

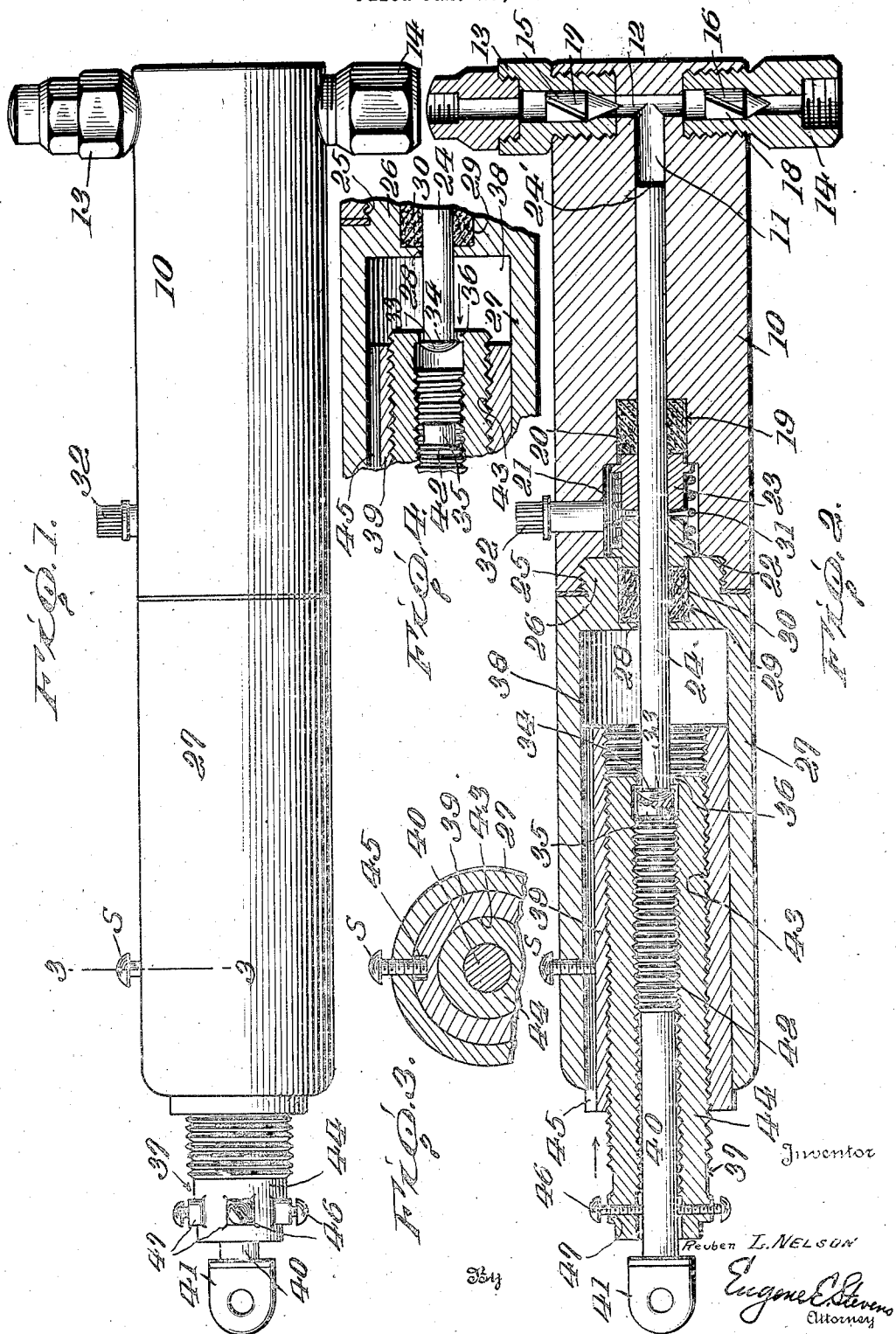
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PUMP

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PUMP

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9 Claims. (Cl. 103—38)

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My invention relates to improvements in pumps and particularly to a reciprocating pump structure for pumping operations requiring the application of high fluid pressure and accurate regulation of the output.

The primary object of my invention is to provide a simple yet positive piston operating mechanism whereby the length of the stroke imparted to the piston may be varied as and when desired to meet exacting requirements in output, as, for example, in the pumping of small quantities of concentrated substances into fluid systems of great capacities and at high pressures, and particularly where the pump is required to maintain a constant pumping rate under varying operating conditions for long periods of time.

A further object of my invention is the provision of a combined pump structure and piston rod operating mechanism in which the piston operating means and the means for adjusting the stroke imparted to the piston on each operation of the mechanism is completely enclosed and concentrically arranged within an extension of the pump body which serves also as a bearing support for the mechanism.

Another object of my invention is the provision of a compact unitary structure in which all of the operating parts are concentric and arranged for assembly from one end of the pump body.

Still another object of my invention is the provision of a pump of this character having readily adjustable means connecting the piston plunger and its operating rod for varying the stroke imparted to the piston by the rod, the parts being concentric with the axis of the piston plunger.

A further object of my invention is the provision of a pump in which the stroke of the piston plunger may be varied at will, and where the piston plunger operating means is reciprocally mounted in one end of the pump body with means for adjusting its operative relation with the piston plunger for producing desired lost motion between the two.

A still further object of my invention is the provision of a pump having a pump plunger and an operating rod having a lost motion connection therewith with slide bearing means for reciprocally supporting the rod in axial alignment with the pump plunger, and piston stroke varying means adjustably connecting the rod, bearing and piston plunger in concentric arrangement.

Other objects of my invention relate to a greatly simplified, variable stroke pump structure in

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which the operating parts are enclosed and lubricated from a single source for more positive and reliable operation of the pump, etc., all as will be hereinafter more fully described in connection with the accompanying drawings, wherein—

Figure 1 is a side elevation of my pump structure illustrating the compact, concentric arrangement of the parts;

Fig. 2 is a vertical section taken longitudinally through the structure of Fig. 1, with certain of the parts shown in elevation, and the parts adjusted for minimum lost motion between the piston rod and piston plunger;

Fig. 3 is a fragmentary view taken transversely through the structure at the position indicated by 3—3 of Fig. 1; and

Fig. 4 is another fragmentary view taken longitudinally through the structure of Fig. 1 with the parts adjusted for maximum lost motion between the parts to produce minimum piston stroke.

Referring now in detail to the drawings, the pump proper comprises a cylindrical body 10, through the center of which extends a relatively small bore 11. This bore is shown as communicating with a right angularly disposed bore 12 extending through one end of the body 10 and in opposite ends of the bore 12 are removably mounted valve fittings 13 and 14. Plug type valves 15 and 16 are shown slidably mounted respectively in the close fitting bores of the fittings 13 and 14, and each of these valves is preferably formed with a cylindrical body portion having rifled passages 17 and 18 in the surface thereof to cause the valves to turn about their axes during operation of the pump for better seating of the valves.

At the opposite end of the pump body or barrel 10 the bore 11 is enlarged as shown at 19 to provide a packing gland for the reception of suitable packing material 20. From the gland 19 the bore is further enlarged toward that end of the body to provide an adjoining chamber 21 of a size to freely receive a pair of opposed packing material compressing and retaining collars 22 and 23. These collars are bored to slidably receive the piston plunger 24. Just inwardly of the end of the body 10 the bore is again enlarged from the chamber 21, and internally threaded as at 25 to provide a screw fitting to receive the threaded end 26 of the cylindrical body extension or casing 27. As clearly shown in the drawing this cylindrical casing 27 is concentric with the bore through the body 10 and its outer surface forms

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an unbroken continuation of the body when all the parts are in the assembled position shown in Fig. 1. As shown in Fig. 2, the threaded end 26 of the casing is centrally bored, as at 28, to slidably receive the piston plunger 24, and as in the case of the body 10 this bore 24 is enlarged to provide a packing gland 29 for holding packing material 30 around the piston plunger 24. Thus the gland bores 19 and 29 are axially aligned with the piston plunger bores 28 and 11, and the packing material 20 and 30 is therefore held under a desired compression around the piston plunger 24, under the action of a coil spring 31 which is compressed between opposed faces of annular flanges extending around each of the collars 22 and 23, when the threaded ends 26 of the casing 27 is screwed into seated position in the body 10. Lubricant may be supplied to the chamber 21 when closed by the end extension 26, through a suitable grease fitting 32 for the lubrication of the parts just described.

As shown in Fig. 2, the outer end of the piston plunger 24 is provided with an enlarged operating head, preferably of hardened material, having a rounded outer surface 33 and a plain or flat annular inner surface 34. These two operating surfaces of the plunger head are adapted to cooperate with two relatively opposed parts 35 and 36 of a piston operating rod assembly, designated generally as 37, when the rod is reciprocated in the bore of the casing 27.

As stated above, the piston plunger 24 is reciprocally arranged within the bore 11 of the body 10 where its fluid compressing end or head 24' is adapted to always move to and from the extreme end of the pumping cylinder or bore 11, designated by the juncture of this bore with the cross bore 12. At the opposite end of the piston plunger are arranged the two faces of the operating head, and the intermediate portion of the piston plunger is adapted to be frictionally held within the cylinder bore 11 by the spring pressed packings 20 and 30, which in operation serve as a brake device to retain the piston plunger in any desired advanced or retracted position at which it may be stopped until force is again applied by the piston operating rod assembly now to be described in detail.

The detachable casing 27, which in assembled position forms a symmetrical extension of the pump barrel 10, is axially bored inwardly from the end opposite the extension 26 to provide an inner cylindrical guideway 38 for a cylindrical slide bearing member 39 that concentrically surrounds the outer headed end 33 of the piston plunger 24.

As shown in Fig. 2, the headed end of the piston plunger extends a material distance into the center of the casing 27, which casing is open at its opposite end. Axially aligned with the piston plunger 24, within the slide bearing member 39, is a piston rod 40, and as shown the outer end of this rod may be provided with a yoke or other connecting link member 41, by which the rod is connected to a suitable source of power, such as a cam shaft or other eccentric (not shown), by which a fixed predetermined operating stroke is imparted to the rod. The forward end portion of the rod body 40 is threaded as at 42 and the inner surface of the slide bearing sleeve 39 is similarly threaded as at 43 to receive between them an interiorly and exteriorly threaded sleeve 44 that provides a positive concentric connection between these parts so that under all operating conditions the rod and slide bearing move together as a unit. For purpose of adjustment between these parts,

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however, the slide bearing may be held against rotation in the cylindrical casing by a machine screw S, the inner end of which works freely in a longitudinal guideway 45 in the outer surface of the bearing sleeve 39, as is best shown in Figs. 2 and 3.

Relative longitudinal adjustment may thus be made between the rod 40 and the slide bearing 39 by turning the rod in the connecting sleeve 44. This adjustment is of primary importance in initially setting the hammer end 35 of the rod 40 to move the piston plunger to the extreme inner end of the pump barrel or bore 11. From this position of the fluid compressing end 24' of the piston 24 the stroke of the piston plunger may be regulated according to demands in output of the chamber by turning the connecting or stroke varying sleeve 44 in a direction to increase or decrease the distance between the opposed piston operating parts 35 and 36 of the assembly 37, as shown in Figs. 2 and 4. In Fig. 2 the parts just described are shown adjusted for minimum lost motion between the rod 40 and pump plunger 24 so as to impart a maximum stroke to the piston, whereas in Fig. 4 the parts are adjusted for maximum lost motion, for minimum piston stroke.

From the two positions just described, it will be obvious that any desired adjustment of the piston stroke may be made and the adjusting parts set by tightening the set screws 46.

As shown particularly in Fig. 1, the stroke adjusting sleeve 44 is of a length to project a material distance beyond the open end of the tubular supporting casing 27. The outer end portion of this adjusting sleeve 44 is preferably provided with a plain cylindrical surface excepting for the annular series of bosses 47 between which a wrench may be engaged to turn the sleeve relative to the piston rod 40 and its slide bearing 39 to adjust the lost motion relation between the piston plunger operating surfaces 35 and 36, above explained.

From the foregoing, it will be observed that a novel pump and operating means therefore is provided by the combination and arrangement of parts shown; further that the unit produced is simple in construction, durable in use and readily assembled and disassembled due to the concentric arrangement of parts and their location at one end of the pump barrel as a symmetrical extension thereof.

While I have described but a single specific embodiment of my invention the same is to be considered as illustrative only and not restrictive, the scope of the invention being defined in the sub-joined claims.

What I claim is:

1. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with said plunger for moving the plunger in one direction, a stroke adjusting sleeve surrounding the adjacent end portions of said rod and plunger and adjustably connected to the rod for engaging and moving the piston plunger in the opposite direction with lost motion therebetween, and a bearing sleeve carried by the adjusting sleeve and adjustable relative thereto for slidably supporting the piston rod.

2. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with said plunger for moving the plunger in one direction, a stroke adjusting sleeve surrounding the adjacent end portions of said rod and plunger and adjustably connected

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to the rod for engaging and moving the piston plunger in the opposite direction with lost motion therebetween, said barrel having a cylindrical extension concentrically surrounding the adjusting sleeve, and a slide bearing sleeve adjustably carried by the adjusting sleeve reciprocally mounted in the barrel extension.

3. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with said plunger for moving the plunger in one direction, a stroke adjusting sleeve surrounding the adjacent end portions of said rod and plunger and adjustably connected to the rod for engaging and moving the piston plunger in the opposite direction with lost motion therebetween, said barrel having a cylindrical extension concentrically surrounding the adjusting sleeve, a slide bearing sleeve adjustably carried by the adjusting sleeve reciprocally mounted in the barrel extension, and a key and guideway connecting the slide bearing sleeve and barrel extension.

4. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with said plunger for moving the plunger in one direction, a stroke adjusting sleeve surrounding the adjacent end portions of said rod and plunger and adjustably connected to the rod for engaging and moving the piston plunger in the opposite direction with lost motion therebetween, said barrel having a cylindrical extension concentrically surrounding the adjusting sleeve, a slide bearing sleeve adjustably carried by the adjusting sleeve reciprocally mounted in the barrel extension, a key and guideway connecting the slide bearing sleeve and barrel extension, and means at the outer end of the adjusting sleeve for adjusting it relative to the piston rod and bearing sleeve.

5. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with said plunger for moving the plunger in one direction, a stroke adjusting sleeve surrounding the adjacent end portions of said rod and plunger and adjustably connected to the rod for engaging and moving the piston plunger in the opposite direction with lost motion therebetween, said barrel having a cylindrical extension concentrically surrounding the adjusting sleeve, a slide bearing sleeve adjustably carried by the adjusting sleeve reciprocally mounted in the barrel extension, a key and guideway connecting the slide bearing sleeve and barrel extension, means at the outer end of the adjusting sleeve for adjusting it relative to the piston rod and bearing sleeve, and means also at the outer end of said adjusting sleeve for securing the parts in adjusted position.

6. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with the piston plunger and

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movable relative thereto for moving the piston plunger in one direction, a stroke adjusting sleeve having threaded engagement with the piston rod, and said sleeve having an abutment portion extending beyond the end of the piston rod for lost motion engagement with the piston plunger for moving the piston plunger in the opposite direction.

7. In a reciprocating pump, a pump barrel, a piston plunger reciprocable within the barrel, a piston rod aligned with the piston plunger and movable relative thereto for moving the piston plunger in one direction, a stroke adjusting sleeve having threaded engagement with the piston rod, said sleeve having an abutment portion extending beyond the end of the piston rod for lost motion engagement with the piston plunger for moving the piston plunger in the opposite direction, and a slide bearing sleeve having threaded engagement with the stroke adjusting sleeve for reciprocally supporting the piston rod.

8. A reciprocating pump comprising a pump barrel having a cylindrical guideway at one end thereof, a piston plunger reciprocable within the barrel and extending axially into the guideway, means for actuating said piston plunger with lost motion between the two, including an operating rod axially aligned with the piston plunger for moving the piston in one direction, and a piston stroke adjusting sleeve concentrically and adjustably carried by said rod within the guideway and cooperating with said piston plunger to move same in the opposite direction.

9. A reciprocating pump comprising a pump barrel having a cylindrical guideway at one end thereof, a piston plunger reciprocable within the barrel and extending axially into the guideway, means for actuating said piston plunger with lost motion between the two, including an operating rod axially aligned with the piston plunger for moving the piston in one direction, a piston stroke adjusting sleeve concentrically and adjustably carried by said rod within the guideway and cooperating with said piston plunger to move same in the opposite direction, and a slide bearing sleeve concentrically and adjustably carried by the stroke adjusting sleeve and having sliding engagement within the cylindrical guideway.

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