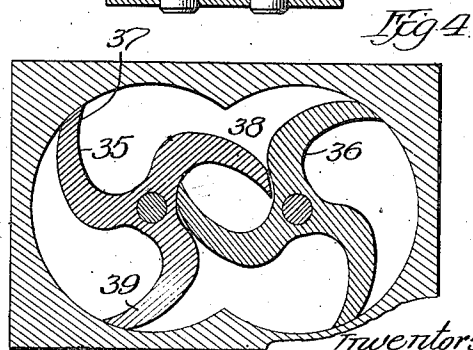
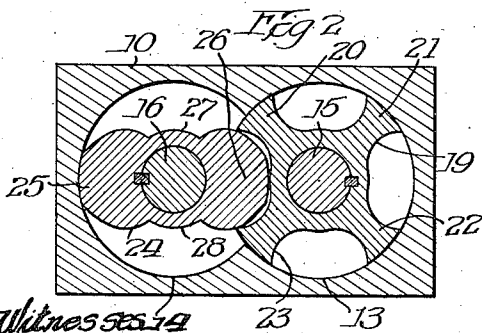
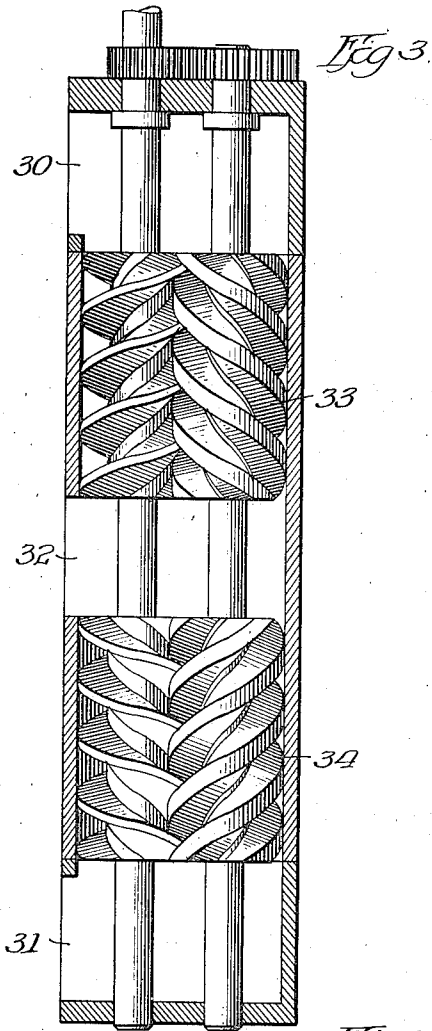
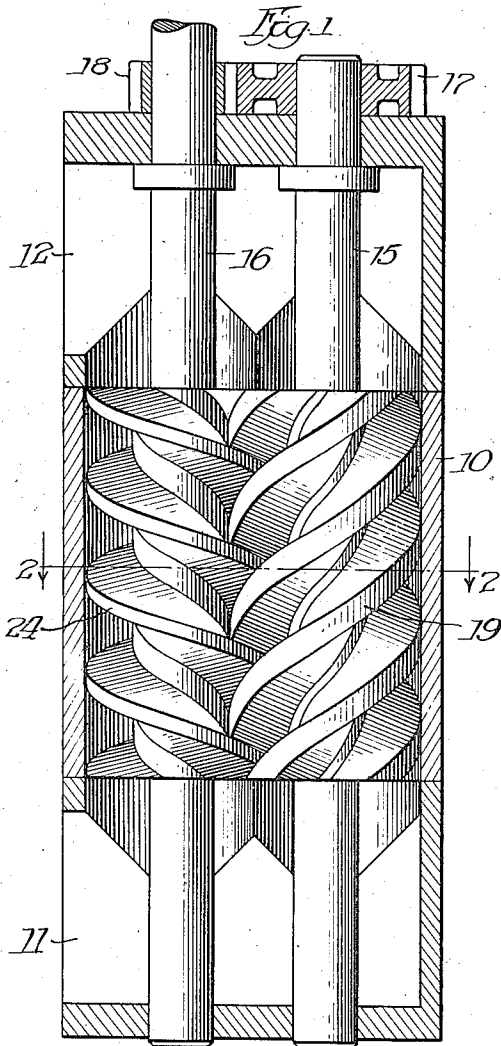


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SCREW PUMP.
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UNITED STATES PATENT OFFICE.

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SCREW-PUMP.

1,306,169.

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To all whom it may concern:

Be it known that we, FREDERICK A. BROOKS and ROGER BROOKS, both citizens of the United States, residing at Urbana, in the county of Champaign and State of Illinois, have invented certain new and useful Improvements in Screw-Pumps, of which the following is a specification.

While we have herein characterized our novel construction as an improvement in pumps, and have illustrated and described the preferred embodiment of the invention as a pump, it will be apparent that its general features are also capable of advantageous employment in other structures, such, for example, as steam or internal-combustion engines, etc.

The principal feature of the invention is the use of a pair or plurality of intermeshing, coacting, helical screws so incased that they provide a succession of closed spiral chambers which advance as the screws are rotated, such forward travel being employed for the pumping or movement of the fluid acted upon. It is desirable to use a plurality of parallel threads on each screw, and, of course, these are so shaped as to afford a succession of fluid-tight closures between them, such closures advancing axially of the screws as the latter revolve, due, of course, to the spiral or helical arrangement of the interengaging threads. In this way the housing or casing in which the screws snugly fit is divided into a series of traveling or advancing chambers or compartments, the initial ones of which may draw in the liquid or fluid.

The threads of the screws are of special design of cross-section, which obviously depends on the type and number of threads employed on each screw and their relative speeds of rotation. That is to say, the two screws need not revolve at the same speed, which necessarily requires that the pitches of their threads differ, being obviously dependent upon the relative speed of rotation.

The main purpose of the invention is the provision of a device of this general character which shall be extremely simple in construction, effective in action, economical to manufacture, and unlikely to become deranged or damaged in service.

In the accompanying drawings, we have illustrated different embodiments of the invention as applied to pumps, and through-

out the various views of these drawings, like reference characters refer to the same parts.

In the drawings:

Figure 1 is a longitudinal section of a pump embodying this invention;

Fig. 2 is a horizontal cross-section on line 2—2 of Fig. 1;

Fig. 3 illustrates in longitudinal section a duplex pump structure for the equalization of the pressures and strains incident to the operation of the pump; and

Fig. 4 is a cross-section illustrating different types of screws, both adapted to rotate at the same speed.

Referring first to the embodiment of the invention depicted in Figs. 1 and 2, it will be observed that the pump comprises a casing 10 having an inlet 11, and a discharge opening 12 at the opposite end, the central portion of the casing accommodating the intermeshing screws being of the shape shown in Fig. 2, the internal chamber being of the form of two intersecting cylinders, the two parts 13 and 14 of which are adapted to accommodate the two screws.

Extending longitudinally through this casing or housing are two shafts 15 and 16 concentric with the axes of the two portions 13 and 14 of the casing chamber. These shafts are connected together by intermeshing gears 17 and 18, the former being of twice the diameter of the latter so that in this special case the speed of rotation of the shaft 15 will be only half that of the shaft 16. In the present instance, the shaft 16 has been shown elongated for the application of any driving means, but of course it is of no importance which of the two shafts is driven, and, in fact, both may have their own independent driving means, the gears 17 and 18 being employed merely as timing means for such shafts.

The shaft 15 is equipped with a screw 19 snugly fitting in the chamber 13 of the casing. The screw, as is illustrated, has four parallel, helical threads 20, 21, 22, and 23, separated from one another by helical grooves of the shape shown, the outer faces of these four threads being partially cylindrical in form to properly fit within the cavity of the casing.

The shaft 16 has fixed thereto a screw 24 having two parallel, helical threads 25 and 26, one hundred and eighty degrees apart from one another and of the form shown

in Fig. 2 their outer faces also being partially cylindrical to conform to the shape of the inner surface of the casing cavity 14. The threads of the screw 24 are of a pitch half as great, or twice as quick, as that of the threads of the screw 19, as is obviously necessitated by the fact that the screw 24 rotates twice as rapidly as the screw 19.

These two parallel, interfitting or intermeshing, helical screws provide in the casing in which they are mounted a plurality of closed spiral compartments which advance axially along the screws as the latter rotate. Stated somewhat differently, the threads of each screw form closures for the grooves of the companion screw, the grooves being otherwise closed by the surrounding casing, and as the screws rotate in the direction indicated by the arrows shown in Fig. 1, the points of closure of any thread with the groove in which it fits advance upwardly, carrying forward the contents of the groove above such closure. The closure for any groove, that is to say, the contact of any thread with the sides and bottom of the groove in which it fits, is not in any one plane, but is of irregular form, due to the helical disposition of the threads.

When the outer faces of the threads 20, 21, 22, and 23 are in contact with either of the partially cylindrical surfaces 27 and 28 of the screw 24 between the threads 25 and 26, there is merely a rolling contact between these parts, both of which are moving at the same peripheral speed: It should be borne in mind that the radius of the parts 27 and 28 is only half that of the outer surfaces of the threads of the companion screw 19, but owing to the fact that the screw 24 is revolving twice as fast as the screw 19, these two surfaces, both cylindrical, will be traveling at the same speed and will have a rolling contact one with the other.

When, however, either of the threads 25 or 26 is in one of the grooves of the screw 19, this previous rolling contact is changed into at least a partial sliding contact, but the closure which such a thread 25 or 26 forms for the groove of the companion screw is effective in operation.

In an appliance of this character there is a tendency for the screws to travel axially in a direction opposite to that of the fluid upon which it acts, and in order to relieve or neutralize such pressure, a duplex-screw pump structure has been devised, as shown in Fig. 3. In all substantial respects this is like the construction shown in Figs. 1 and 2 except that the casing has inlets 30 and 31 at its opposite ends, and is supplied with a central outlet or discharge opening 32 between the two pump structures 33 and 34. Each of these latter is like that of Fig. 1, but the two are reversed. That is to say,

the pitches of the screws of the part 34 are just the opposite of those of the part 33, so that whatever longitudinal strain the one appliance places upon the shafts is substantially neutralized or overcome by the opposite action on the shafts by the other screw structure.

By reversing the direction of rotation of the shafts, the openings 30 and 31 may be used to discharge the pumped fluid, the passage 32 under these circumstances acting as an inlet.

In Fig. 4, we have shown another suitable cross-section for the screws 35 and 36 when both shafts are rotated at the same speed, and in this instance the two screws are substantially alike, each having three parallel, helical threads 37, 38, and 39, the pitches of the threads of both screws, of course, being alike, as is required, due to the fact that the two screws have the same speed of rotation.

In all of these embodiments of the invention, the fluid or liquid to be pumped either flows into the inlet or is drawn in by the action of the screws, and these trap it in their grooves and gradually advance it along such grooves owing to the co-action of the threads of the other screw fitting in such grooves and advancing along the same. That is to say, the closures for the bottoms or ends of these various spiral chambers advance in such a way as to force the contents of the chambers along, ultimately discharging them through the outlet 12 or 32, as the case may be.

To those skilled in this art, it will be plain that this invention is susceptible of a variety of embodiments and is not limited and restricted to the precise and exact structural features herein illustrated and described in detail. The various minor mechanical characteristics of the appliance may be varied within wide limits without departure from the essence of the invention and without the sacrifice of any of its substantial benefits and advantages.

We claim:

1. In a device of the character described, the combination of a casing, and a pair of revoluble intermeshing parallel helical screws in said casing, the threads of said screws being of different pitch, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

2. In a device of the character described, the combination of a casing, and a pair of revoluble intermeshing helical screws in said casing, the threads of said screws being of different pitch, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

3. In a device of the character described, the combination of a casing, and a pair of

revoluble helical screws in said casing, the number of threads on said screws being different, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

4. In a device of the character described, the combination of a casing, and a pair of revoluble intermeshing helical screws in said casing, the number of threads on said screws being different and of different pitch, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

5. In a device of the character described, the combination of a casing, a pair of revoluble intermeshing screws in said casing, and means to cause said screws to revolve at different rates of revolution, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

6. In a device of the character described, the combination of a casing, a pair of revoluble intermeshing screws in said casing, the threads of said screws being of different pitch, and means to cause said screws to revolve at different rates of revolution, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

7. In a device of the character described, the combination of a casing, a pair of revoluble intermeshing screws in said casing, the number of threads on said screws being different and of different pitch, and means to cause said screws to revolve at different rates of speed, said screws being adapted by their coöperation to advance the material acted upon along their grooves, substantially as described.

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