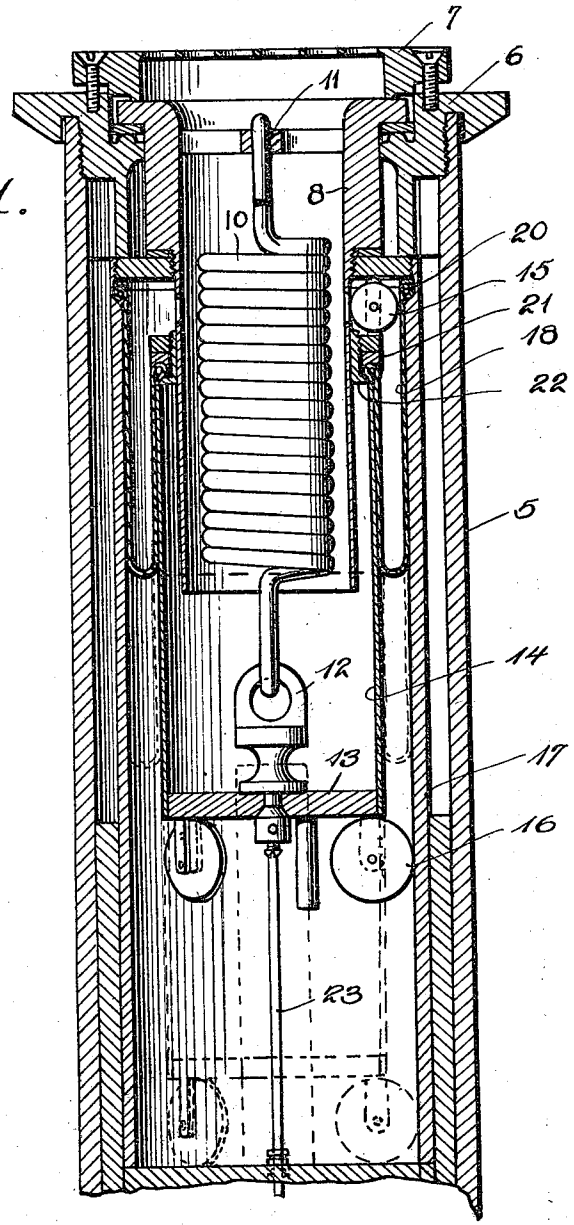
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FLEXIBLE SLEEVE

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Fig. 1.



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Fig. 3.

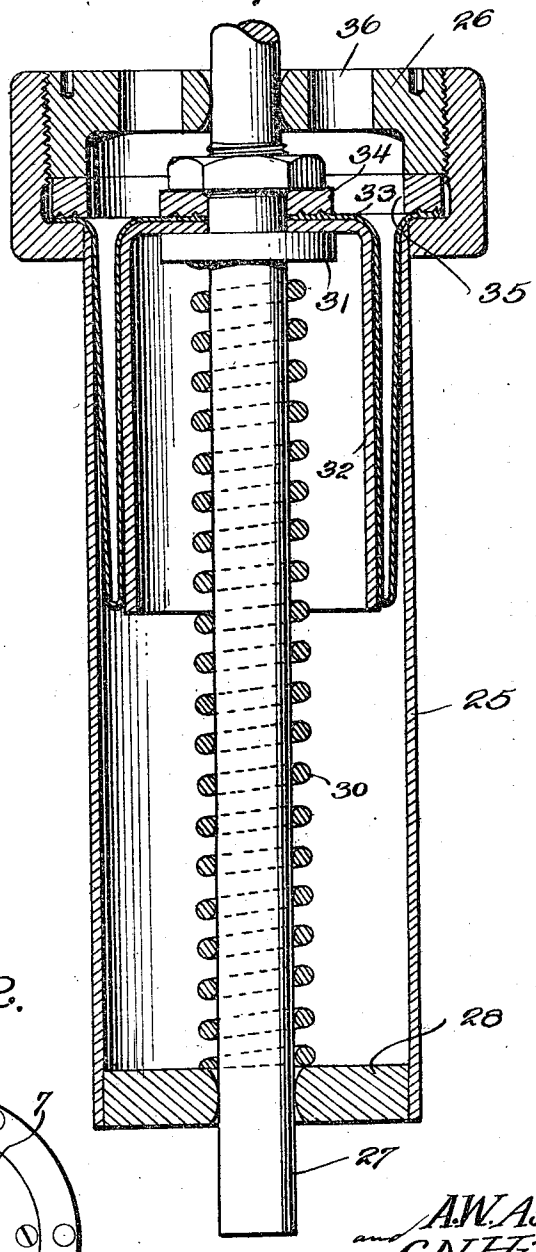
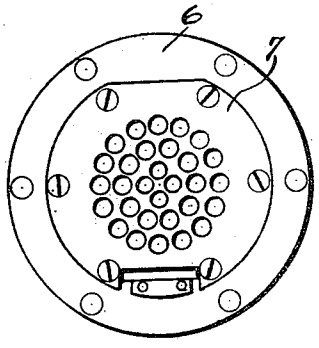


Fig. 2.



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UNITED STATES PATENT OFFICE.

ALLAN W. ASHBROOK AND CLARENCE N. HICKMAN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNORS TO THE GOVERNMENT OF THE UNITED STATES, REPRESENTED BY THE SECRETARY OF THE NAVY.

FLEXIBLE SLEEVE.

Application filed September 29, 1923. Serial No. 665,665.

To all whom it may concern:

Be it known that we, ALLAN W. ASHBROOK and CLARENCE N. HICKMAN, citizens of the United States, and residents of Washington, District of Columbia, have invented certain new and useful Improvements in Flexible Sleeves, of which the following is a specification.

This invention relates to improvements in flexible sleeves and more particularly to flexible sleeves adapted to be used in connection with various devices and instruments operated by fluid pressure. The invention will hereinafter be described with relation to its general application to any of these devices having been specifically described in combination with a mine in our co-pending application. (Serial No. 665,666, filed August 13, 1923.)

One of the objects of the present invention is to provide a device of the above general character which will be substantially frictionless in operation, water-tight or gas-tight in construction and having a large relative movement which may be converted into movements of other character whereby a direct reading of an instrument such as a pressure gage, depth recorder or a barometer, for instance, may be obtained.

A further object is to provide a movable diaphragm operated by any fluid pressure and so constructed as to eliminate as much as possible any lag in the movement of the parts.

Still another object is to provide a fluid tight frictionless joint about a piston whose motion produced by any suitable source of power may be used to measure or decrease the displacement of the case to which the apparatus is connected and thus increase or decrease the buoyancy of the assembly.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the accompanying sheet of drawings wherein is illustrated various possible embodiments of the present invention.

Figure 1 is a longitudinal sectional view showing one form of the device as constructed for use as a depth recorder.

Figure 2 is an end view thereof.

Figure 3 is a view similar to Figure 1 showing the simplified and modified form of apparatus.

Referring now to the drawing in detail and more particularly to Figure 1, 5 denotes a cylindrical casing adapted to be placed in any sort of receptacle such as a mine case, for example, or a case containing depth recording instruments. This member 5 is provided with a flange member at the top 6 to which is secured a perforated protecting cover 7 also holding in place an inner sleeve 8, surrounding a spiral spring 10, one end of which is attached to a spider 11 while the opposite end passes through a ring 12 secured to the bottom 13 of an inner movable tube 14. This tube 14 is provided with guide rollers 15 and 16 at its top and bottom which roll on the inner tube 8 and the inner tube 17 respectively. The flexible tubular sleeve 18 is secured in any desired air-tight manner as at 20 to the guide tube 17 and at 21 to the movable cylinder 14. Packing joints 22 are provided so as to make the device as substantially air-tight and water-tight as possible. To the bottom 13 of the movable tube 14 is secured a rod 23 which is adapted to be connected to any desired recording instrument or movable member as desired and in accordance with the uses to which the device is put.

It will thus be seen from the above that when this instrument is applied to a casing and subjected to fluid pressure the fluid enters through the part or cover 7 and into the chamber formed by the inner tubular member 14 and as the fluid pressure increases the spring 10 will be extended and the tube 14 moves downwardly actuating the rod 23 and such instrumentalities to which it may be connected.

Obviously the change of buoyancy is independent of the means employed to produce the motion. Fluid pressure as suggested above will only tend to decrease the displacement and the corresponding buoyancy. Other sources of power may be used which will force the piston out against the fluid pressure and thus increase the displacement and corresponding buoyancy.

In Figure 3 there is shown another form using a compressing spring in which an outer casing 25 is provided with a securing means and perforated cover 26 and a single elongated rod 27 passes through this cover and an opening in the bottom 28. A spring 30 surrounds the rod and acts against the bot-

tom 28 at one end and a collar 31 at the top abutting an inner cylindrical tube 32 and about which a flexible sleeve 33 is positioned having its ends clamped as by means of securing members 34 and 35. In this type of instrument the spring must be so designed that there will always be clearance between the spring and the rod which it surrounds, as otherwise friction will be developed here and produce in the motion of the piston a lag the obviation of which is one of the objects of the invention. Fluid entering through openings 36 act upon this flexible sleeve or diaphragm forcing the same downwardly into the tube 25 compressing the spring 30. Likewise the rod 27 is moved downwardly and its lower end may be connected to a recording mechanism or depth control mechanism or other suitable instrument according to the uses to which the device is put.

As in the other types of instrument described this type may be used to effect a change in the buoyancy by producing a change in the position of the movable piston.

It will thus be seen that the present invention contemplates a simple and practical apparatus well adapted to accomplish among others all of the objects and advantages herein set forth.

What we claim is:—

1. In an apparatus of the character described, in combination, a tubular member adapted to be fixed in relative position, a second tubular member closed at one end and having its opposite end open to fluid pressure whereby the inner member is movable relative to the said outer when subjected to such pressure, a flexible sleeve having its ends connected in a fluid tight manner respectively with the inner and outer tubular members, a member movable with said inner tubular member adapted to be connected with any desired instrumentality and guide rollers interposed between the inner and outer members whereby they move in alignment.

2. In an apparatus of the character described, in combination, a tubular member adapted to be mounted in relatively fixed position in any desired support, a second tubular member concentrically disposed with respect to the first member, guide rollers associated with said parts whereby they are kept in alignment as relative movement occurs and a flexible diaphragm connecting said two concentrically disposed members.

3 In an apparatus of the character described, in combination, a tubular member adapted to be mounted in relatively fixed position in any desired support, a second tubular member concentrically disposed with respect to the first member, guide rollers associated with said parts whereby they are kept in alignment as relative movement occurs, a flexible diaphragm connecting said two concentrically disposed members and spring means associated with the movable member adapted to restore same to normal position when fluid pressure is relieved.

Signed at Washington, District of Columbia, this 9th day of July, 1923.

ALLAN W. ASHBROOK.
CLARENCE N. HICKMAN.