Sept. 28, 1948. E. C. GILLET 2,450,374

TELESCOPIC TUBULAR PROP

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FIG.2

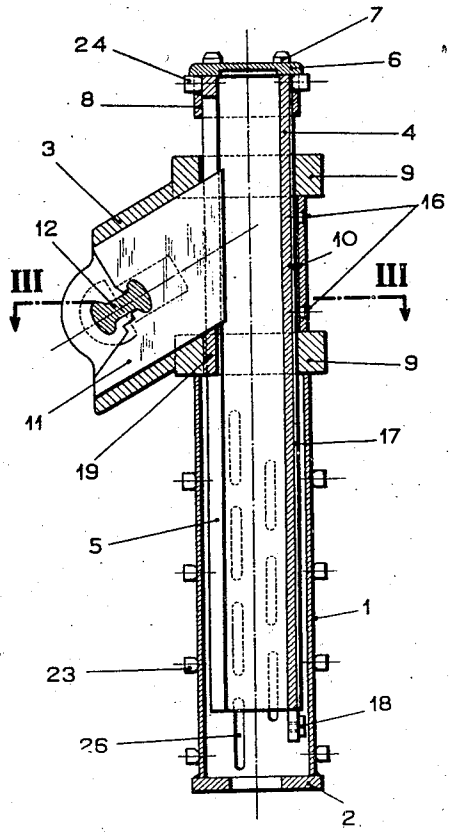


FIG.1

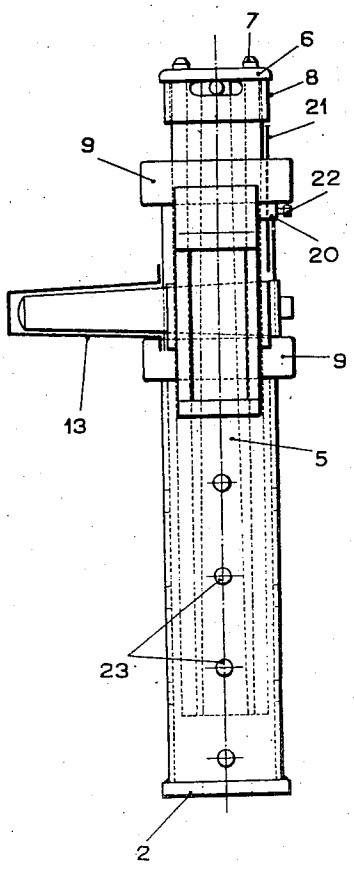


FIG.3

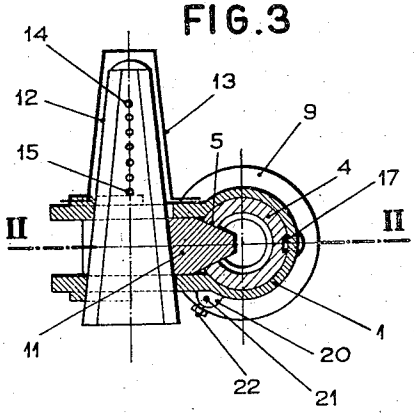
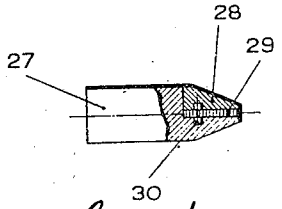


FIG.4



Inventor.
E. C. Gillet
By E. F. Vanderwotte
Atty

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FIG. 6

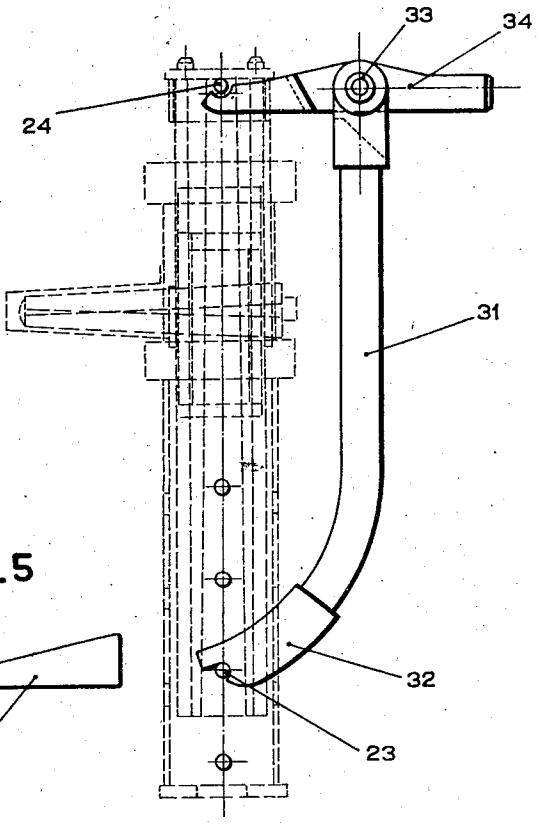


FIG. 5

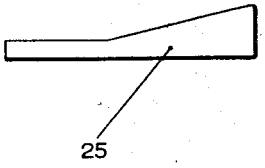
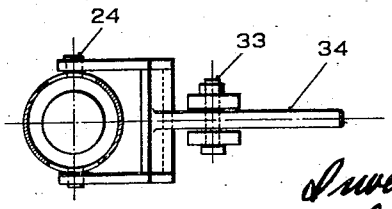


FIG. 7



Inventor:
E. C. Gillet
By E. F. Henderoth
Atty

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UNITED STATES PATENT OFFICE

2,450,374

TELESCOPIC TUBULAR PROP

Eugène Charles Gillet, Valenciennes, France, assignor to Societe Anonyme des Tubes de Valenciennes & Denain, Paris, France, a corporation of France

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Patent expires June 8, 1965

10 Claims. (Cl. 248—354)

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There are frequently used at present (particularly in mining), metal pit-props, adjustable in height and adapted to replace wooden vertical supporting elements. Such props comprise a standard or a foot member of square cross-section surmounted by a blocking device or "lock" and by a plunger likewise of square cross-section which may be caused to extend into the foot member to a more or less great extent and immobilized at any desired level by means of wedges inserted into said lock. In props of such type, as known in the present art, said plunger is of tapered form or more accurately in the form of a pyramid frustrum, the larger base of which is disposed upwards.

Such type of prop offers a number of drawbacks.

(1) By reason of its taper the guiding of the plunger becomes less and less positive as it is lifted, so as to engage the cross bar which it is intended to support, inasmuch as at that time the wedges which provide for the rigidity of the whole structure may not be blocked.

Such defect in guiding may give rise to certain difficulties in positioning the device.

(2) The tapered blocking key is liable to slide either under the effect of accidental impacts or under that of the enormous pressures which it may be called upon to withstand.

(3) The foot and the square plunger are formed by a pair of angle bars or channel sections assembled by welding. This entails a considerable amount of labour and great difficulties in the eventual use of high tensile steels.

(4) The lock generally comprises a considerable number of parts, the assembly of which is somewhat difficult for unskilled labour.

The present invention has for its object to provide, as a new article of manufacture, a telescopic tubular prop, the construction of which has been specially designed to overcome the above-mentioned drawbacks and which is essentially characterized by the combination of: a tubular standard or foot of circular cross-section carrying at the upper portion thereof the blocking device or "lock"; a similarly round tubular plunger having thick gauge walls, slidable within the foot and provided with a longitudinally extended slot, the width of which is made to decrease from bottom to top, in a vertical direction, and from the exterior towards the interior in a horizontal direction; a pivotal cover mounted at the upper end of the plunger and upon which rests the load; a blocking wedge producing the expansion of the plunger and thereby bringing the outer surface

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thereof in contact with the inner surface of the lock in such a way that the plunger finds itself blocked within the lock; lastly, a control device for the above-mentioned wedge constituted by a double acting key member comprising a pair of longitudinal projections, one of which engages a complementary groove formed in the wedge and the other of which is made to fit into a groove formed in the lock.

The invention is further characterized by various other features that will appear from the more detailed description which will now be made thereof.

In the accompanying drawings there have schematically been illustrated by way of example only and with no intention of limiting the scope of the invention, a form of embodiment of the latter and some modifications thereof.

In the drawings:

Fig. 1 is an outer front view of the improved metal prop;

Fig. 2 is a vertical cross section taken on the line II—II of Fig. 3;

Fig. 3 is a horizontal cross section taken on the line III—III of Fig. 2;

Fig. 4 is a horizontal cross sectional view of a modified form of a blocking wedge;

Fig. 5 illustrates a key for fixing the plunger;

Fig. 6 is an elevational view showing the application to the prop of a leverage device serving as a hoisting jack, and

Fig. 7 is a plan view of Fig. 6.

As more particularly shown in Figs. 1 to 3, the new adjustable prop is organized as follows:

The foot **1** comprises a round tube resting upon a base **2** and carrying at its upper portion a "lock" **3**.

The plunger **4** is a length of thick-walled circular tubing in which is formed a longitudinal slot **5**, the width of which decreases from bottom to top (see Fig. 1) and from outside to inside (see Fig. 3). At the upper portion thereof the plunger **4** is fitted with a pivotal cover **6**, topped with four lugs **7** and centered on said plunger by means of an annular flange **8**. The upper part of the cover **6** may be formed to any suitable shape for conforming to that of the cross bars to be supported: in particular it could be provided in V-shape.

The lock **3** could be an integral casting; however, for reasons of safety, it is preferred to provide the hoop-rings **9** with seamless tubing, or stamped steel. Similarly, the spacer member **10** between the hoop-rings may be cut from a length of tubing or formed from a rolled sheet. In that

case, assembly of the various elements is effected by arc welding.

In the lock 3 is movably mounted the blocking wedge 11 which engages the slot 5; for that purpose the sharper end of said wedge is provided with a shape conforming to that of the slot, i. e. tapering down from bottom to top and from outside to inside. With respect to the axis of the prop, the wedge may extend either normally or at an angle.

The angle which is formed in a horizontal plane by the sides of the slot 5 is selected in such a way that the wedge 11 will be capable under the effect of a relatively low pressure, of expanding the plunger 4 and bring the outer surface thereof in engagement with the inner cylindrical surface of the lock, said inner surface being machined to a diameter which is only a few tenths of a millimeter larger than that of the slotted tube 4. It follows that the necessary expansion of the tube 4 for locking it in the lock may be very small and it will easily be understood that both surfaces may be made to tightly engage each other.

The movements of the wedge 11 are controlled by a key 12 having a pair of flanges (Figs. 2 and 3). One of the flanges of said key engages the slot of elliptical, circular, or any other form opening outwardly and formed in the back portion of the wedge; the other flange is fitted in a suitably formed slot provided in the lock 3 and forming a fixed slideway for the key. It may easily be seen by examining the drawing and particularly Fig. 3, that by reason of the shape of the various parts involved, the longitudinal movement of the key causes the wedge 11 to penetrate into, or to be withdrawn out of, the slot 5 of the plunger.

In order to avoid displacement of the key 12 under the effect of accidental impacts, there is provided a removable protecting cap 13 adapted to be hooked upon the lock.

For the same purpose, after the prop has been put into place, a spring-urged cotter pin may be inserted into one of the holes 14 provided to that end in the central portion of the key (see Fig. 3). At its forward end said key has a hole 15 formed therein through which normally extends a cotter pin identical to the above-mentioned one and which prevents dismantling of the whole structure by preventing the withdrawal of the key 12.

In practise it would be the pin engaging the hole 15 which, after the prop has been mounted, would be inserted as desired in one of the holes 14 and which, when necessary to withdraw the key 12 for removing the prop, would be shifted back from one of the holes 14 to the hole 15.

On the spacer member 10 there are fixed as by screws threads, or in any other way, a pair of lugs 16, engaging a slot 17 of the plunger 4 and providing for the guiding of said plunger in the vertical displacements thereof. Such vertical displacements are upwardly limited by a screw 18 which serves to avert any risk of disassembly.

A small lug 19 welded to the lower hoop-ring 9 supports the end of the wedge 11, in vertical alignment with the stressed portion thereof.

The lock comprises a boss 20 (Figs. 1 and 3) wherein is freely slidable a pin 21 of small diameter which may, if desired, be blocked by means of a set screw 22. This pin, the upper end of which is after assembly of the prop brought into registry with the lower edge of the flange 8, serves as an index for measuring the extent of penetration of the plunger under the effect of the loads supported thereby.

On the foot 1, small lugs 23 are welded for receiving the foot of the hoisting device of Fig. 6 and a pair of lugs 24 are provided on the plunger 4 to serve as a fulcrum for the upper level of said jacking device.

The plunger may likewise be brought into engagement with the cross-bar which is to be supported thereby, in a known manner, by means of a pair of keys 25 (Fig. 5) engaging the slots 26.

If for any reason it should be desired to obtain a fairly pronounced penetration of the plunger under the effect of the loads, it would be possible, as shown in Fig. 4, to provide the wedge in two parts 27 and 28 between which there could be placed an insert 29 of wood or any similar more-or-less compressible material, according to the amount of compression desired. In such case, lugs 30 would be provided for ensuring assembly of the whole structure.

The device is used in the following way:

The prop being placed under the beam to be supported by it, the plunger is brought into contact with said beam, either in a known manner by means of the keys 25 serving as wedges, or by means of the jack shown in Figs. 6 and 7, which forms a feature of this invention and which comprises a bent lever 31 terminating at its lower end by a fork 32 and pivoted at 33 on a control lever 34.

By acting on lever 34 the plunger is raised, the jacking device being fulcrumed on the lugs 23 of the foot 1 and the lugs 24 of plunger 4.

After the plunger of the prop has thus been drawn into contact with the beam to be supported, the larger end of the key 12 is hammered upon, this having for effect to push the wedge 11 into the slot 5; under this pushing action the plunger expands slightly (the margins of the slot being pushed apart) and the plunger is brought to bear throughout its entire outer surface against the machined surface of the bore portion of the lock.

When this is so, the plunger 4 may no longer move downwards or may only do so to a very small extent under the action of considerable loads causing resilient lengthening of the hoop-rings.

This is so because if the plunger tends to descend it is caused to expand more and more through the action of wedge 11 in the slot 5 and the structure is sure to reach a positive blocked condition after a very short time.

If it is desired to obtain absolute safety, the cotter pin inserted in the hole 15 is withdrawn and introduced into one of the holes 14, which prevents the removal of the key 12 under the action of an accidental shock. With the same purpose the cap 13 may also be put on and secured.

In order to provide for the measurement of any subsequent settling the index pin 21 may be suitably positioned.

For removing the prop, it is only necessary, after having displaced the safety cotter pin by removing it from the particular hole 14 which it was engaging and inserting it into the hole 15 or after having removed the cap 13, to drive in the key 12 by hammering the narrow end thereof either with light or with heavy blows according to whether a progressive sagging or an instantaneous lowering of the plunger is desired. Under the effect of light impacts the longitudinal displacements of the key are of limited amplitude and the same is true of the vertical displacements of the plunger 4. However, under a violent blow the key is rapidly and completely disengaged from its recess, carrying with it the wedge 11

towards the rear. It follows that the outer diameter of the plunger 4 will be instantly brought back to its initial length, by reason of the resiliency of the metal, and the plunger may freely slide without the possibility of becoming wedged in the lock and will therefore sag down instantaneously.

From the description which has just been made the advantages secured by the present invention will be easily apparent. Said advantages are the following:

(*a*) By virtue of its cylindrical form the plunger is always satisfactorily guided, whatever the height to which the prop may be set upon adjustment; thus no trouble is had in the positioning of the prop.

(*b*) The device only comprises a very small number of welded parts and such welds are only found in points which are not of vital importance; the device may therefore be constructed in high tensile steel, thereby making for a reduction in weight.

(*c*) The prop is made up of a very small number of parts; it follows that mounting and dismantling are a very simple matter and may be accomplished by any unskilled person.

(*d*) The general cylindrical form given to the essential parts of the device and particularly to the hoop-rings 9 makes it possible to cause the metal to work under a maximum fatigue ratio, while obtaining the greatest possible security.

(*e*) The cylindrical form of the plunger has made it possible to cap the latter with a pivotal head, which in particular facilitates the positioning of the prop.

(*f*) The stresses acting upon the wedges 11 practically have no tendency to move the same backwards; it follows that the lead supported by the key is limited to a very low value and that said key runs absolutely no risk of becoming dislodged under the effect of normal stresses.

It will, of course, be understood that the details of embodiment as described and illustrated have been given by way of illustration and that the same could be modified in various ways and certain arrangements could be replaced by equivalent ones without departing from the spirit of the invention.

What I claim is:

1. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard comprising a pair of vertically aligned bores formed in a pair of vertically spaced annular members interconnected by a spacer means, a transversely-expansible tubular plunger slidably mounted in said standard in normally free sliding relationship with said inner bearing means, load-supporting means at the upper end of said plunger and adapted to receive thereon a load to be supported by said structure, and blocking means for expanding said plunger into blocking relationship with said inner bearing means.

2. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, the slot tapering in width and contour and having the narrowest portion at the upper end thereof, load-supporting means at the upper end of said plunger, and wedging means adapted to engage said slot to a greater or lesser extent to thereby more or less expand said tube into blocking relationship therewith, said wedging means being tapered to coact with said tapered slot.

3. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, the slot tapering in width and contour and having the narrowest portion at the upper end thereof, load-supporting means at the upper end of said plunger, and wedging means adapted to engage said slot to a greater or lesser extent to thereby more or less expand said tube into blocking relationship therewith, said wedging means being tapered to coact with said tapered slot, and adjusting means for more or less engaging said wedging means into said slot.

4. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, the slot tapering in width and contour and having the narrowest portion at the upper end thereof, a load-supporting cap rotatably mounted on the top of said plunger, and blocking means for expanding said plunger into blocking relationship with said inner bearing means.

5. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, said slot having a transverse dimension decreasing from bottom to top, load-supporting means at the upper end of said plunger, and wedging means adapted to engage said slot to a greater or lesser extent to thereby more or less expand said tube into blocking relationship therewith as said slotted tube is lowered or raised in said standard.

6. A metallic supporting structure such as a pit-prop, comprising in combination: a tubular standard, cylindrical bearing means at the upper portion of said standard, a transversely-expansible tubular plunger slidably mounted in said standard in normally free sliding relationship with said inner bearing means, load-supporting means at the upper end of said plunger and adapted to receive thereon a load to be supported by said structure, vertical guiding means for said plunger in said standard comprising a longitudinal slot in said plunger and lugs in said standard coacting with said slot, and blocking means for expanding said plunger into blocking relationship with said inner bearing means.

7. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, the slot tapering in width and contour and having the narrowest portion at the upper end thereof, load-supporting means at the upper end of said plunger, and wedging means adapted to engage said slot to a greater or lesser extent to thereby more or less expand said tube into blocking relationship therewith, and adjusting means for said wedging means.

8. A metallic prop comprising in combination: a tubular standard, bearing means at the upper

portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, load-supporting means at the upper end of said plunger, wedging means adapted to engage said slot in said plunger, a recess formed backwardly of said wedging means, a tapered adjusting key member formed with the opposite longitudinal projections therein, one of said projections slidingly co-operating with said recess in said wedging means, guiding means in fixed relationship with said bearing means and in guiding sliding co-operation with the other of said projections of said tapered key member, so adapted as to permit of adjusting the extent of engagement of said wedging means into said slot by acting on said key member.

9. A metallic prop comprising in combination: a tubular standard, bearing means at the upper portion of said standard, an expansible plunger comprising a longitudinally-slotted tube slidably mounted in said standard in normally free sliding relationship with said inner bearing means, the slot tapering in width and contour and having the narrowest portion at the upper end thereof, load-supporting means at the upper end of said plunger and relatively compressible wedging means adapted to engage said slot to a greater or lesser extent to thereby more or less expand said tube into blocking relationship therewith, said wedging means comprising two outer non-compressible portions and a portion of relatively compressible

material therebetween and means for assembling said portions.

10. A metallic supporting structure such as a pit-prop, comprising in combination: a tubular standard, cylindrical bearing means at the upper portion of said standard, a transversely-expansible tubular plunger slidably mounted in said standard in normally free sliding relationship with said inner bearing means, the slot tapering in width and contour and having the narrowest portion at the upper end thereof, load-supporting means at the upper end of said plunger and adapted to receive thereon a load to be supported by said structure, and blocking means for expanding said plunger into blocking relationship with said inner bearing means, and index means for measuring the extent to which said plunger may have sagged with respect to said standard under a load exerted thereupon.

EUGÈNE CHARLES GILLET.

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