United States Patent

Krekeler

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[54] ADJUSTABLE VERTICAL SUPPORT

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[52] U.S. Cl. **248/356,** 248/358

[51] Int. Cl. **E21b 15/18**

[58] Field of Search ..... 248/354 R, 354 S, 356

[56] **References Cited**

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[57] **ABSTRACT**

An adjustable vertical support comprising a first elongated cylindrical hollow element having a closed end and a bearing means at its other end, and a second elongated, cylindrical element of lesser diameter and slidable in the bearing means of the first cylindrical element between a retracted position wherein a portion of its length is located within the first cylindrical element and an extended position wherein a lesser portion of its length is located within the first cylindrical element. The end of the second cylindrical element, located within the first cylindrical element, is closed and slidably but captively held within the first cylindrical element. One end of the support is provided with an anvil member connected thereto by a toggle assembly. The anvil member has a bearing surface. The annular space formed between the first and second cylindrical elements, when the second cylindrical element is in its retracted position, is filled with granular or particulate load-bearing material capable of flowing in the space formed beneath the closed end of the second cylindrical element as it moves toward its extended position and supporting the closed end of the second cylindrical element at any desired vertical position within the first cylindrical element. The toggle assembly is designed to permit remote retrival of the support, even after the support has yielded somewhat but is still supporting a great weight. The toggle assembly further provides the last increment of length adjustment when setting the support in position.

17 Claims, 7 Drawing Figures

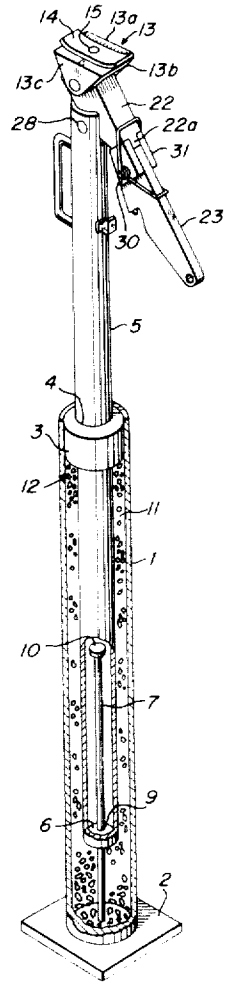


FIG-1

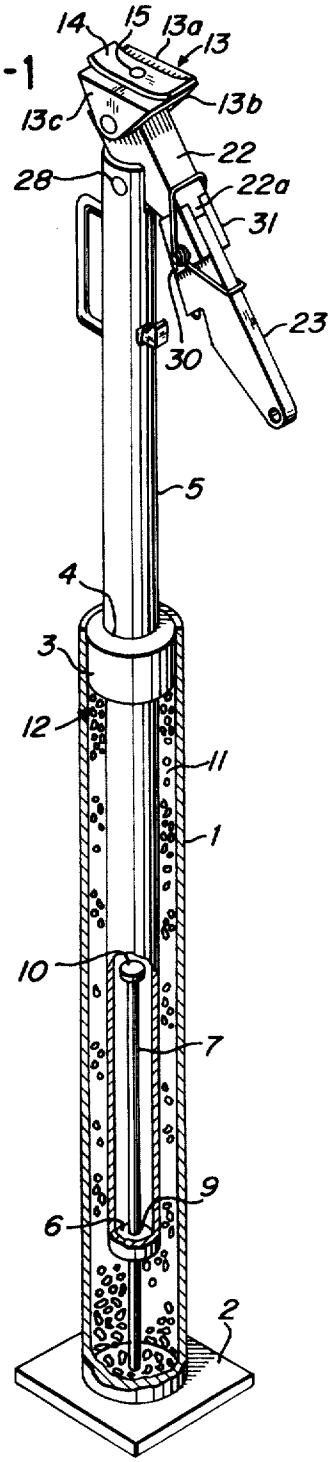
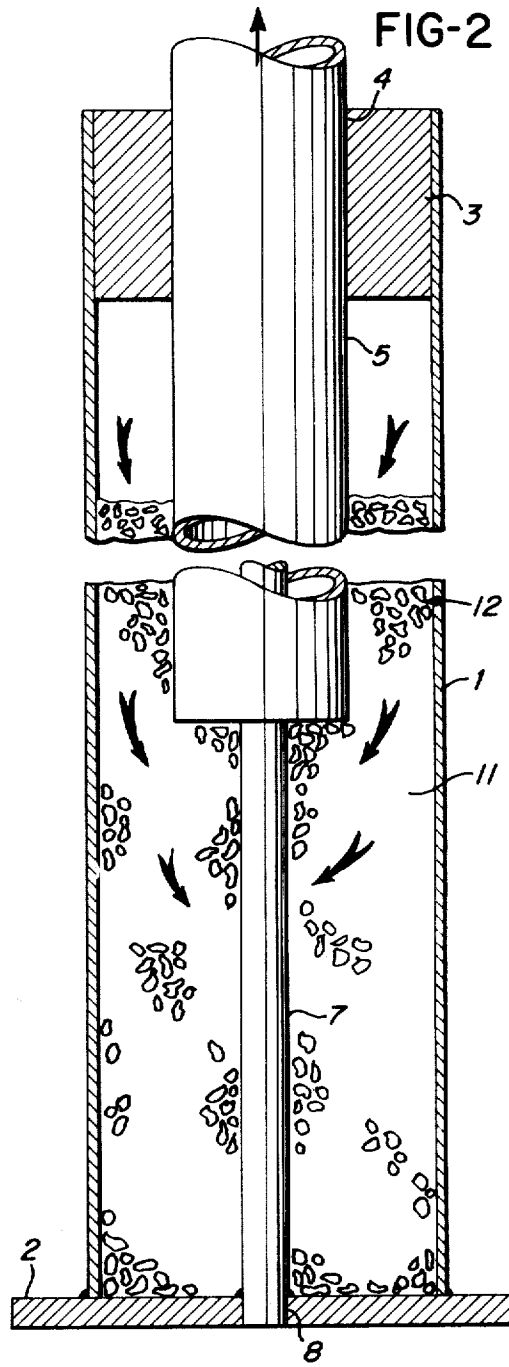


FIG-2



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FIG-3

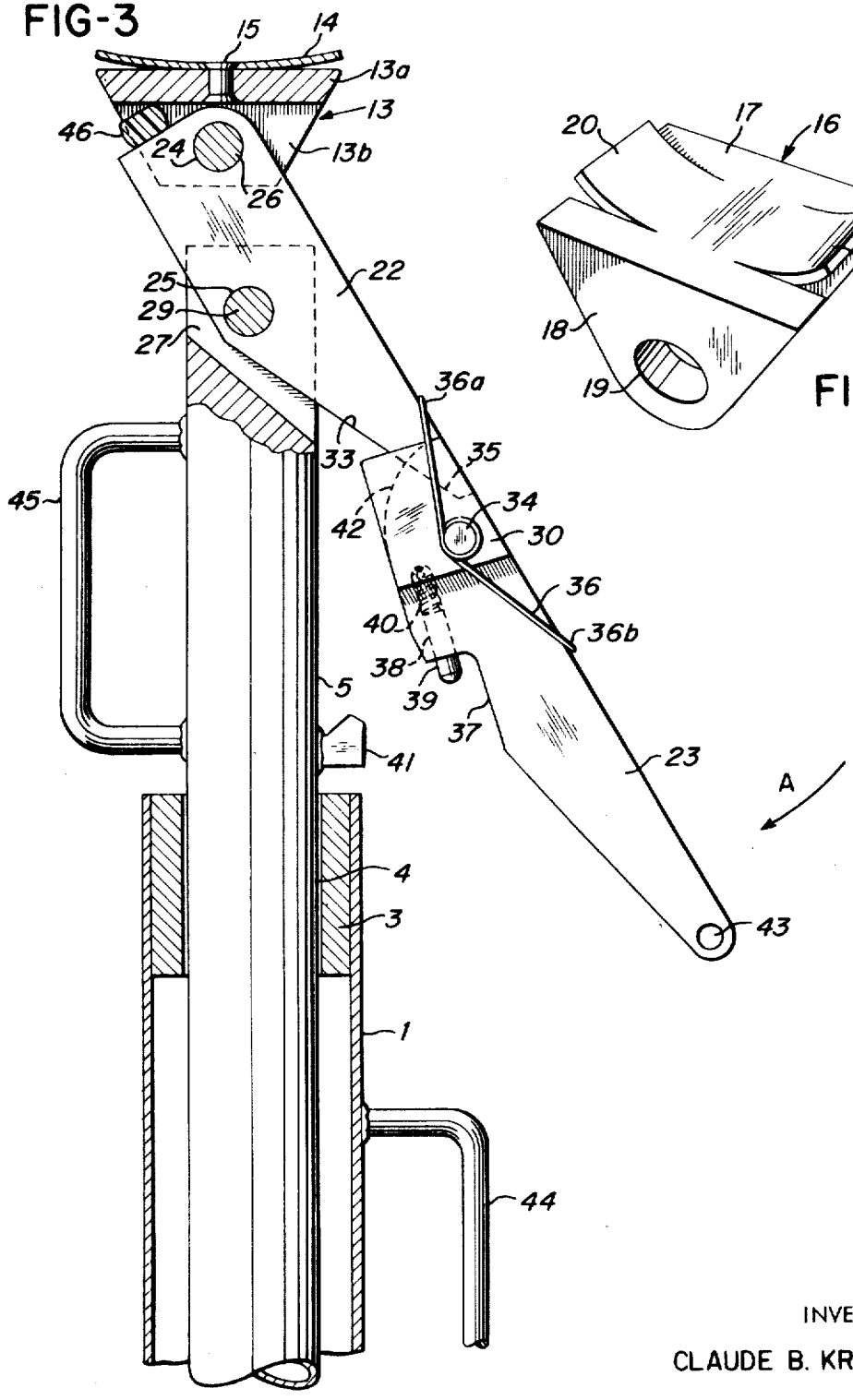


FIG-6

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FIG-4

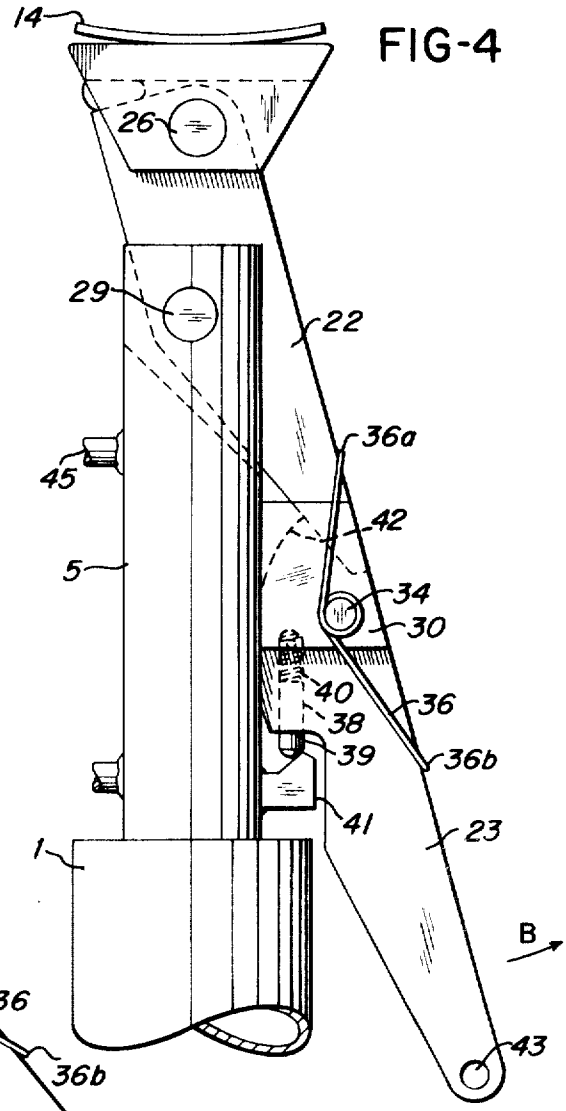
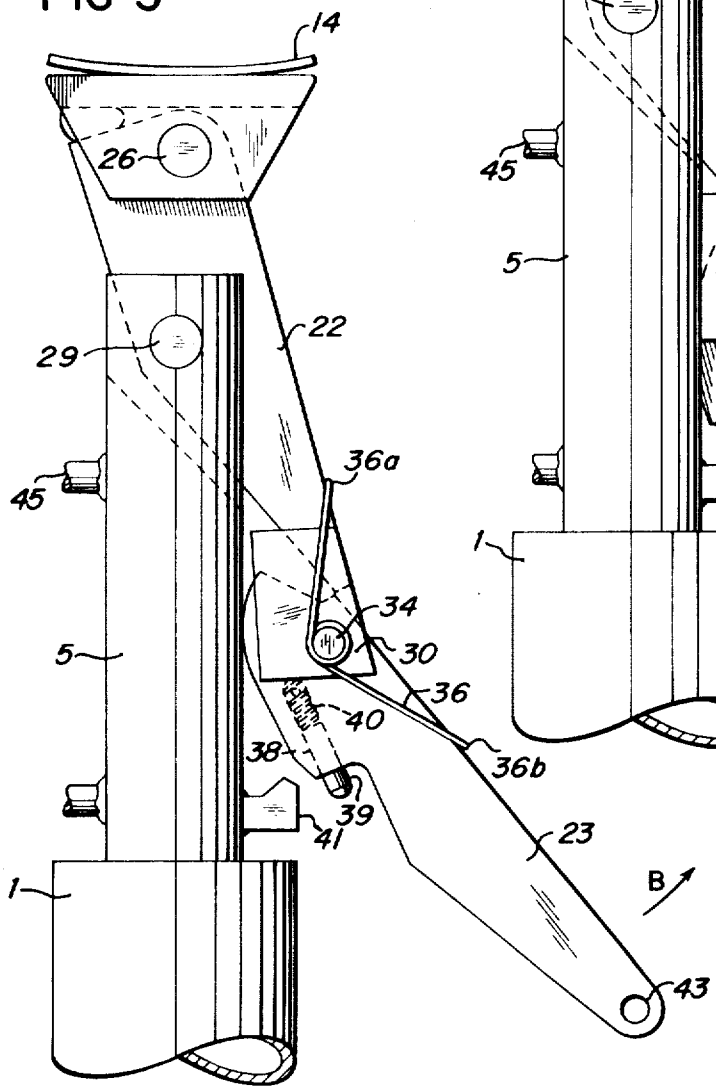


FIG-5



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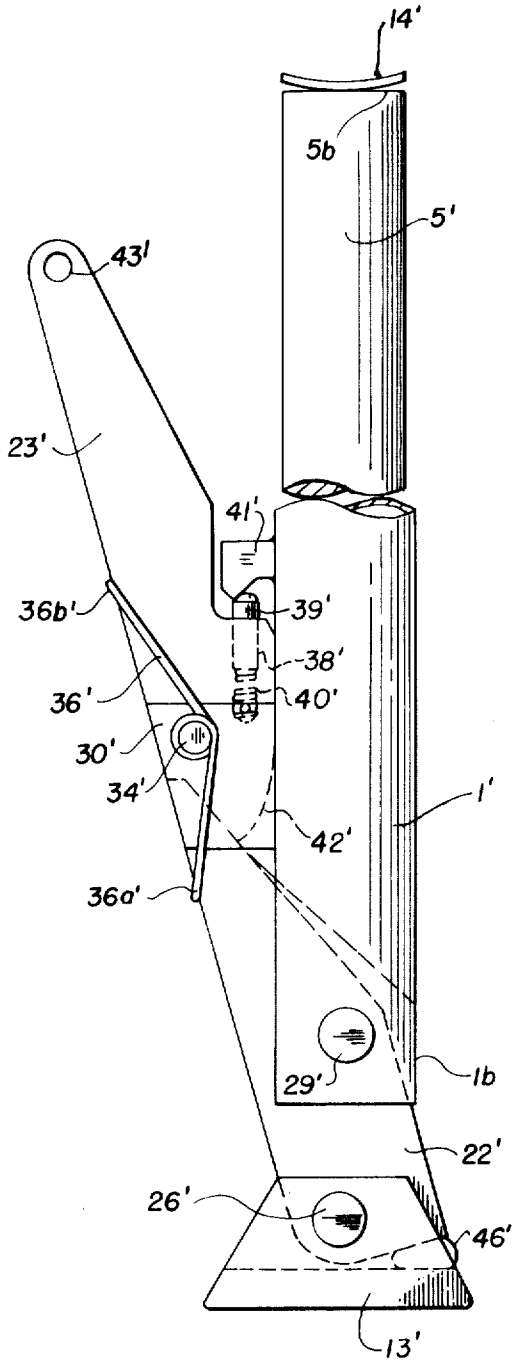


FIG. 7

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ADJUSTABLE VERTICAL SUPPORT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to an adjustable vertical support, and more particularly to a support capable of being located between existing upper and lower substantially horizontal surfaces and capable of being remotely retrieved therefrom, when desired.

2. Description of the Prior Art

While the adjustable support of the present invention may be used wherever a vertical support means is required, it will, for purposes of an exemplary showing, be described with respect to its use as a mine prop. Since the vertical support of the present invention is retrievable from a position remote from the support itself, it is particularly adapted for use in the "long-wall method" of coal mining. In accordance with this method, all of the coal is removed in one cutting, the roof being temporarily supported by vertical support means close to the face of the cut. As the face of the cut advances, the vertical supports are advanced, the rearmost supports being remotely removed and retrieved so as to allow the rearward portion of the mine roof to cave in.

Heretofore, extensive use has been made of vertical support means of the hydraulic or screw-jack types. Hydraulic props or supports are expensive to manufacture, time consuming to install and subject to leakage, requiring constant maintenance. Similarly, the screw-jack type of prop is complex in nature, and expensive to manufacture.

Prior art workers have developed adjustable stands or supports comprising a first elongated element telescoped within a second elongated element and held at a desired height within the second element by particulate or granular load-bearing material. Such devices are exemplified by U.S. Pat. Nos. 1,765,200 and 2,510,688. Supports of this type are advantageous in that they may be manufactured relatively inexpensively and installed rapidly.

Vertical supports comprising telescoping elements utilizing granular or particulate load-bearing material have been adapted for use as mine props. Heretofore, however, mine props of this type have not been capable of proper final adjustment between existing upper and lower substantially horizontal surfaces and have not lent themselves to remote retrieval. Further, their telescoping ability has been limited and the particulate material therein has not been free to flow readily during adjustment of such props due to mechanical obstructions therein.

The present invention is directed to a vertical support comprising telescoping elements and utilizing load-bearing granular or particulate matter, which support may be inexpensively manufactured, rapidly installed, readily retrieved from a remote position and properly adjusted with respect to its vertical length. The support of the present invention is further characterized by an infinite adjustability between two extremes of length; an ability to yield at a predetermined load level (thus rendering it virtually indescructable when used within the limits intended); and a substantial imperviousness to hostile environments due primarily to the fact that no close fitting hydraulic seals or the like are required.

SUMMARY OF THE INVENTION

An adjustable vertical support comprising first and second elongated, cylindrical elements. The first cylindrical element has a base means at one end and a bearing means at the other. The second cylindrical element is closed at one end and has an anvil member with a bearing surface connected to the other end by a toggle assembly.

The second cylindrical element is slidably mounted in the bearing means of the first cylindrical element and is movable between a retracted position wherein the majority of its length lies within the first cylindrical element and an extended position wherein the majority of its length lies outside the first cylindrical element.

The diameter of the second cylindrical element is smaller than the diameter of the first cylindrical element by an amount sufficient to provide an annular space therebetween when the second cylindrical element is in its retracted position. This annular space is filled with granular or particulate load-bearing material capable of flowing beneath and supporting the closed end of the second cylindrical element at any desired vertical position within the first cylindrical element.

The bearing surface affixed to the second cylindrical element may be provided with spring detent means which, in cooperating with the toggle assembly, will assure that the vertical support will be tightly positioned with proper vertical length adjustment. The toggle assembly is further designed to permit release and retrieval of the vertical support from a position remote from the support, even when the support has yielded somewhat but still is supporting a very great weight.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the adjustable vertical support of the present invention, with parts in cross section.

FIG. 2 is a fragmentary cross sectional elevational view illustrating the action of the granular or particulate matter.

FIG. 3 is a fragmentary elevational view, partly in cross section, illustrating the toggle assembly in released position.

FIG. 4 is a fragmentary elevational view illustrating the toggle assembly in locked position.

FIG. 5 is a fragmentary elevational view, similar to FIG. 4, but illustrating the position of the toggle assembly as it passes from locked to unlocked position.

FIG. 6 is a perspective view illustrating an alternate form of anvil member with a bearing surface thereon, affixable to the toggle assembly.

FIG. 7 is a fragmentary elevational view of another embodiment of the present invention wherein the toggle assembly is mounted on the bottom end of the support.

FIG. 8 is a fragmentary elevational view, partly in cross section, illustrating the use of particulate or granular material having a rounded or spherical shape.

FIG. 9 is a fragmentary elevational view, partly in cross section, illustrating the use of particulate or granular material having flat surfaces or a cubical configuration.

FIG. 10 is a fragmentary elevational view, partly in cross section, illustrating the use of particulate or granular material having a cylindrical configuration.

FIG. 11 is a fragmentary elevational view, partly in cross section, illustrating the use of mixed granular or particular material of various configuration.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 and 2, a first elongated cylindrical elements is shown at 1, affixed to a base member 2 at its bottom end. The member 2 serves not only to close the bottom end of the cylindrical element 1, but also as a base means for the entire vertical support assembly. The precise configuration of the base member 2 is not limiting. For example, it could comprise a round closure for the bottom of cylindrical element 1, having a convex curvature toward the bottom.

The upper end of the cylindrical element 1 is provided with a bearing means 3 having a perforation 4 therethrough, A second cylindrical element 5 is slidably mounted in the bearing 3 so as to have a telescoping relationship with the cylindrical element 1. The lowermost end of the cylindrical element 5 is closed by a closure element 6.

The cylindrical element 5 is slidable in the bearing 3 between an extended position and a retracted position, with respect to the cylindrical element 1. For purposes of an exemplary illustration, the cylindrical element 5 in FIGS. 1 and 2 is shown in a partially extended position. It will be evident from the Figures that the limit of its retracted position will be determined by contact of the bottom end of the cylindrical element 5 with base member 2.

For reasons which will be evident upon the further reading of this specification, it is desirable that means be provided to limit the extended position of the cylindrical element **5**, so that it cannot be inadvertently removed from the bearing means **3**. As a consequence, any suitable means may be provided to render the bottom end of the cylindrical element **5** captive within the cylindrical element **1**. For example, the bottom end of the cylindrical element **5** could be provided with lugs or an annular rim (not shown), so dimensioned as to prevent the passage of the bottom end of the cylindrical element **5** through the perforation **4**. However, again for reasons which will be evident hereinafter, it is desirable that the exterior surface of that portion of the cylindrical element **5** which is capable of extending into the cylindrical element **1** be as smooth and uninterrupted as possible. FIGS. **1** and **2** illustrate a means for rendering the cylindrical element **5** captive within the cylindrical element **1** without interfering with the exterior surface of the cylindrical element **5**.

As shown, an elongated rod **7** extends into a perforation **8** in the base member **2** and is affixed in that perforation, as by welding or the like. The bottom closure member **6** of the cylindrical element **5** has a perforation **9** therein, through which the rod **7** passes with a sliding fit. At its upper end, the rod **7** is headed as at **10**, with the head being so dimensioned as to prevent passage thereof through the perforation **9** in the closure member **6**. As a consequence, the extended position of the cylindrical element **5** will be limited by the head **10**. The length of the rod **7** will be determined by such factors as the ultimate desired length to be attained by the vertical support, the diameters of the cylindrical elements **1** and **5**, and the like. The determination of these dimensions will depend upon the size of the vertical support desired, and are well within the skill of the worker in the art.

It would also be within the scope of the invention to use a chain or cable, one end of which is affixed to the exterior surface of the cylindrical element **1**, while the other end is affixed to the exterior surface of the cylindrical element **5**. The chain or cable would be so sized as to become taut when cylindrical element **5** reached its maximum extended position. While this would be more bulky and less convenient than the rod **7** of FIGS. **1** and **2**, it would permit the exterior surface of the cylindrical element **5** to be smooth and uninterrupted. Load-bearing material, generally indicated at **12**. The amount of particulate or granular material **12** preferably should not exceed that amount which can be held by the annular chamber **11** when the cylindrical element **5** is in its fully retracted position.

As the cylindrical element **5** is raised from its fully retracted position, the granular or articulate material **12** will fall beneath the bottom end of the cylindrical element **5** to form a support therefor. This is indicated by the arrows in FIG. **2**.

Thus, the cylindrical element **5** may be raised to any desired extended position and it will be held in such extended position by the coaction of the bottom closure member **6** and the particulate or granular load-bearing material **12**. To return the cylindrical element **5** to its retracted position, it is only necessary to invert the vertical support assembly. When the vertical support is inverted, the particulate or granular material **12** will fall back into the annular chamber **11** as the cylindrical element **5** is returned to its retracted position.

From the description above, it will be evident that the clearance of the cylindrical element **5** in the perforation **4** of the bearing **3**, the clearance of the rod **7** in the perforation **9** of the closure member **6**, and the size of the granular or particulate matter must be so dimensioned as to prevent passage of the granular or particulate matter through the perforations **4** or **9**. This is also one of the reasons why the cylindrical element **5** preferably should be captively held within the cylindrical element **1**.

When care is taken to ensure a smooth and unobstructed exterior surface on the cylindrical element **5**, the granular or particulate matter **12** will flow rapidly during the adjustment of the cylindrical element **5** between its retracted and extended positions. This will ensure that the vertical support may be positioned and removed rapidly and efficiently.

Any suitable granular or particulate matter may be used, depending upon the performance characteristics desired for the adjustment support. The performance characteristics of the adjustable support will depend upon the nature of the particulate or granular material, its shape, its hardness (if metallic in nature), or its resistance to fracture (if nonmetallic in nature). For example, it has been found that material having a rounded or spherical shape (as at **12***a* in FIG. **8**) will flow rapidly, but will not sustain high pressures as well as some other shapes because it has a tendency to flow upwardly back into the annular chamber **11** under high pressure. In addition, rounded or spherical material is characterized by the fact that loads will not be distributed over the entire surface of each particle, but rather will be located at points where adjacent particles touch. Thus, under heavy load conditions, the pressures at these points of contact could conceivably be infinite.

Material having flat surfaces or a cubical configuration (as at **12***b* in FIG. **9**) will not tend to bleed upwardly. However, by the same token they will not flow as well. Material having a cylindrical configuration (as at **12***c* in FIG. **10**) displays characteristics between the above mentioned extremes. Even material such as sand may be used, but will display deterioration, under certain circumstances, as caused by fracturing or the like. Should the material as sand fracture into minute particles, such particles could find their way between bearing **3** and cylindrical element **5**, or opening **9** and retaining rod **7**, and cause the support to become jammed.

It is possible to mix granular or particulate material of various configurations to obtain a desired flow rate as at **12***d* in FIG. **11**. Care must also be taken to choose a material having a sufficient hardness to perform well under the circumstances of use. A material may also be chosen so as to have a yield point, whereby to prevent bending of the vertical support under excessive pressures. By yield point is meant a point where the material will flow upwardly into the annular chamber **11** under excessive pressure. In this context yield point does not refer to the compressive strength of the material. Thus should pressures be encountered of such magnitude as to cause the vertical support to bend or deform, such a bending or deformation may be prevented by providing a granular or particulate load bearing material which, under such pressures, would flow upwardly from beneath the closed end of the cylindrical element **5**.

The choice of granular or particulate material with respect to shape, hardness or resistance to fracture will depend upon the use for which the support is intended. As a non-limiting example, if the support is to be used as a mine prop, it may have to have a load bearing capacity in the neighborhood of 100 tons. If the bottom **6** of cylindrical element **5** has an available surface of say 1½square inches, the granular or particulate material must have a compressive strength in excess of 130,000 p.s.i.

The various particle or granule shapes mentioned above are but a few of the geometric shapes that are possible to give a wide variety of actions of the particulate or granular material. An even greater variety of actions can be achieved by blending material of various shapes. Again, the choice will depend largely on the performance characteristics sought to be displayed by the support.

As an example, when the vertical support is to be used as a mine prop, particulate material comprising short pieces of steel tubing, cylindrical steel castings, or cut carbon wire, having a hardness of about 25 Rockwell, have been found to perform well. Such material has the added advantage of less inherent weight.

The upper end of the cylindrical element **5** is provided with an anvil member having a bearing surface to contact the upper surface to be supported by the assembly. The anvil is affixed to the cylindrical element **5** by a toggle assembly. Referring to FIGS. **1** and **3**, the anvil is generally indicated at **13**. The anvil **13** has a planar portion **13***a* and two downwardly depending

legs 13*b* and 13*c* (see FIG. 1). The legs 13*b* and 13*c* are provided with coaxial perforations. A spring detent means 14 may be affixed to the planar portion 13*a* by any suitable means such as the rivet 15. The purpose of the spring detent means will be set forth hereinafter.

FIG. 6 illustrates an alternate form of anvil, generally indicated at 16. The anvil 16 is substantially the same as the anvil 13, having a planar portion 17 and a pair of downwardly depending legs (one of which is shown at 18) having coaxial perforations therein (one of which is shown at 19). The anvil 16 differs from the anvil 13 in that portions 20 and 21 of the planar surface 17 are bent upwardly to form integral, spaced detent means equivalent to the spring detent 14.

The toggle assembly of the present invention comprises upper and lower level elements 22 and 23, respectively. The upper level element 22 is provided with two perforations 24 and 25. The anvil 13 is pivotally affixed to the upper level element by means of the pivot pin 26 passing through the perforation 24 in the upper level element and the coaxial perforations in the anvil legs 13*b* and 13*c*.

The upper end of the cylindrical element 5 is bifurcated as at 27. The bifurcations are provided with coaxial perforations, one of which is shown at 28 in FIG. 1. The upper level element 22 is located between the bifurcations and is pivotally affixed thereto by pivot pin 29 passing through the perforation 25 in the upper level element and the coaxial perforations in the bifurcations.

The lowermost end of the upper level element 22 is reduced in width as at 22*a* (see FIG. 1) and has rearwardly extending plates 30 and 31 affixed to either side thereof by welding or the like. It will be noted that the sloping bottom surface 33 of the upper level element 22 extends between the plates 30 and 31. It will be understood by one skilled in the art that the plates 30 and 31 could constitute integral parts of the upper lever elements if desired.

The lower lever element 23 has a perforation in its upper end. The plates 30 and 31 on the upper level element are provided with coaxial perforations as well. In this way, the lower lever element may be pivotally affixed between the plates 30 and 31 by pivot pin 34. It will be noted that the upper surface 35 of the lower element 23 is slanted and is adapted to abut the lower surface 33 of the upper level element 22, as shown in FIG. 3. When the surfaces 33 and 35 are in abutting relationship, the upper and lower lever elements 22 and 23 will act as a single lever when moved in the direction of arrow A. A spring means 36 is mounted on the pivot pin 34 and has an arm 36*a* contacting the upper lever element 22 and an arm 36*b* contacting the lower lever element 23 in such a way that the spring 36 tends to maintain the lever elements 22 and 23 in the position shown in FIG. 3.

The lower lever element 23 is notched as at 37. The upper arm of the notch 37 is provided with a perforation 38. A latch element 39 is slidably mounted in the perforation 38 and is urged to its extended position by spring means 40.

The latch element 39 may be mechanically affixed to the spring means 40, which in turn is mechanically attached at the root of the perforation 38. The spring means 40 may be replaced by an elastomeric substance which may extrude into perforation 38 through a small transverse orifice. In such an instance, the latch element 39 would be captively held in the perforation 38, or attached to the elastomeric substance. The latch element 39 is adapted to cooperate with a latch lug 41 affixed to the cylindrical element 5 by welding or the like.

Finally, the upper end of the lower lever element 23 has a curved camming surface 42. The lower end of lever element 23 may be provided with a perforation 43 to which a cable, chain or rope may be affixed.

The operation of the adjustable support of the present invention may be described as follows. The base of the support may be located in a desired position. The cylindrical element 5 may then be pulled upwardly to an extended position wherein the anvil, and particularly the spring detent 14 contacts the upper surface to be supported. The cylindrical element 5 will remain in its extended position by virtue of the coaction of its closure member 6 and the granular or particular material material located in the cylindrical element 1.

When the adjustable support has been so located, the upper and lower lever elements 22 and 23 of the toggle assembly, acting as a single lever by virtue of the abutment of surfaces 33 and 35, may be moved in the direction of arrow A in FIG. 3. Movement in the direction of arrow A will continue until latch element 39 engages latch lug 41. At this point, the vertical support of the present invention will be locked in place and the toggle elements will assume the positions shown in FIG. 4.

In FIG. 4, like elements have been given like index numerals. It will be noted that when the toggle assembly is in its latched position, the center of the pivot pin 26 will lie slightly to the right of the center of the pivot pin 29 (as seen in FIG. 4). It will be remembered from FIG. 3 that the center of the pivot pin 26 is located to the left of the center of pivot pin 29 (as viewed in that Figure) when the toggle assembly is in unlatched position. Thus, the pivot pins 26 and 29 produce an overcenter locking action assuring that the vertical support will be maintained firmly in place.

When the toggle assembly is in locked position, as shown in FIG. 4, the pivot pin 26 will be higher than it was when the toggle assembly was in its unlocked position. This extension of the assembly will compensate for any settling or compaction of the particulate matter during the locking action. It will be understood, however, that the pivot pin 26 will be at its highest point (by a few thousandths of an inch) as it passes through the center line of pivot pin 29 to its overcenter position. This last few thousandths of an inch will be compensated for by the spring detent means 14.

When it is desired to release and remove the adjustable vertical support of the present invention, it is only necessary to move the lower lever element 23 in the direction of arrows B in FIGS. 4 and 5. When so moved, the lower lever element 23 will pivot about the pivot pin 34 against the action of the spring 36. This will cause the latch element 39 to be cammed inwardly by the latch lug 41 and finally released therefrom.

Once the latch element 39 has been released from the latch lug 41, the lower lever element 23 will continue to pivot about the pivot pin 34 and the lower lever element cam surface 42 will coact with the side of the cylindrical element 5 to cause the upper lever element 22 to pivot about pivot pin 29. This camming action will be sufficient to cause the pivot pin 26 to move through dead center to its released position and the parts will again assume the position illustrated in FIG. 3.

It will be readily apparent from the above description that this release of the toggle assembly could be accomplished from a position remote from the vertical support by means of a cable, chain or rope tied through the perforation 43 in the lower lever element 23. Once released and retrieved, the cylindrical element 5 of the vertical support can be returned to its retracted position simply by inverting the vertical support, as described above.

To aid in the manipulation of the vertical support of the present invention, handles may be provided on cylindrical elements 1 and 5, as at 44 and 45 respectively. It is also within the scope of the invention to affix a block of resilient material 46 to the upper end of the upper lever element 22 so as to maintain the anvil 13 in its proper orientation while the vertical support is being initially located.

It will be understood by one skilled in the art that if the vertical support were provided with the anvil of FIG. 6, its action and the action of the detents 20 and 21 would be equivalent to the action of the anvil 13 and its spring detent 14.

Modifications may be made in the invention without departing from the spirit of it. For example, the toggle assembly above described, may be provided at the bottom end of the cylindrical element 1. This is illustrated in FIG. 7. In other respects, FIG. 7 is similar to FIG. 4 and like parts have been given like index numerals followed by "'".

In the structure of FIG. 7 the bottom end of the cylindrical element 1' may be bifurcated as at 1*b* and provided with a

pivot pin 29' by which lever 22' is affixed to cylindrical element 1'. In all other respects, the toggle assembly of FIG. 7 is the same as that shown in FIG. 4, and its operation will be as described above.

When the toggle assembly is located at the bottom of the support (as shown in FIG. 7) the uppermost end of the cylindrical element 5' may be closed as at 5*b* and the spring detent 14' (similar to the spring detent 14 of FIG. 4) may be located thereon, rather than on the anvil 13'.

I claim:

1. An adjustable vertical support comprising a first elongated hollow element closed at one end and having a bearing means at the other end, a second elongated element of lesser cross sectional dimension than said first elongated element and movably mounted in said bearing means between a retracted position wherein a portion of its length is located within said first elongated element and an extended position wherein a lesser portion of its length lies within said first elongated element, that end of said second elongated element located within said first elongated element being closed, an annular space being formed within said first elongated element between said first and second elongated elements when said second elongated element is in said retracted position, granular or particular load-bearing material being located within said annular space, said load-bearing material being flowable into the space formed beneath said closed end of said second elongated element as said second elongated element is moved toward said extended position whereby to support said second elongated element at any desired position between said retracted and extended positions thereof, said second elongated element being movable toward said retracted position and said load-bearing material being flowable into said annular space when said support is inverted, the free end of said second elongated element having a bearing surface thereon adapted to engage the material to be supported by said support, means for shifting said surface between a released position and a locked position wherein said surface is engaged with said material to be supported, said last mentioned means being so configured as to make a final increment of length adjustment of said support as said surface is moved from said unlocked to said locked position.

2. An adjustable vertical support comprising a first elongated hollow element closed at one end and having a bearing means at the other end, a second elongated element of lesser cross sectional dimension than said first elongated element and movably mounted in said bearing means between a retracted position wherein a portion of its length is located within said first elongated element and an extended position wherein a lesser portion of its length lies within said first elongated element, means for supporting said second elongated element at any desired position between said retracted and extended positions, the free end of said second elongated element having a bearing surface thereon adapted to engage the material to be supported by said support, means for shifting said surface between a released position and a locked position wherein said surface is engaged with said material to be supported, said last mentioned means being so configured as to make a final increment of length adjustment of said support as said surface is moved from said unlocked to said locked position, said free end of said second elongated element having an anvil pivotally affixed thereto by a toggle assembly, said anvil having said bearing surface thereon, said toggle assembly comprising said means for shifting said bearing surface between said released and locked positions.

3. An adjustable vertical support comprising a first elongated hollow element closed at one end and having a bearing means at the other end, a second elongated element of lesser cross sectional dimension than said first elongated element and slidably mounted in said bearing means, said second elongated element being slidable with respect to said first elongated element between a retracted position wherein a portion of its length is located within said first elongated element and an extended position wherein a lesser portion of its length lies within said first elongated element, the end of the second elongated element located within said first elongated element being closed, an annular space being formed within said first elongated element between said first and second elongated elements when said second elongated element is in said retracted position, granular or particulate load-bearing material being located within said annular space, said load-bearing material being flowable into the space formed beneath said closed end of said second elongated element as said second elongated element is moved toward said extended position whereby to support said second elongated element at any desired position between said retracted and extended positions thereof, said second elongated element being movable toward said retracted position and said load-bearing material being flowable into said annular space when said support is inverted, the other end of said second elongated element having an anvil affixed thereto by a toggle assembly, said anvil having a bearing surface adapted to engage the material to be supported by said support, said anvil being movable by said toggle assembly between a released position and an overcenter supporting position, said toggle assembly being so configured as to make a final increment of length adjustment of said support as said anvil moves from said released position to said overcenter support position.

4. The structure claimed in claim 3 wherein said first and second elongated elements have a circular cross section.

5. The structure claimed in claim 3 including means for captively maintaining said closed end of said second elongated element within said first elongated element.

6. The structure claimed in claim 3 wherein that portion of said second elongated element located within said first elongated element when said second elongated element is in said retracted position has a smooth uninterrupted exterior surface whereby to insure flow of said load-bearing material into the space formed beneath said closed end when said second elongated element is moved toward said extended position.

7. The structure claimed in claim 3 wherein said toggle assembly comprises a first lever element, said first lever element having an upper end and a lower end, said first lever element being pivotally attached at a point between said upper and lower ends thereof to said free end of said second elongated element, said anvil being pivotally attached to said upper end of said first lever element, said pivotal attachment of said first lever element to said second elongated element and said pivotal attachment of said anvil to said first lever element being such that as said first lever is pivoted so that said lower end thereof is moved toward said second elongated element said anvil will shift from said released position to said overcenter locked position and as said first lever element is pivoted so that said lower end thereof moves away from said second elongated element said anvil will shift from said locked to said released position.

8. The structure claimed in claim 3 wherein said load-bearing material comprises a mixture of at least two particulate or granular substances having different exterior configurations to obtain proper flow characteristics.

9. The structure claimed in claim 3 wherein said load bearing material comprises particulate matter, said particles having a cylindrical configuration.

10. The structure claimed in claim 3 including spring detent means on said bearing surface of said anvil, said spring detent means engaging said material to be supported and compensating for the overcenter vertical movement of said anvil and settling of said load-bearing material.

11. The structure claimed in claim 5 wherein said means for captively maintaining said closed end of said second elongated element within said first elongated element comprises a rod extending axially within said first elongated element and affixed at one end to the closed end of said first elongated element, said rod slidably extending through a perforation in said closed end of said second elongated element, the free end of said rod within said second elongated element having a diameter greater than said last mentioned perforation whereby to

captively maintain the closed end of said second elongated member within said first elongated member and to determine the maximum extended position of said second elongated member.

12. The structure claimed in claim 7 including a second lever element having upper and lower ends, the upper end of said second lever element being pivotally affixed to said lower end of said first lever element, said lever elements having cooperating surfaces which abut when said second lever element is pivoted toward said second elongated element so that said first and second lever elements act as a single long lever element when shifting said anvil from said released to said locked position, said second lever element having a cam surface thereon which abuts said second elongated element when said second lever element is pivoted so that its lower end moves away from said second elongated element whereby to assist in pivoting said first lever element in such a way that said anvil is shifted from said locked position to said released position.

13. The structure claimed in claim 10 wherein said spring detent means comprises an integral part of said anvil.

14. The structure claimed in claim 12 including a spring detent on said second lever element and a latching lug on said second elongated element, said spring detent and latching lug being engaged when said anvil is in said locked position.

15. The structure claimed in claim 12 including means on said lower end of said second lever for attachment thereto of an elongated member whereby said vertical support may be remotely retrieved by pulling on said elongated member.

16. The structure claimed in claim 12 including spring means mounted at said pivotal connection between said first and second levers, said spring means having a first leg contacting said first lever and a second leg contacting said second lever, said spring being so configured as to urge said first and second levers to said position wherein said cooperating surfaces abut until overcome by the resistance of shifting said anvil from said locked position to said released position.

17. An adjustable vertical support for maintaining two surfaces in spaced relationship, said support comprising a first elongated hollow element closed at one end and having a bearing means at the other end, said closed end comprising one end of said support, a second elongated element of lesser cross-sectional dimension than said first elongated element and movably mounted in said bearing means between a retracted position wherein a portion of its length is located within said first elongated element and an extended position wherein a lesser portion of its length lies within said first elongated element, means for supporting said second elongated element at any desired position between said retracted and extended positions, the end of said second elongated element extending beyond said first elongated element comprising the other end of said support, said ends of said support having bearing surfaces adapted to contact said surfaces to be maintained in spaced relationship, an anvil being pivotally affixed to said closed end of said first elongated element by a toggle assembly, said bearing surface at said closed end of said first elongated element being located on said anvil, said anvil bearing surface being shiftable by said toggle assembly between a released and a locked position wherein said anvil bearing surface is engaged with the adjacent one of said surfaces to be maintained in spaced relationship, said toggle assembly being so configured as to make an increment of length adjustment of said support as said anvil bearing surface is moved from said unlocked to said locked position.

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