March 4, 1930. T. ELLIOTT 1,749,212

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Filed May 18, 1928 3 Sheets-Sheet 1

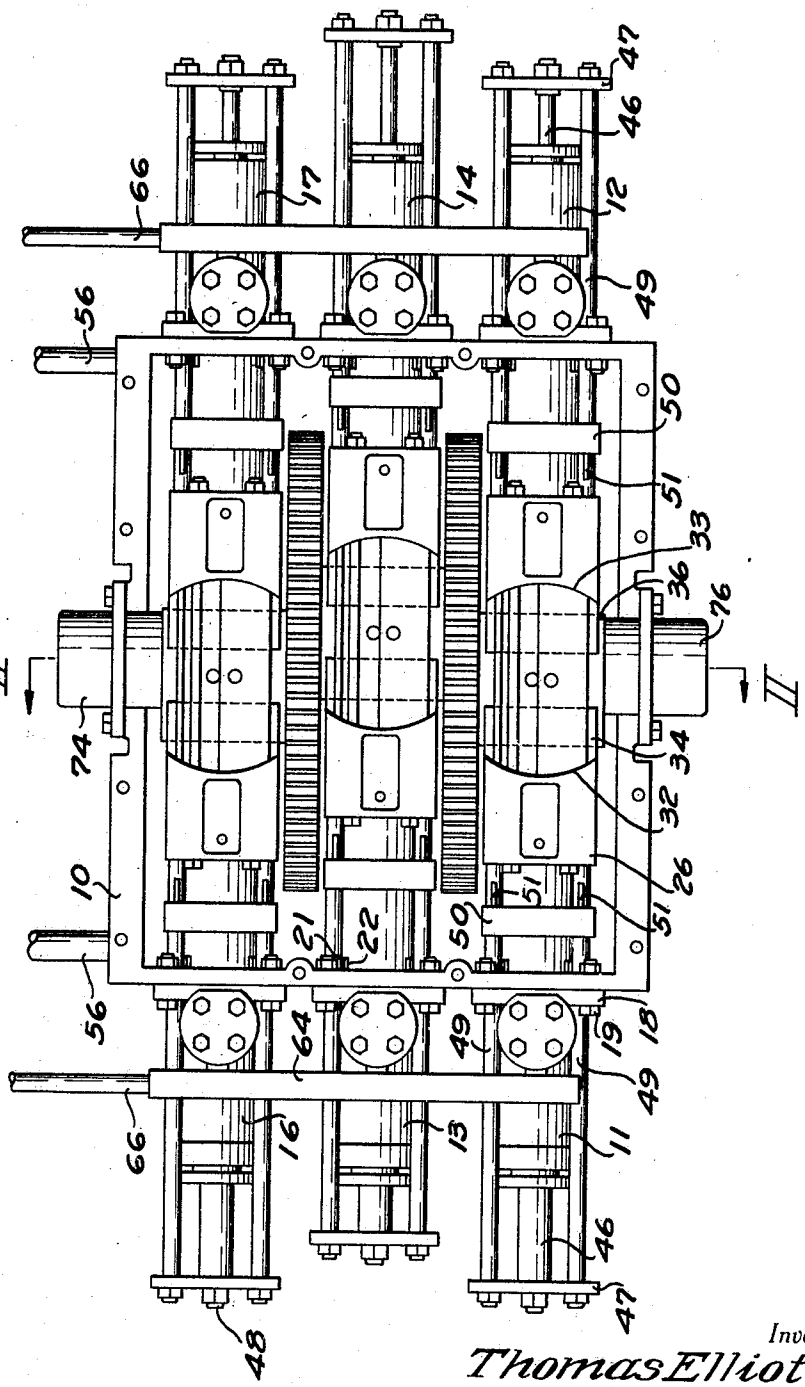


Fig. 1

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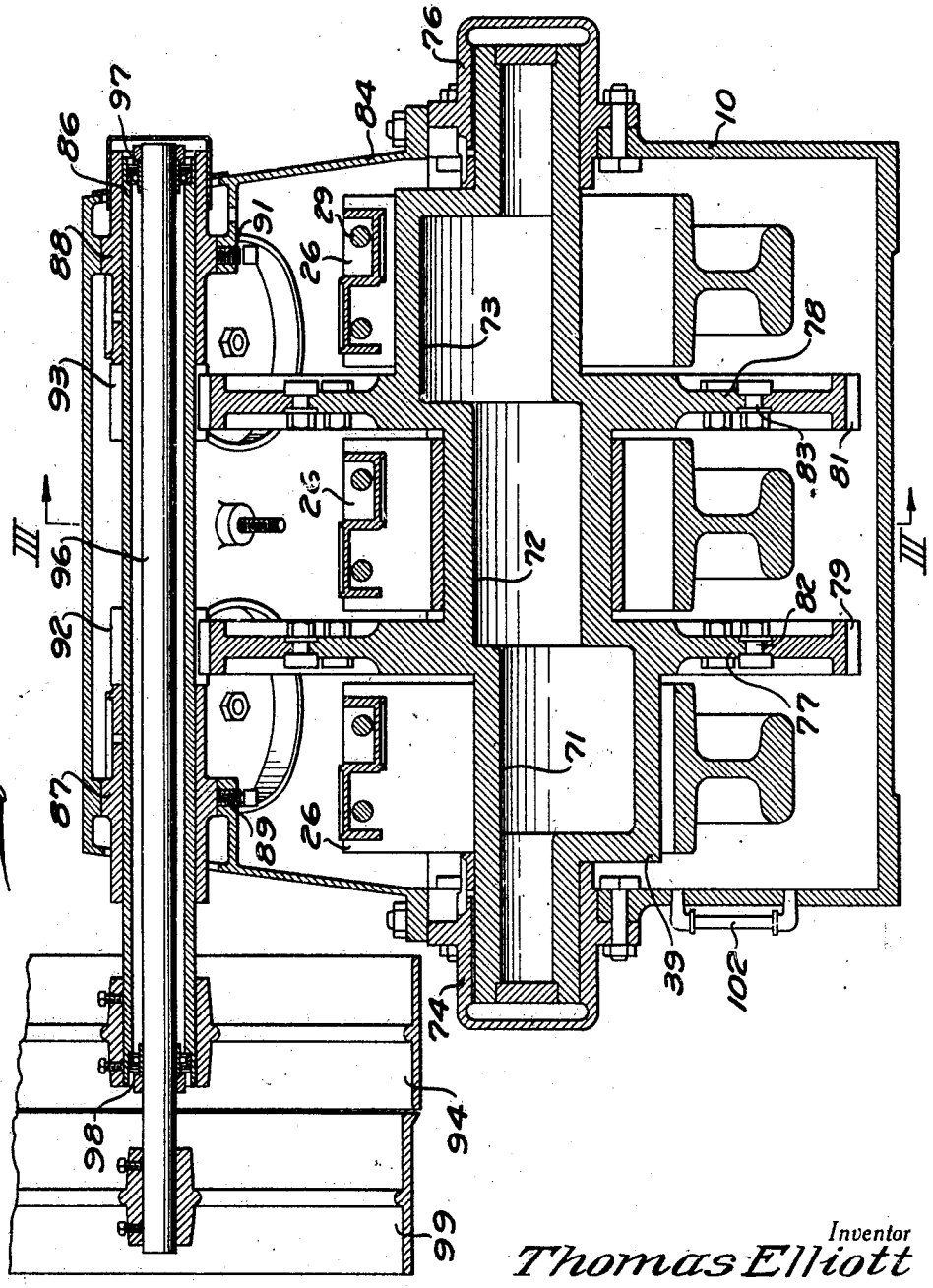


Fig. 2

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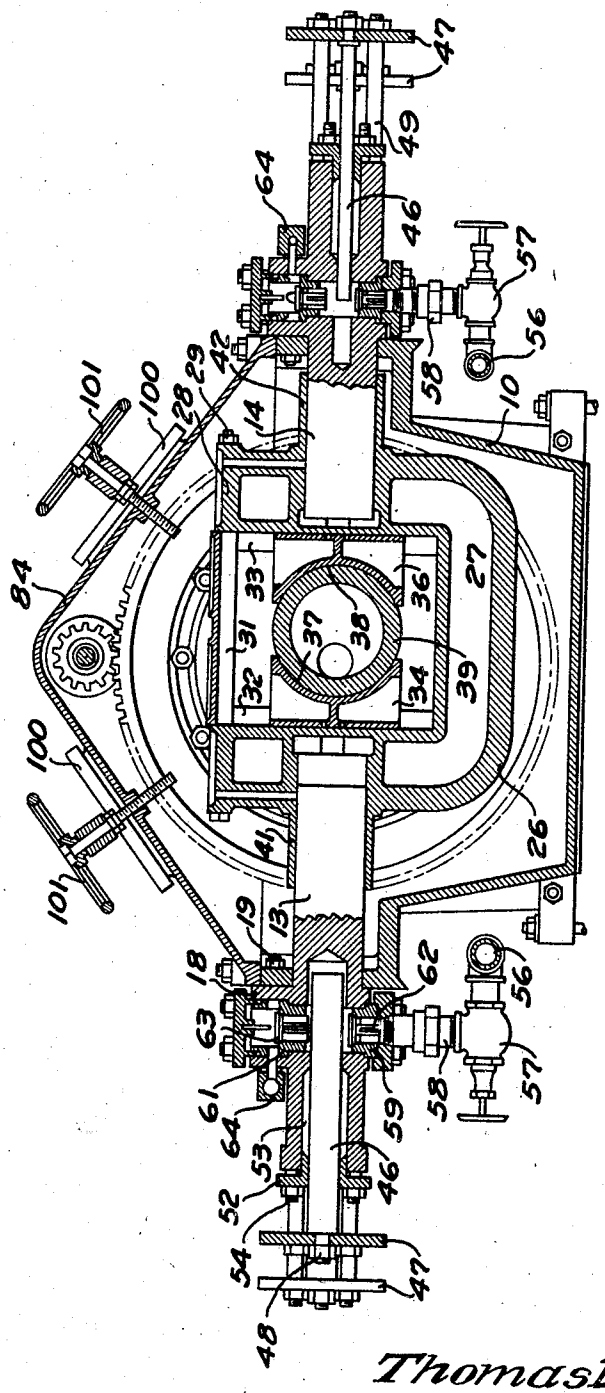


Fig. 3

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Patented Mar. 4, 1930 1,749,212

UNITED STATES PATENT OFFICE

THOMAS ELLIOTT, OF BIRMINGHAM, ALABAMA, ASSIGNOR TO CONTINENTAL GIN COMPANY, A CORPORATION OF DELAWARE

PUMP

Application filed May 18, 1928. Serial No. 278,814.

My invention relates to pumps, particularly to multi-cylinder pumps for developing relatively high pressures, and has for its object the provision of apparatus of the character designated which shall be simple and sturdy of design and operation.

A further object of my invention is to provide a simplified sturdy design of drive for pumps of the character designated, said drive including a scotch yoke, together with improved means for mounting the slides utilized for driving the yoke, whereby inequalities in wear and alignment are compensated and strain on the yokes is equalized.

A more specific object of my invention is to provide a drive means, embodying a scotch yoke, for a multi-cylinder high pressure pump, together with novel means for supporting and driving the yoke, thereby providing a smoothly operating apparatus free from destructive pounding heretofore present in such apparatus.

Briefly, my invention comprises a housing supporting a plurality of cylinders extending from the exterior of the housing inwardly thereof and arranged in opposed aligned pairs with the inner opposed ends spaced apart. Slidingly supported on the opposed ends of each pair of cylinders is a yoke having opposed arcuate slideways formed therein. A crank shaft passing through the yoke has a pair of slides fitting in the opposed slideways of each yoke so as to reciprocate the yoke between the opposed ends of each pair of cylinders. The slides having arcuate bearing surfaces in the slideways, serve to correct errors in alignment or bending of the crank shaft under strain and also compensate for unequal wear on the yokes or crank shaft bearings. The pistons of the cylinders extend from the outer ends inwardly and are connected to their associated yoke by means of rods. Formed on the crank shaft is a gear which is driven by a pinion journalled in the housing cover. I have produced, by this construction, a sturdy dependable pump, practically noiseless in operation, and capable of developing relatively high pressures with a minimum of power.

Apparatus embodying features of my invention is illustrated in the accompanying drawing forming a part of this application, wherein

Fig. 1 is a plan view of the apparatus with the housing cover removed;

Fig. 2 is a transverse sectional view taken along the line II—II of Fig. 1 and showing the housing cover in place, and

Fig. 3 is a longitudinal sectional view along the line III—III of Fig. 2.

Referring now to the drawing, I show a housing 10 supporting a plurality of cylinders indicated by numerals 11, 12, 13, 14, 16 and 17. The six cylinders shown are arranged in aligned pairs with the opposed inner ends thereof spaced apart as best shown for cylinders 13 and 14 in Fig. 3. Each of the cylinders is provided with a flange 18 bolted to the housing 10 by means of bolts 19. In order to further secure the cylinders with respect to the housing, each cylinder is provided with a lateral slot 21, and a key 22 is driven into the slot so as to tightly draw the flanges 18 against the housing.

As shown, the cylinders on one side of the pump are of a larger internal diameter than those on the other side so that they are capable of developing a somewhat lower pressure than the smaller diameter cylinders. It will be obvious, however, that the cylinders may be designed to all develop the same pressure if desired. Slidingly supported on the opposed spaced ends of each pair of cylinders is a yoke 26. Each of the yokes 26 has a lower, heavier, depending portion 27 and an upper open portion 28, the upper open portion having its sides joined together by bolts 29 and spacer blocks 31. Formed in the opposed sides of the upper open portion 28 are opposed arcuate slideways 32 and 33 in

which fit complementary slides 34 and 36. The slides 34 and 36 are formed with inner bearing surfaces 37 and 38 which bear against a hollow crank shaft 39. The outer sides of the yoke 26 are provided with bearing portions 41 and 42 which fit over the opposed ends of the cylinders so that the yoke is freely reciprocable thereon. As is well understood, when the crank shaft 39 is rotated the yoke 26 reciprocates to and fro between the opposed ends of the cylinders.

Extending inwardly of each cylinder from the outer end thereof is a piston 46 which is secured to a plate member 47 by means of a bolt 48. The plate member 47 is connected to the yoke 26 by means of four bolts 49 which extend along the outside of the cylinders through a flange 50 on the yoke 26 and have their inner ends bearing against the outside of the yoke. Keys 51, bearing against the flange 50, draw the rods 49 tightly against the yokes and hold the rods tightly in place. Each of the pistons is provided with the usual stuffing box gland 52 for retaining packing 53 and held in place by means of studs 54.

An inlet manifold 56 is provided for the cylinders on each side of the housing and connected thereto is a valve 57, associated with each cylinder, and controlling the flow from the manifold 56 to each cylinder through a connection 58. The cylinders are each transversely bored to accommodate an inlet valve cage 59 and a discharge valve cage 61 housing an inlet valve 62 and a discharge valve 63, respectively. Secured to the cylinders on each side of the pump is a discharge manifold 64, communicating with all of the cylinders on one side, and with a discharge conduit 66 to convey the liquid pumped to the point of use.

The hollow crank shaft 39 extends transversely of the housing 10 and is provided with crank portions 71, 72 and 73 for driving the three yokes 26. The ends of the crank shaft 39 are supported in bearings 74 and 76 carried by the lower part of the housing 10. Partly formed on the crank shaft 39 are two relatively large gears 77 and 78. The gears 77 and 78 are provided with separable rim portions 79 and 81 secured to the body of the gear by means of bolts 82 and 83.

The housing 10 is provided with a cover 84 in which is mounted a hollow drive shaft 86 supported in bearings 87 and 88 carried by the cover 84 and held in place by means of set screws 89 and 91. Carried by the driven shaft 86 are pinions 92 and 93 meshing with the rim portions 79 and 81 respectively of the gears 77 and 78. On the outer end of the shaft 86 is a pulley 94 which may be coupled to any suitable source of power, not shown. In order that the pump may be readily stopped when required, I provide an idler shaft 96, within the hollow shaft 86 and supported therein by ball bearings 97 and 98. Mounted on the outer end of the shaft 96 is an idler pulley 99 to accommodate the driving belt, not shown, whenever the pump is not to be operated. The cover 84 is provided with suitable man holes 100 having operating means 101 whereby the casing may be opened and inspection made of the interior thereof.

The lower portion of the housing 10 is filled with oil to lubricate the moving parts in operation and a gauge glass 102 is provided to indicate the height of oil therein. When in operation, the gears 79 and 81 pick up the oil and splash it around the inner casing and suitable oil holes are provided to all the bearings requiring lubrication, as is well understood in the art.

From the foregoing description the operation of my improved pump will be readily understood. The drive shaft 86 is driven by the pulley 94, rotating the gears 79 and 81 and crank shaft 39, thereby bringing about reciprocation of the yokes 26 and the pistons 46 to operate the pump. I have found the pump especially adapted for developing relatively high pressures for use in the hydraulic presses of cotton seed oil mills. When designed as illustrated, the cylinders on one side develop a relatively low pressure for use in one type of press while the cylinders on the opposite side develop a much higher pressure and lesser volume, the pump being designed so that the actual work performed by each of the cylinders of the pair is approximately the same. The support of the yokes 26 so as to reciprocate on the opposed ends of the cylinders, together with the arcuate slideways 32 and 33 and correspondingly shaped slides 34 and 36, provides a sturdy construction, extremely flexible in operation. The arcuate bearings for the slides compensate for errors in alignment, unequal torsional strain on portions of the crank shaft and inequalities in wear of the crank shaft and bearings. The result is a pump which is extremely quiet in operation and running with a minimum of wear on its moving parts.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible to various changes and modifications without departing from the spirit thereof, and I desire therefore that only such limitations shall be placed thereupon as are imposed by the prior art, or as are specifically set forth by the appended claims.

What I claim is:

1. In a pump, a plurality of pairs of spaced aligned cylinders, a scotch yoke disposed between the opposed spaced ends of each pair of cylinders and having opposed arcuate slideways, complementary slides fitting in the slideways, a crank for actuating the slides, a reciprocable piston in each of the cylinders,

and means connecting each of the pistons with its associated yoke.

2. In a pump, spaced opposed cylinders, a scotch yoke slidingly supported by the opposed ends of the cylinders, a reciprocable piston in each of the cylinders connected to the yoke, arcuate bearing surfaces provided in the opposed faces of the yoke, slide means fitting the arcuate bearing surfaces, and a crank for actuating the slide means.

3. In a pump, a pair of spaced aligned cylinders, a yoke slidingly supported on the opposed spaced ends of the cylinders, a reciprocable piston in the outer end of each of the cylinders, means connecting both of the pistons to the yoke, and crank and slide means for operating the yoke.

4. In a pump, a housing, a pair of aligned cylinders projecting inwardly from opposite sides of the housing and having their inner ends spaced apart, a yoke slidingly supported to reciprocate between the opposed inner ends of the cylinders, a piston in each of the cylinders and projecting into each cylinder from the outer end thereof, means connecting the pistons to the yoke, a crank, and divided slide means embracing the crank and having arcuate bearing surfaces cooperating with the yoke, there being complementary bearing surfaces formed on the yoke.

5. In a pump, a housing, a pair of aligned cylinders projecting inwardly from opposite sides of the housing and having their inner ends spaced apart, a yoke slidingly supported to reciprocate between the opposed inner ends of the cylinders, a piston in each of the cylinders and projecting into each cylinder from the outer end thereof, means connecting the pistons to the yoke, a crank shaft extending transversely of the housing, a gear carried by the crank shaft, arcuate slideways formed in the yoke, a slide fitting the slideways and driven by the crank shaft, and a power driven pinion meshing with the gear.

6. In a pump, a housing, a pair of aligned cylinders supported by the housing and projecting inwardly thereinto from opposite sides thereof and having their opposed inner ends spaced apart, a yoke slidingly supported on the opposed inner ends of the cylinders and having opposed arcuate slideways formed in the opposite sides thereof, a driving crank shaft extending transversely of the housing and between the slideways, a slide actuated by the crank shaft and fitting in the slideways, and pistons for the cylinders connected to the yoke.

7. In a pump, a housing, a plurality of aligned pairs of cylinders supported by the housing and projecting inwardly thereof, the opposed inner ends of each pair of cylinders being spaced apart, a yoke slidingly supported on the opposed inner ends of each pair of cylinders and each having opposed arcuate slideways formed in the opposite sides thereof, a crank shaft extending transversely of the housing and between the slideways, a pair of slides for each yoke actuated by the crank shaft and fitting in the slideways, reciprocable pistons for the cylinders extending inwardly from the outer ends thereof, and connecting means between the yokes and the pistons, and extending along outside of the cylinders.

In testimony whereof I affix my signature.

THOMAS ELLIOTT.