

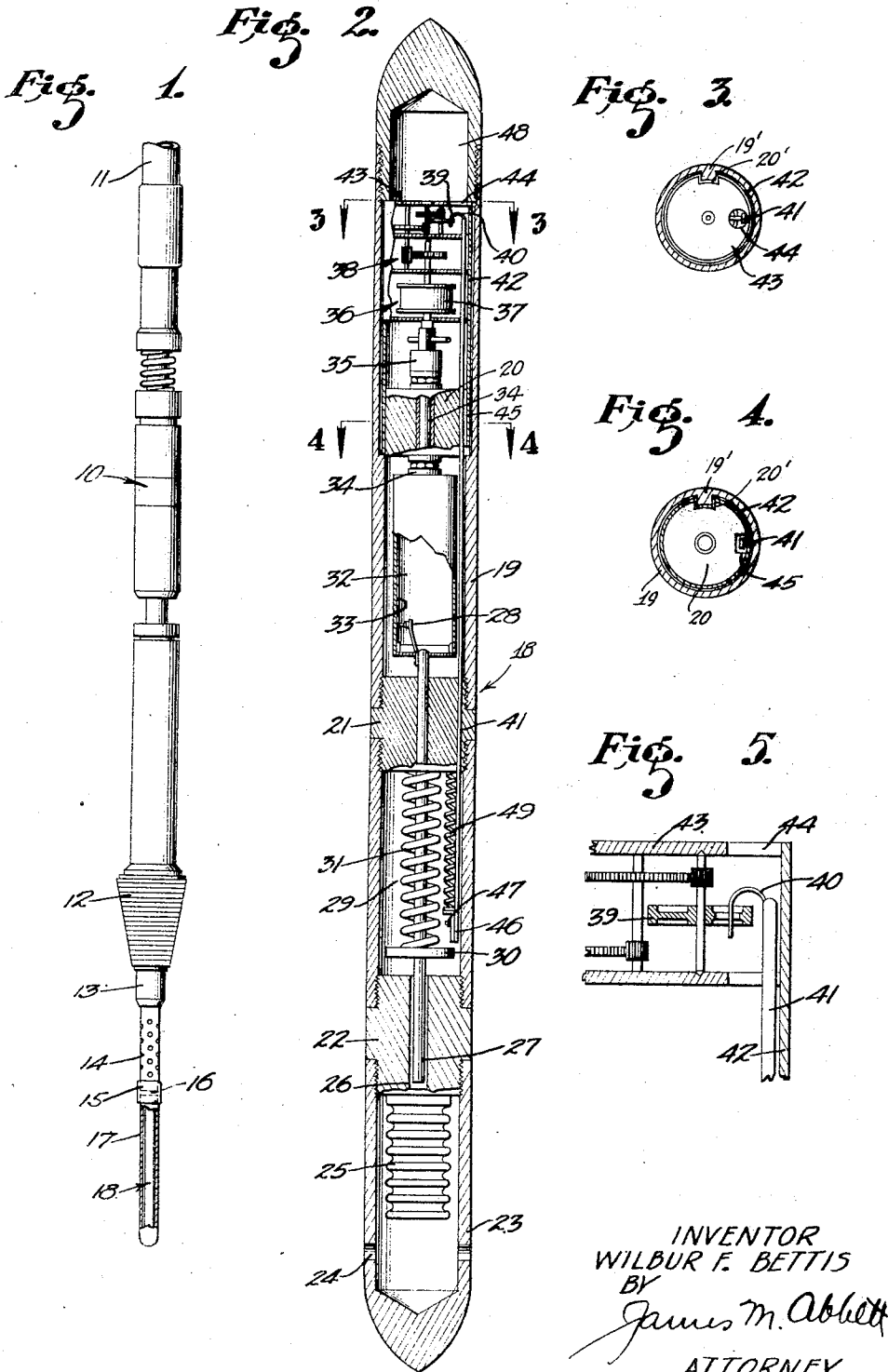
Dec. 2, 1941.

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2,265,098

RELEASE FOR PRESSURE BOMBS

Filed Oct. 28, 1939



UNITED STATES PATENT OFFICE

2,265,098

RELEASE FOR PRESSURE BOMBS

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Application October 28, 1939, Serial No. 301,846

2 Claims. (Cl. 234—20)

This invention relates to oil well drilling and production apparatus, and particularly pertains to a Release for pressure bombs and the like, and is a continuation in part of my co-pending application entitled "Pressure release for clocks and the like," Serial No. 158,399, filed August 10, 1937.

In the development of oil wells it has become a matter of common practice to lower a pressure recording device into a well which is being drilled so that a record may be made of the pressure existing at a desired zone within the well. These pressure recording structures are often associated with well testing devices which are opened at a selected depth in the well to receive a sample of the fluid within the well and coincident with which operation the fluid pressure of the well is measured. In structures of this type the pressure recording chart is moved with relation to a stylus and the driving action of the chart is produced by a timing clock. It has been common practice to place the pressure recording structure within the apparatus to be lowered into the well and at that time to start the clock in motion so that the record of pressure will be made as the device is lowered. Recently, the technique of well drilling has been changed so that instead of drilling wells to an average of from 6000 to 8000 feet they are now drilled to a depth of 15,000. This represents a depth of almost three miles. It is obvious that difficulties are experienced in obtaining a clock having a spring motor which will sustain the operation of the recording structure during the extended period of time required to lower the device into the well, thereafter setting the testing tool in position, and then making the pressure record. It is the principal object of the present invention, therefore, to provide means for causing the pressure recording structure, or "pressure bomb" as it is commercially known, to be held against operation until it has been lowered into the fluid of the well to a selected pressure area, after which the clock mechanism will be released to insure that pressure will be recorded in the zone which it is desired to explore while the clock mechanism is still operating and will continue to operate through the period of exploration.

The present invention contemplates the provision of a fluid responsive means equipped with a timing clock or motor for driving the same, and which motor is automatically released to permit driving action when the structure has been submerged within the fluid of a well or the like to a predetermined depth, and after which a record will be made.

The invention is illustrated by way of example in the accompanying drawing, in which:

Figure 1 is a view indicating the application of the present invention to a well testing apparatus.

Fig. 2 is an enlarged view in central longitudinal section showing a form of the recording device dissociated from the well testing structure.

Fig. 3 is a view in transverse section through the device as seen on the line 3—3 of Fig. 2.

Fig. 4 is a transverse view of the structure as seen on the line 4—4 of Fig. 2.

Fig. 5 is an enlarged fragmentary view showing the clock release mechanism.

In describing the present invention it is to be understood that the principal application of the structure shown in Fig. 2 and known to the industry as a "pressure bomb" is in measuring the pressure occurring in an oil well when the structure has been submerged in the fluid standing in the well to a desired depth. It is to be pointed out that two pressure forces are operating at a given depth in a well, one being that produced by the hydrostatic head of a column of fluid standing in the well, and the other by the pressure exerted by the fluid in the geological formation being penetrated. In the use of a well tester it is part of the operation to shut off a length of the well bore so that a zone will be created beneath and separate from the column of fluid standing in the well. It is desirable to measure the pressure existing in this zone and also the pressure which may be exerted by the column of fluid before and after the shut off. This invention is specifically controlled with means for actuating or releasing the recording mechanism when a predetermined selected pressure zone has been reached.

Referring more particularly to the drawing, 10 indicates an oil well testing device fitted with a valve which will open and close and permit a sample of fluid to be entrapped with a supporting drill string 11. Mounted at the lower end of the testing device is a packer 12, here indicated as a rathole packer, which would seal the bore of the well. A tubular mandrel 13 extends downwardly from the packer and carries a perforated tube 14 through which fluid from the formation may pass. It is usual practice to mount a coupling collar 15 at the lower end of the tube 14, which collar has a blank partition wall 16 therein. Secured in the lower end of the collar is a perforate tubular housing 17 which encloses the pressure bomb structure 18 with which the present invention is particularly concerned.

The pressure bomb structure 18 includes an

outer housing 19 connected together at points in its length as indicated at 21 and 22. The lower end of the housing is formed with a tubular nose 23 having perforations 24 and within which a collapsible siphon or diaphragm structure 25 is disposed. The upper end of the structure is closed by a hollow end closure 48 which is threaded onto the upper end of the housing 19. This structure is mounted at the lower end of the coupling 22 and covers the lower end of a central bore 26 within which a plunger rod 27 reciprocates. The plunger rod 27 extends upwardly through the coupling 21 by which it is guided and carries a stylus 28 at the end thereof. Mounted upon the plunger rod 27 and within a compartment 29 is a collar 30. This collar moves with the plunger rod and acts as a trip for the clock mechanism, as will be hereinafter described. Interposed between the coupling 21 and the collar 30 is a compression spring 31 which tends to hold the plunger 27 and its collar in their lowermost positions. When pressure of the fluid within which the structure is submerged acts through the perforations 24 and against the member 25 the plunger 27 will move upwardly in direct response to the magnitude of the imposed pressure, it being understood that the structure 25 is filled with an incompressible fluid. The stylus 28 which is carried upon the upper end of the plunger 27 and within a chart compartment 32 is here shown as bearing against a cylindrical chart 33 carried upon a mandrel 34. The mandrel 34 extends upwardly through a bearing block 20 and is provided with a detachable coupling 35 which connects it with a spring motor or clock works 36. The clock works is generally indicated as having a motor coil spring 37 and suitable gearing and escapement mechanism 38. An escapement wheel 39 is usually a part of such a mechanism and is formed with spokes so that intermediate spaces will occur between the spokes. A trip mechanism is designed to engage one of these openings and to prevent rotation of the escapement wheel 39 and subsequent operation of the clock until released. This trip mechanism includes a finger 40, here shown as being U-shaped and as being carried upon a trip rod 41. The case 42 of the clock is formed with an end wall 43 having an opening 44 through it so that the trip and escapement mechanisms may be properly interlocked and so that the rod 41 may move upwardly into the hollow end closure 48 of the housing as actuated. The trip rod 41 is guided through a groove in the housing coupling 21 and extends through slotted grooves 45 in the bearing block 20. The bearing block 20 is fixed in the lower end of the case 42 and is fixed with a keyway 20' receiving a key portion of the case, which in turn is keyed to the housing 19 by a keyway 19'; thus, the bearing block 20 and the case are held against rotation within the housing 19. Mounted upon the lower end of the trip rod is an adjusting finger 46 which may be held by a set screw 47 and which when adjusted longitudinally of the rod will determine the point in the travel of the collar 30 at which the rod will be lifted. A suitable spring 49 may be interposed between the finger 46 on the rod and the coupling 21 so that after pressure has been relieved from the plunger 27 and this plunger has been moved toward its original position by its spring 31 the finger 40 will be drawn down into engagement with the escapement wheel 39 to lock the structure again and to prevent further operation of the clock. This is only necessary, however, in

cases where it is desired to conserve the energy of the clock for another recording action.

In operation of the present invention the pressure bomb structure 18 is assembled as shown in the drawing and if used in connection with a well testing operation may be placed in the perforated housing 17 at the lower end of the assembled tester structure shown in Fig. 1. The finger 46 on the trip rod 41 is then adjusted to provide a predetermined amount of clearance between it and the collar 30 on the plunger 27. This clearance represents the amount of movement the plunger may have before the trip rod 41 goes into action. It is to be understood that if desired the collar 30 might be adjusted on the rod 27 to perform a similar action. The clock is then wound and the trip finger 40 is placed between two of the spokes on the escapement wheel 39. The structure is lowered into the well and as the pressure increases as exerted by the fluid within the well a tendency will be made to collapse the member 25 and to force the rod 27 upwardly. This will be in direct proportion to the resistance offered by the spring 31. When the fluid pressure exerted upon the element 25 is sufficient to lift the plunger to a point where it engages the end of the trip rod 41 the trip finger 40 will begin to be lifted from its engagement between the spokes so that the escapement wheel 39 will be released. This will allow the clock or motor mechanism 36 to operate and drive the chart and its carrier. It will be understood that the plunger 27 will be moving upwardly so that the stylus will make a suitable mark on the moving chart which will be a direct indication of the magnitude of the pressure exerted, and when the chart rotates the time interval will be indicated as well as the pressure. After a desired reading has been made the instrument, together with the particular tool with which it is associated such for example as a tester, may be withdrawn from the hole, and as pressure is relieved upon the structure due to the fact that the hydrostatic head will be reduced as the instrument is elevated, the plunger 27 under influence of its spring 31 will move to its lowermost position and its collar 30 will move out of engagement with the finger 46 on the trip rod 41. Thus, the spring 49 will then be free to move the trip rod 41 downwardly and to bring the trip finger 40 into engagement with the escapement wheel 39 so that the clock mechanism 36 will be held against further operation.

It is to be understood that while one particular embodiment of the invention is shown in the application, and that one means of temporarily arresting and releasing driving movement of the clock is indicated, that the invention is not confined to any particular structure of this type but is broadly concerned with a device which will temporarily hold a recording structure inoperative until submerged where a desired pressure is indicated and at which time the recording structure will be rendered operative over a predetermined pressure range.

It will thus be seen that the structure here disclosed is simple in operation and construction, and that it will operate accurately and effectively to permit the action of pressure recording means when it has been submerged within a body of liquid having a predetermined fluid pressure.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in com-

bination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of my invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In an oil well pressure recorder of the type including a housing adapted to be lowered to a desired depth of submergence within the column of fluid with which a well is filled, said housing being formed at its lower end with an opening through which fluid may pass, fluid pressure responsive means within the lower end of the housing and moving progressively under the influence of the pressure of the fluid within which the housing is lowered, a stylus carried by said fluid pressure responsive means and movable thereby in response to the change in fluid pressure, a record chart holder within the housing

to support a chart to be acted upon by the stylus and clock works for driving the chart holder; means temporarily holding the clock works against operation and actuating means associated with the holding means and normally spaced from and disposed in the path of the moving fluid pressure responsive means within the housing to release the holding means only when the housing has reached such a depth of submergence within the fluid of the well that a pre-determined fluid pressure is acting upon the fluid pressure responsive means.

2. The structure of claim 1 wherein adjustable means is provided to vary the normal spacing between the actuating means and the fluid pressure responsive means.

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