Feb. 28, 1939. E. B. FUQUA 2,148,740

PUMP

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FIG. 1

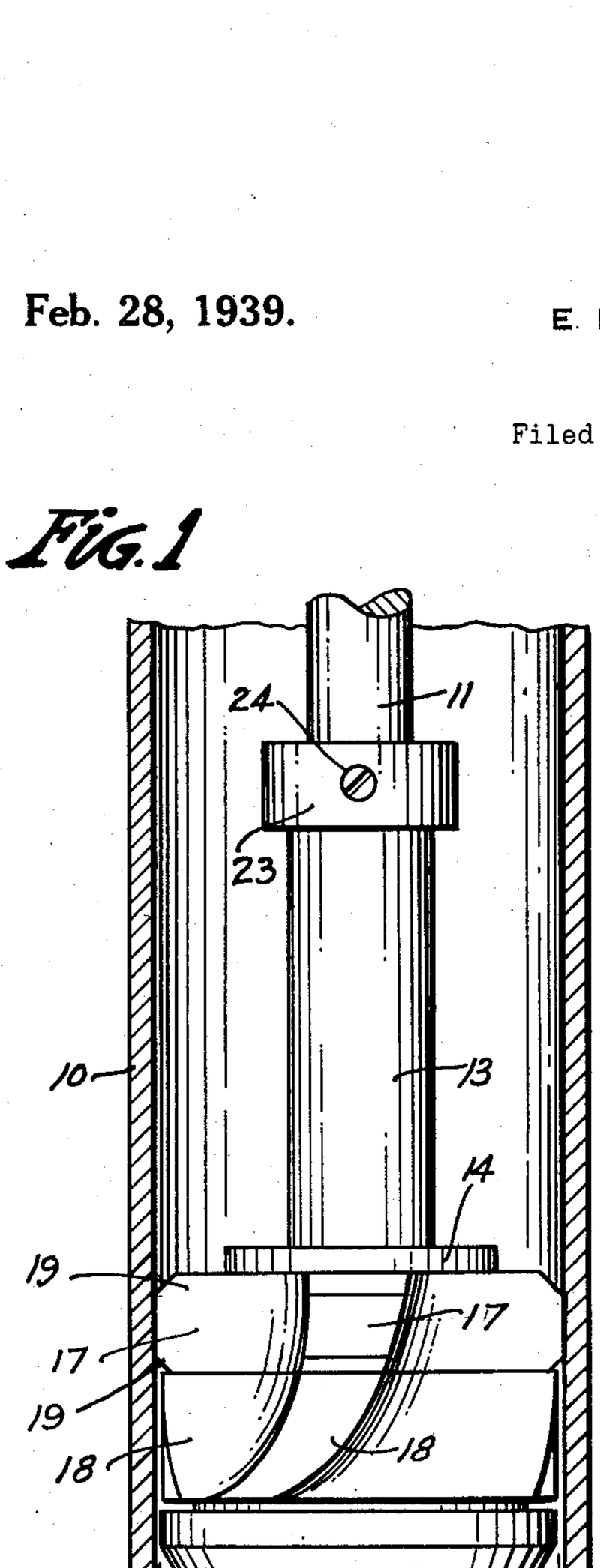

FIG. 3.

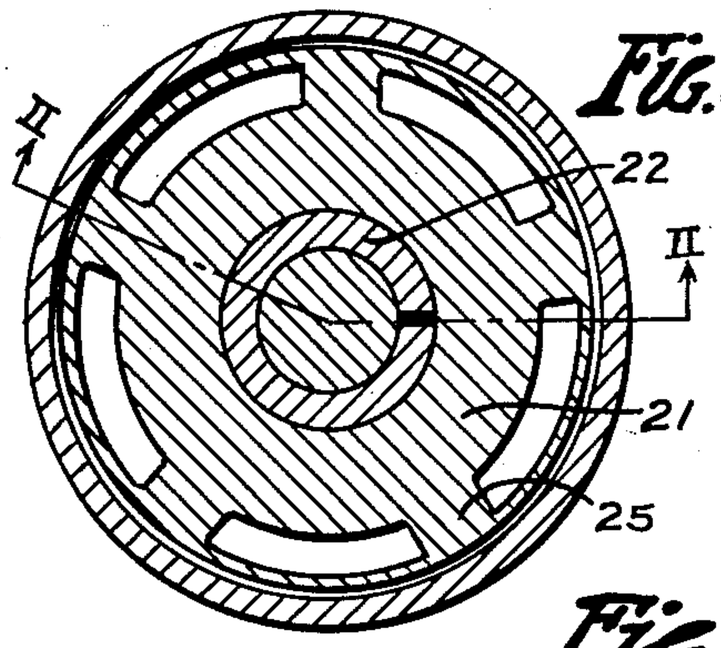

FIG. 2

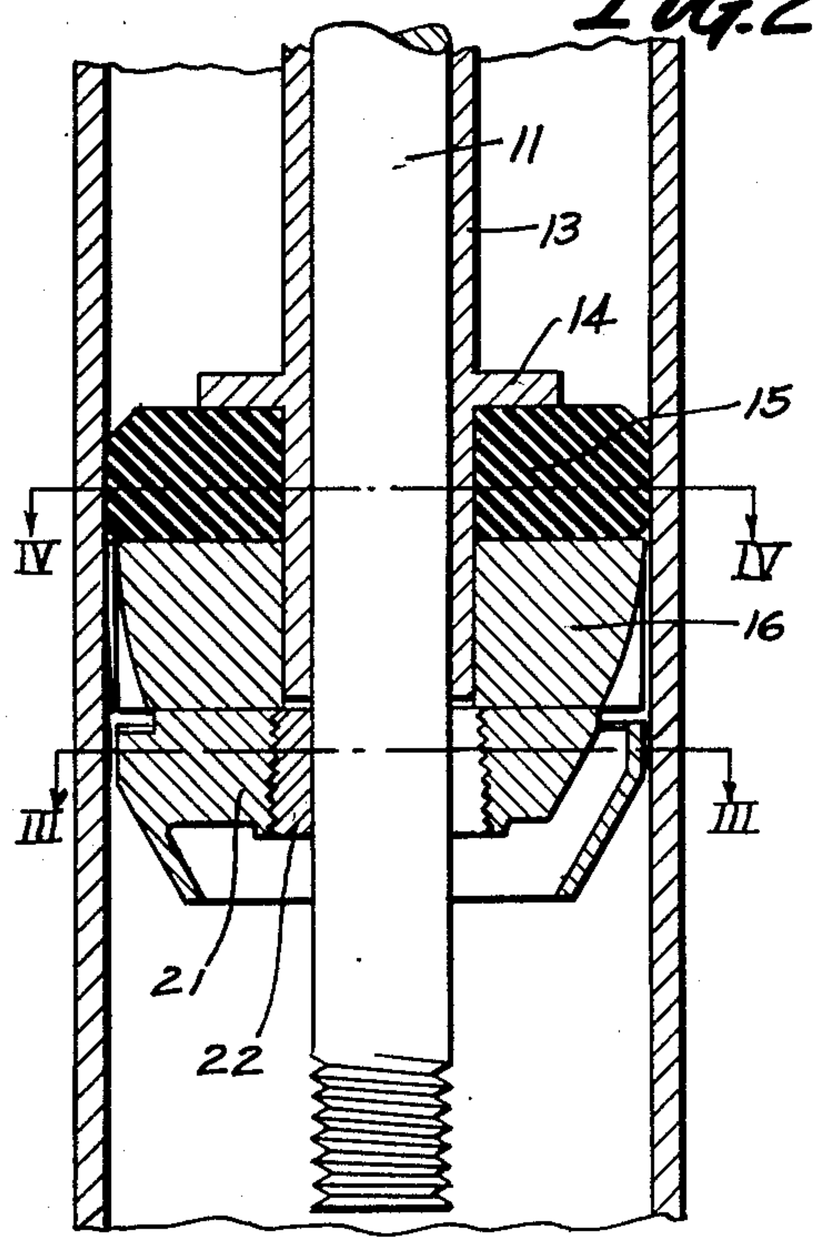

FIG. 4.

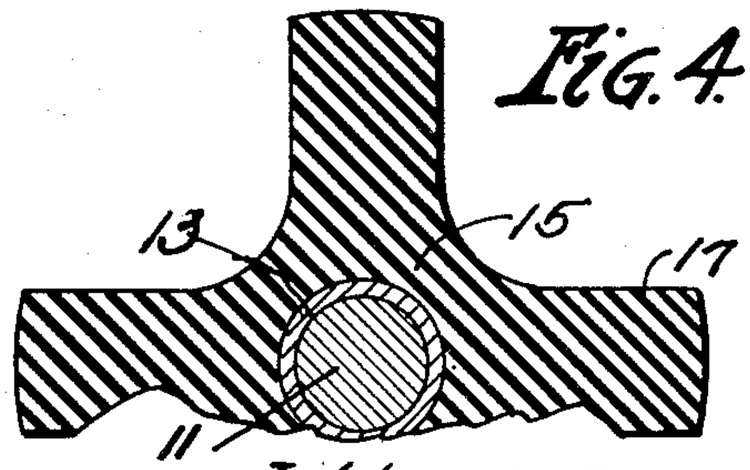

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Fig. 5

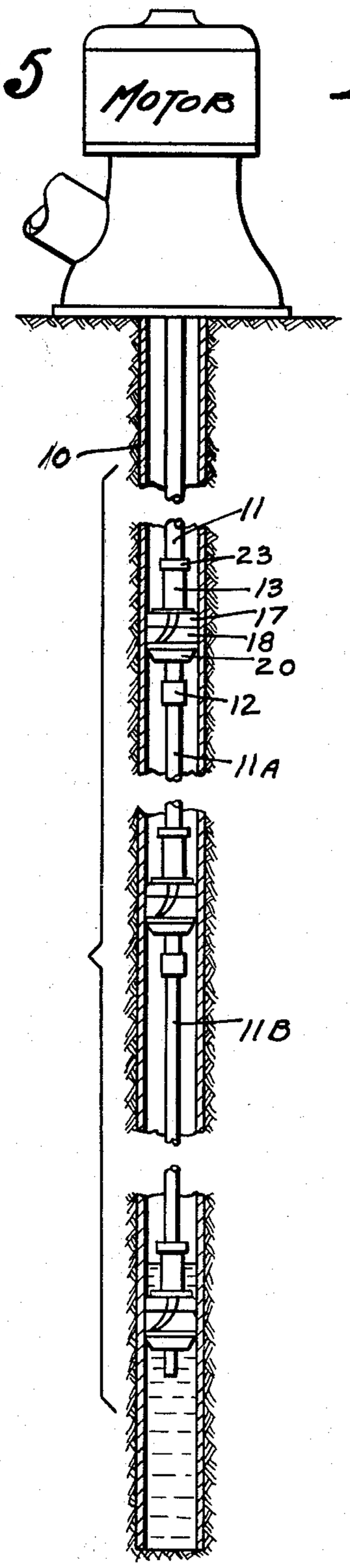


Fig. 7

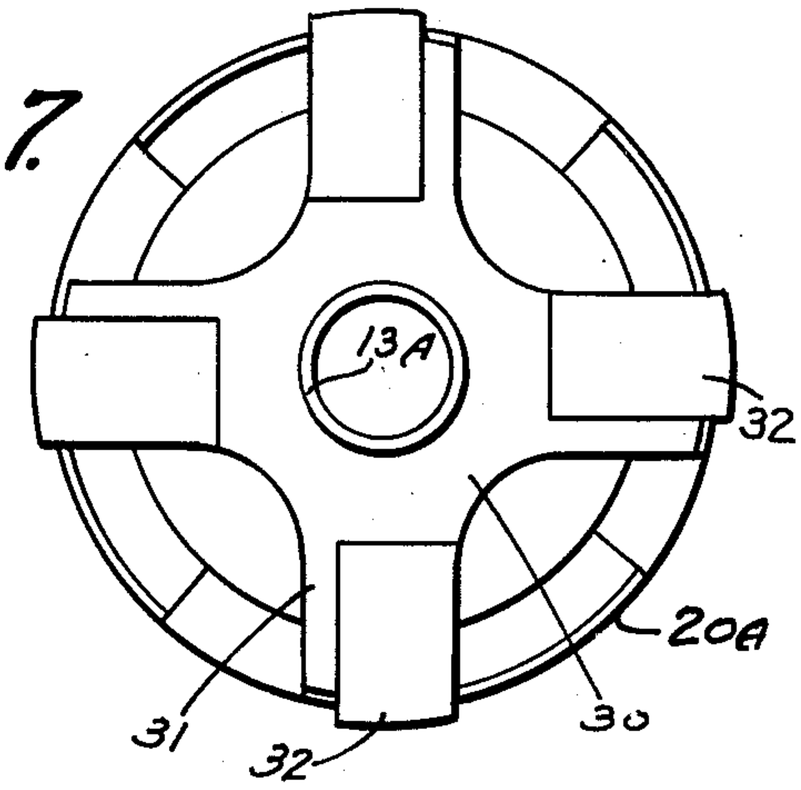
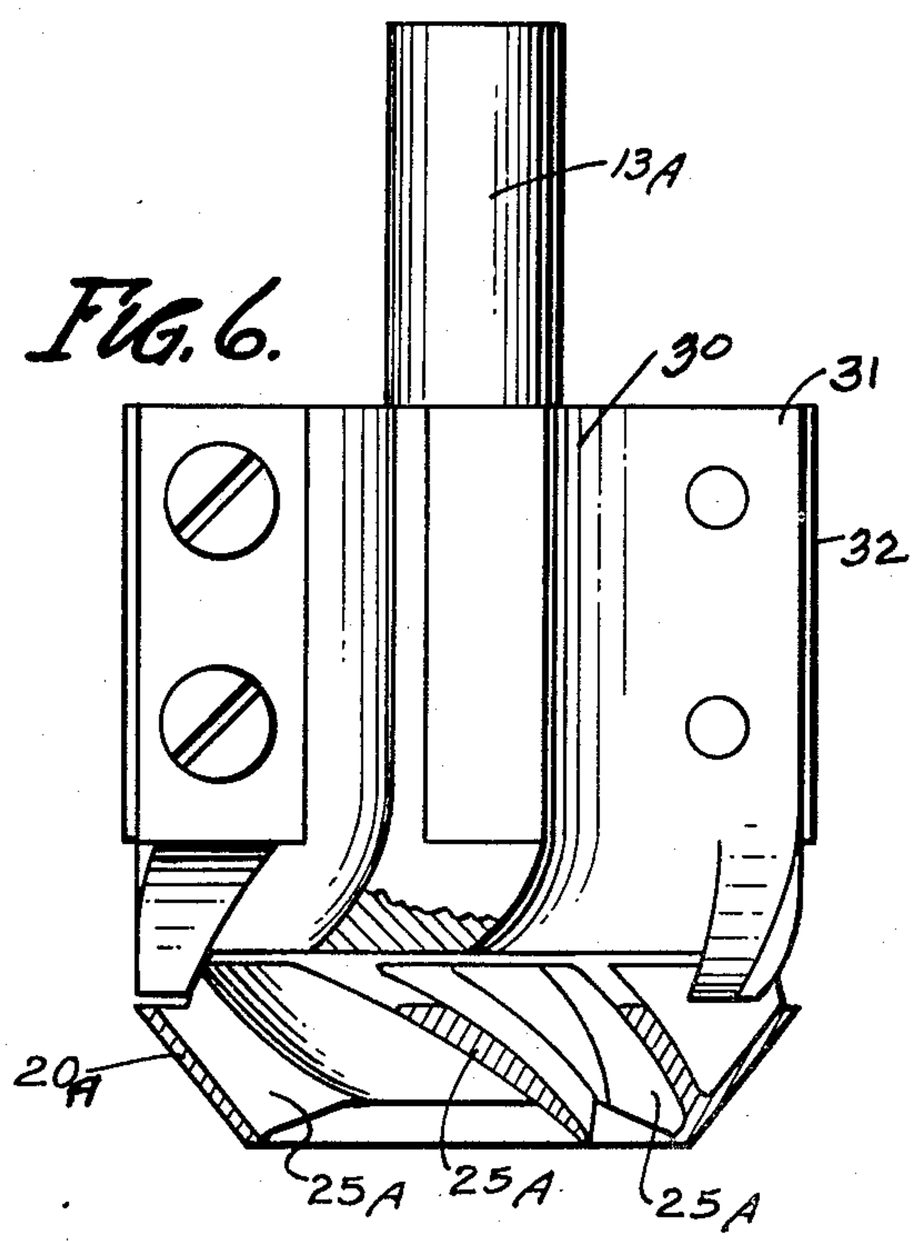


Fig. 6.



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Patented Feb. 28, 1939

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UNITED STATES PATENT OFFICE

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PUMP

Edward B. Fuqua, Memphis, Tenn.

Application February 28, 1938, Serial No. 192,905

2 Claims. (Cl. 103—90)

This invention relates to improvements in pumps for deep wells and particularly to a turbine type of pump for such purposes.

The majority of deep well pumps at present in use employ a motor above the ground surface from which motor a shaft and a discharge pipe enclosing said shaft extend downward to and below water level. The lower end of the discharge pipe carries a series of casings, usually substantially bell shaped, in each of which casings there is an impeller and an impeller shaft, these shafts being coupled together by suitable coupling means and coupled to the shaft extending downward from the motor by which all of them are driven. Each impeller builds up a certain amount of head and such number of casings and impellers are coupled together as is necessary to build up a sufficient head for the particular depth of well. Each impeller discharges into the casing above, the upper impeller discharging into the discharge pipe. Obviously the casings necessitate the use of impellers of greatly reduced diameter as compared with impellers which might be placed directly in the well casing.

The objects of the present device are:

To provide deep well pumping means which eliminates the necessity of a discharge pipe and of casings for housing the impellers;

To provide deep well pumping means which are self-contained and easily removable for repairing and replacements;

To provide deep well pumping means in which the shaft is steadied at frequent intervals and in which such steadying means is readily removable and replaceable by the removal and replacement of the shaft;

To provide deep well pumping means in which the impellers are spaced at substantial intervals from top to bottom of the well whereby the shaft may be reduced in size after passing each such impeller and the lower section of said shaft may be of only such size as is necessary to drive a single impeller; and,

To provide in a deep well pump a combined steady bearing and discharge vane assembly adjacent and in cooperation with each impeller.

The means by which the foregoing and other objects are accomplished and the method of and accomplishment will readily be understood from the following specifications on reference to the accompanying drawings, in which:

Fig. 1 is an elevation showing one of the units and portions of the well casing and pump shaft.

Fig. 2 is a sectional elevation taken on the line II—II of Fig. 3.

Fig. 3 is a sectional plan taken on the line III—III of Fig. 2.

Fig. 4 is a section on the line IV—IV of Fig. 2.

Fig. 5 is a sectional elevation showing a well installation including the pumping units.

Fig. 6 is a sectional elevation of the modified form of the pumping unit; and,

Fig. 7 is a plan of the unit.

Referring now to the drawings in which the various parts are indicated by numerals:

10 is a well casing. 11 is a pump shaft which is made up of sections joined together by couplings 12. 13 is a sleeve in which the shaft 11 is journalled, this sleeve having a flange 14 intermediate its length. Disposed on the sleeve below the flange 14 are deflectors made up of a soft rubber portion 15 and a metal portion 16, these portions each having each a central hub and vanes 17, 18, respectively, the vanes 17 being complementary to and forming a continuation of the vanes 18. The diameter of the metal section and the vanes 18 is less than the diameter of the well casing, so that the vanes 18 enter freely therein, whereas the vanes 17 project beyond the vanes 18, and firmly contact the well casing to center and steady the bearing sleeve 13. The upper and lower edges of the vanes 17 are beveled at 19 to insure insertion movement of the unit downward along the well casing and its subsequent removal from the casing.

20 is an impeller of enclosed type having a hub portion 21 which is secured to the shaft 11 by a split sleeve 22, this sleeve being exteriorly tapered and threaded and clamping around the shaft. The hub 21 of the impeller is disposed against the under side of the metal portion 16 of the deflectors and adjacent the lower end of the bearing sleeve 13. 23 is a collar secured to the shaft 11 as by a set screw 24, this collar cooperating with the impeller to position the bearing sleeve with reference to the shaft. The impeller has the usual blades 25.

In Fig. 5 short portions of the well casing 10, and of the shaft 11, with pumping units attached thereto are shown. In this view it will be particularly noted that the upper portion of the shaft designated by the numeral 11 is slightly larger in size than the portion 11—A below the coupling 12, and that the portions 11—B is still further reduced in diameter, this being made possible by the fact that while the upper portion of the shaft must drive all the impellers the remaining portions of the shaft need only be large enough to drive the impellers therebelow. It will be understood that while three pumping units are

shown in Fig. 5, that this number has been selected for purposes of illustration only and that such additional number of impellers may be used as the depth of the well and the characteristics of the impellers may require.

In Figs. 6 and 7 the impeller 20—A is of substantially the same type as that shown in the preceding figures. In Fig. 6 the front portion of the housing has been cut away to disclose the blades 25—A. In this form of the device the deflectors comprise a metal hub portion which is secured on the bearing sleeve 13—A in any usual or desired manner, or may be integral therewith. The deflector is of metal and has vanes 31 of a composite type, the metal portion being cut away to receive insets 32 of soft rubber, which insets project beyond both the remainder of the vanes, and the housing of the impeller as well and provide seats which firmly engage the well casing to center and steady the bearing sleeve.

It will be understood that the idea of the device is to space a series of impellers at suitable and substantially equal intervals along a shaft which is suspended in the well at the ground level and depends to the liquid to be pumped. In connection with each impeller, a bearing, having rubber parts adapted to snugly engage the inside of the well casing is used. The impellers are made as large as the size of the casing will permit without their touching the casing. The impellers are selected with blade characteristics dependent on the spacing apart of the impellers in the well, and also with due regard to the speed of the motor which is to be used.

In installing the device an impeller is secured adjacent the lower end of a section of shaft. A bearing and its deflectors are placed on the shaft adjacent the impeller and are secured against longitudinal displacement by means of the collar 23. This section of shaft is lowered into the well, and additional sections of shaft secured thereto by couplings 12, there usually being two or more intermediate sections of shafts before another impeller is installed. At the desired interval a second impeller and bearing are secured on a shaft section and this section coupled to the sections already in the well and the unit further lowered, this being repeated until the impeller on the lower end of the shaft has reached the desired level.

The size of the shaft may be stepped up as each impeller is added, or ordinarily after two or three impellers are added. In placing the pumping units in the well casing the impeller and the metal parts of the unit enter the casing freely, the rubber portion of the vanes, however, must be forced into the casing, being thereby somewhat compressed and holding the bearing steady.

It will be understood that the impeller, while shown and described as a closed impeller, may be an open impeller of screw type or other type, it being understood that except as the claims are so limited the type of impeller is not a part of the present invention.

I claim:

1. Pumping means for a deep well having a casing, said means including a shaft depending in said casing, means for driving said shaft, and a plurality of units supported by said shaft at spaced intervals therealong; each said unit including an enclosed impeller secured to said shaft, a bearing disposed around said shaft above said impeller, and a collar secured around said shaft and confining said bearing against said impeller, said bearing including a metal section and a soft rubber section having complementary deflector vanes, the outer edges of said rubber section vanes extending beyond said metal section vanes, and into steadying contact with said casing.

2. Well pumping means including a well casing, a shaft within said casing, an impeller secured to said shaft, a bearing disposed around said shaft above said impeller, means secured around said shaft and confining said bearing against said impeller, said bearing including a metal section and a soft rubber section having complementary deflector vanes, the outer edges of said rubber section vanes extending beyond said metal section vanes and said impeller, and into steadying contact with said casing.

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