that distance which in the operator's estimation will produce the approximate length of jack necessary for the jacking operation at hand. Thereafter, the hand wheel 21 is "spun" to cause the same to travel down the screw. This operation of adjusting the nut 20 on the screw 18 is quickly accomplished, after which the nut is applied to the standard and turned so as to take the recesses 23 out of register with the hook lugs 16 of the housing.

In this condition, the jack can be readily handled, without a separation between the parts, for a setting of the jack in position for the jacking operation to be carried out. With the base 38 resting on the mine bottom or floor, the jack now stands in an upright position with the head positioned near the timber. By turning the wheel 21 in the proper direction, the screw is extended to firmly engage the head in supporting relation to the timber.

Now assume that it is desired to use one of the jacks in a "pin-up" jacking operation, as in Fig. 8. The bolt 47 is removed so that the base may be separated from the standard. The end of the standard is then inserted through the side opening 46 and into the interior of the base 38, so that its extremity is engaged with the wall 41 of the base. At this time the bottom wall 41 of the base extends parallel with one side of the standard. Thereafter, the bolt 47 is replaced and the base has the relative position on the standard, as appears at the bottom of Fig. 8.

After the length of the jack required for the pin-up jacking operation has been estimated, it is extended to the approximate length, as before described. The recess 39*a* of the base is then engaged upon the pin-up pin 39 and the jack then disposed in an oblique position. The head 27 is then tilted so that its surface 35 is engageable with the end of the timber 34 as appears in the upper portion of Fig. 8, at which time the flange 37 of the head is engaged by the extremity of said timber end.

By turning the hand wheel in the proper direction, the screw 18 is extended to that position wherein the jack supports the timber from the pin-up pin. When the jack is in this position, it is so located that it cannot be engaged by a derailed locomotive or car and be dislodged from its placed or set position. As the pin 39 is located at a level above the mine bottom or floor, the jack in no way interferes with the loading operations of the mining equipment used for the purpose.

The improved jack, though light in weight for easy one-man handling, is indeed strong and rigid and will withstand high compression forces without bending, buckling or collapsing.

Furthermore, it may be speedily adjusted for approximate length and is safe in use. Also, the improved jack may be readily used for either conventional or for pin-up jack operation, without the necessity of providing special parts or new jacks for either operation and the change-over may be quickly and easily made.

While in describing the invention I have referred in detail to the form, arrangement and construction of the parts involved, the same is to be considered only in the illustrative sense and therefore I do not wish to be limited thereto, except as may be specifically set forth in the appended claims.

I claim as my invention:

1. A mine roof and timbering jack embodying therein a standard member having at least a tubular upper end portion, a screw having a part disposed in said portion of said member, a nut member through which the screw extends and with which it has constant threaded engagement, one of said members having a radial flange thereon and against which the other of said members has a bearing engagement, said other of said members having at least one lug thereon formed to extend inwardly of and in confining relation to the flange on said one of said members, said flange having at least one recess therein for the passage of said lug through the flange when said lug and said recess are in register to permit of a relative longitudinal movement of said members for a quick adjustment of the nut member by turning the same on the screw in

approximating the extended or the retracted condition of the jack for a particular jacking operation.

2. A mine roof and timbering jack embodying therein a standard member having at least a tubular upper end portion, a screw having a part disposed in said portion of said member, a nut member through which the screw extends and with which it has threaded engagement, one of said members having a radial flange thereon, the other of said members having a plurality of arcuately spaced lugs thereon formed to extend inwardly of and in confining relation to the flange on said one of said members, said flange having recesses therein arcuately spaced complementally to said lugs for the passage of said lugs through the flange, when said lugs and said recesses are in register, to permit of a relative longitudinal movement of said members for a quick adjustment of said nut member by turning the same on the screw in approximating the extended or the retracted condition of the jack for a particular jacking operation.

3. A mine roof and timbering jack embodying therein a standard having at least a tubular upper end portion, a member operatively secured to the upper end of the standard, a screw having a part disposed in said upper end of the standard and passing through said member, a nut through which said screw extends and has constant threaded engagement therewith, said nut including a radial flange having a bearing engagement upon said member, means on said member providing a plurality of arcuately spaced lugs that overhang said flange, said flange having recesses therein complemental to said lugs for the passage of said lugs through said flange when said recesses and said lugs are in register, to permit of a relative longitudinal movement between said standard and said nut for a quick adjustment of the nut by turning the same on the screw in approximating the extended or retracted condition of the jack for a particular jacking operation.

4. A mine roof and timbering jack embodying therein a standard, a lifting screw operatively engaged in one end of said standard, a cap on that end of the screw outwardly beyond said end of the standard, a timber engageable head mounted on said cap for a limited tilting movement about an axis perpendicular to said screw, means providing timber engageable surfaces on said head, disposed at an angle to each other, and means carried by said head and engageable with parts of the cap for limiting the tilting movement of said head to that angle substantially corresponding to the angle between said timber engageable surfaces of said head.

5. A mine roof and timbering jack embodying therein a standard, a lifting screw operatively engaged in one end of said standard, a cap on that end of the screw outwardly beyond said end of the standard, a lug on the end of said cap, a timber engageable head having ears disposed upon opposite sides of said lug, means providing a pivotal connection between said lug and said ears of the head and providing a tilting movement of the head on the cap about an axis perpendicular to said screw, means providing timber engageable surfaces on said head disposed at an angle to each other, and means carried by said ears and engageable with opposite sides of said lug for limiting the tilting movement of said head to that angle substantially corresponding to the angle between said timber engageable surfaces of said head.

6. A mine roof and timbering jack embodying therein a standard, a base member for said standard including a part adapted for connection with said standard providing a change between two positions thereon, a flange on said base member providing a footing therefor when in one position relative to the standard, said flange being formed for operative engagement with a pin-up pin when in the other position relative to the standard, said member including parts for engagement with the circumference of a part of said standard to secure the same against rocking movement relative to said member when said standard is in either of said positions.

7. A mine roof and timbering jack embodying therein a standard, a base member for said standard and including a part formed with a socket having a top opening and a side opening, through either of which an end part of the standard may be passed to extend into said socket, means for securing said part of the base member to said standard, when said end of the standard is passed into the socket through either opening, said base member having a flange providing a footing therefor when said standard end has been entered into said socket through one of said openings, said flange having a recess in one side thereof for engagement with a pin-up pin when said end of the standard has been entered into said socket through the other of said openings.

8. A mine roof and timbering jack embodying therein a standard member having at least a tubular upper end portion, a screw having a part disposed in said portion of said member, a nut member through which the screw extends and with which it has constant threaded engagement, one of said members having a radial flange thereon and against which the other of said members has a bearing engagement, a lug carried by the other of said members and formed to pass the periphery of said flange, means carried by said lug and extending inwardly therefrom into overhanging confining relation to said flange, said flange having at least one recess therein for the passage of said means carried by said lug when said recess and said means are in register to permit of a relative longitudinal movement of said members for a quick adjustment of the nut member relative to the screw by a turning of the nut member on the screw in approximating the extended or the retracted condition of the jack for a particular jacking operation.

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