(No Model.)

E. E. JOHNSON.

PUMP.

No. 588,995. Patented Aug. 31, 1897.

Fig. 1.

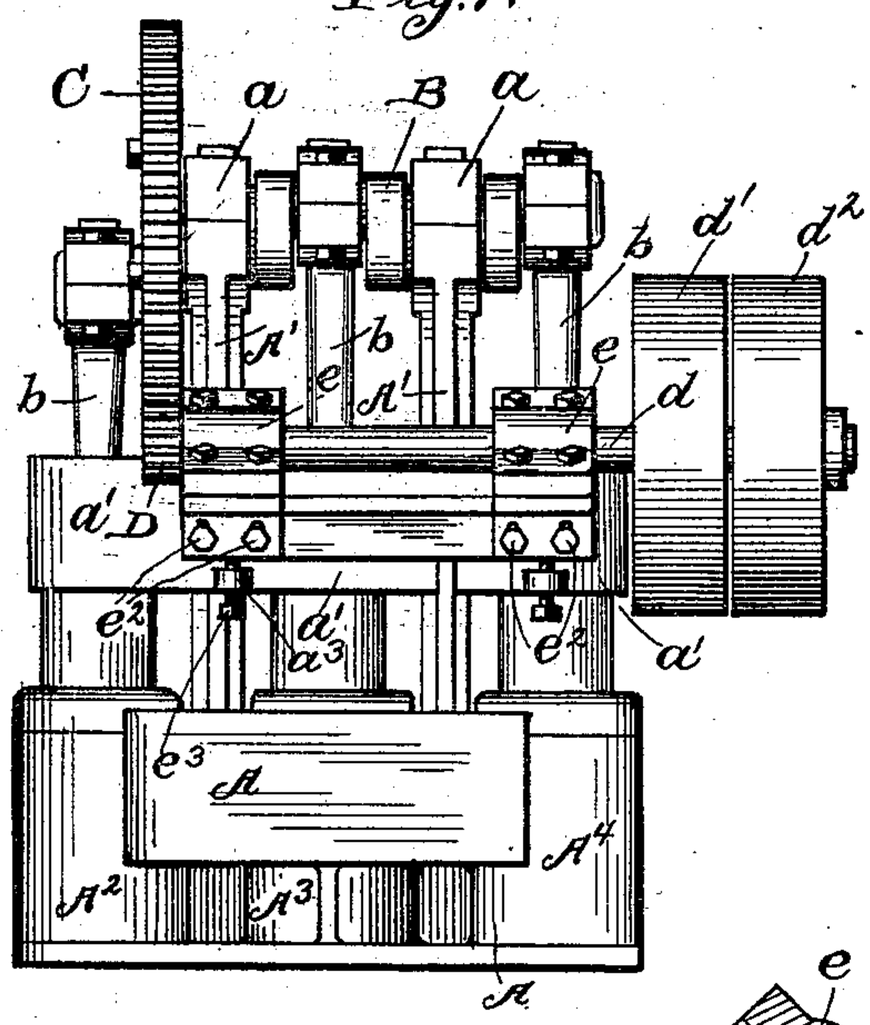


Fig. 2.

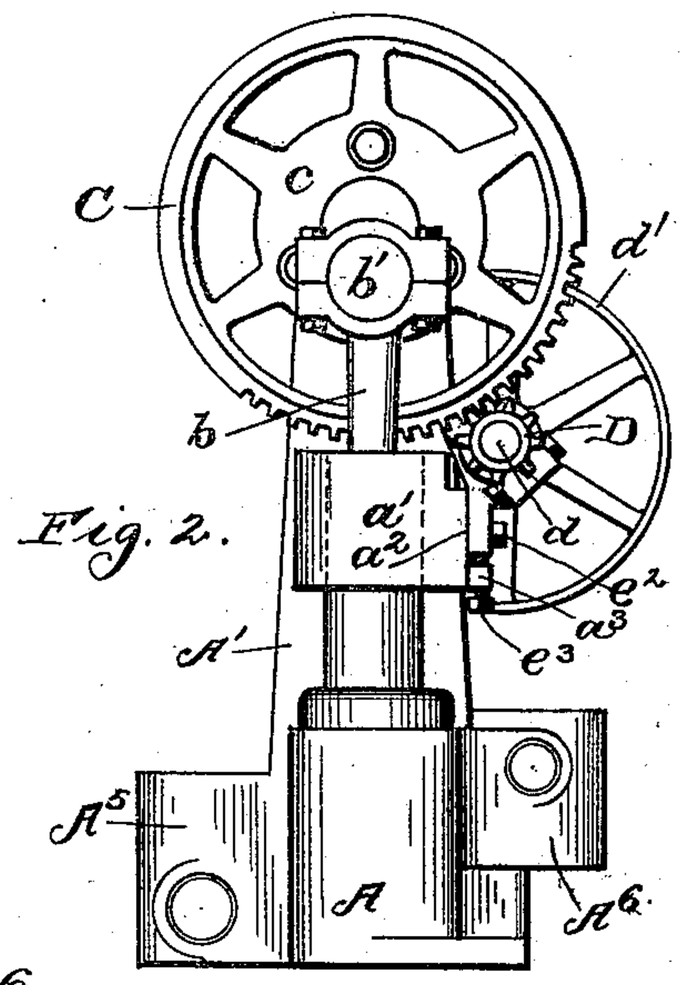


Fig. 6.

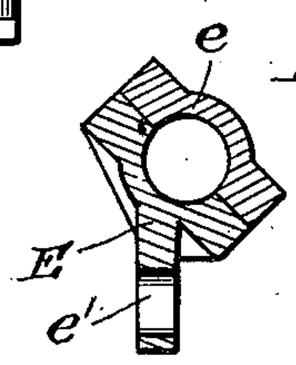


Fig. 3.

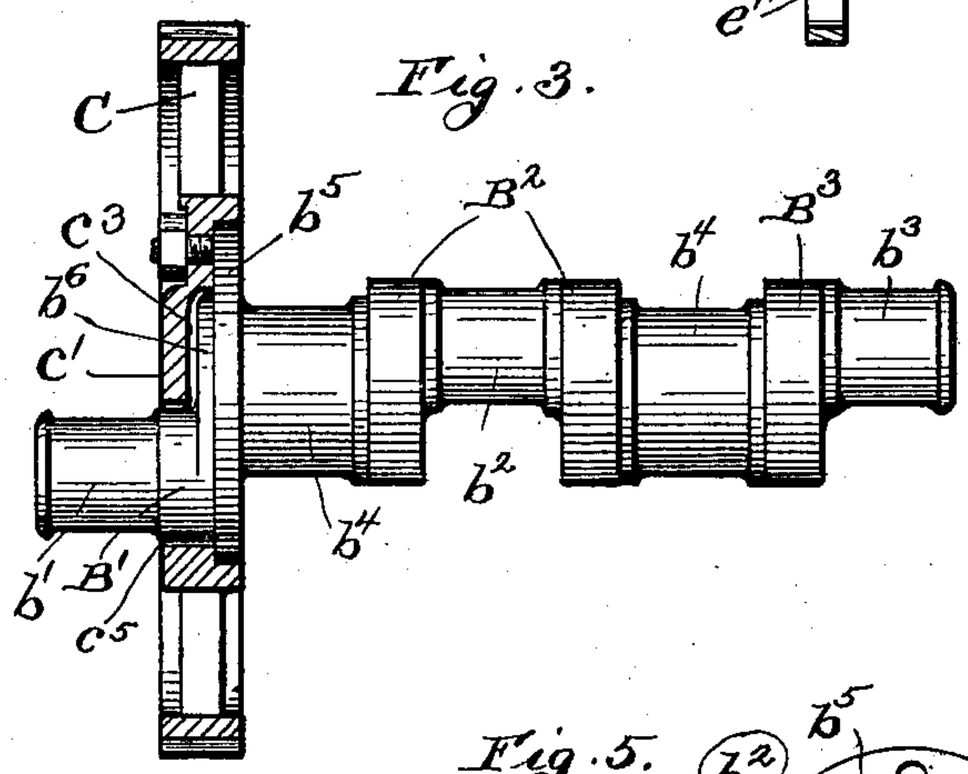


Fig. 4.

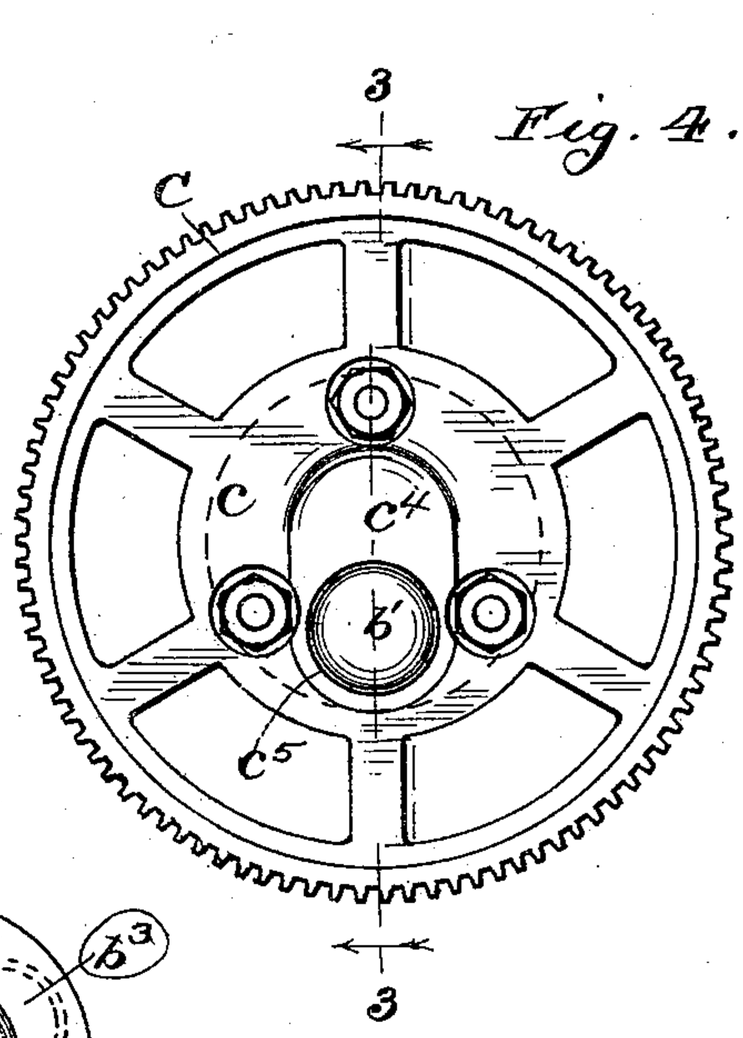
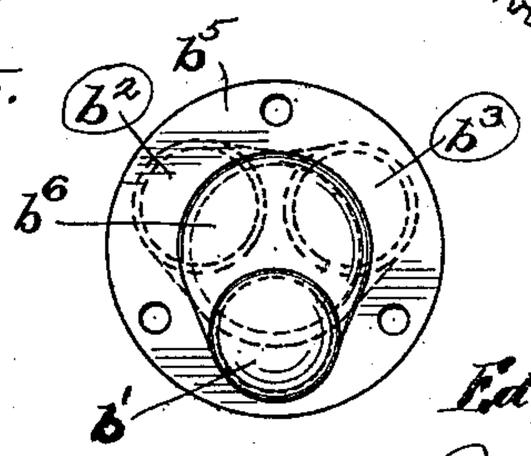


Fig. 5.



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PUMP.

SPECIFICATION forming part of Letters Patent No. 588,995, dated August 31, 1897.

Application filed March 2, 1896. Serial No. 581,466. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. JOHNSON, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

The invention relates to triplex power-pumps having three single or double acting plungers working in as many cylinders and operated by connections with the three cranks of a single crank-shaft which is driven by a rigidly-attached driving-gear, and it relates more particularly to the manner of constructing and connecting the crank-shaft and driving-gear and of mounting or journaling said shaft in the pump-frame.

The invention consists in the matters hereinafter set forth, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a view of a triplex pump constructed in accordance with my invention. Fig. 2 is an end elevation thereof. Fig. 3 is a detail view of the crank-shaft and driving-gear, the latter being shown in section. Fig. 4 is an end view thereof. Fig. 5 is a similar view of the crank-shaft with the gear removed. Fig. 6 is a sectional detail of the adjustable counter-shaft support, taken on line 6 6 of Fig. 2.

In said drawings, A designates the base of the pump; A′, the standards, which rise from said base to carry the journal-bearings *a* for the crank-shaft.

B is the crank-shaft, and C the driving-gear therefor. Ordinarily and as herein shown the base A is cast integral with the standards A′ and includes three distinct cylinders A^2, A^3, and A^4, arranged in a line beneath the crank-shaft. Suitable plungers are provided within said cylinders and are connected by pitmen *b* with the crank-pins of the shaft B. Suitable cross-head guides *a′* for the upper ends of the plunger-rods may also be cast integral with the frame A and standards A′. Suction and discharge chambers A^5 and A^6 are herein shown as located on opposite sides of the base A and are provided with such suitable valves and outlet and inlet apertures as may be found necessary. The general features thus far described are such as are commonly employed in pumps of this character and may be of any suitable or desired construction, except as hereinafter noted.

The crank-shaft B is made in one piece and is preferably a steel casting. It comprises three distinct crank portions B′, B^2, and B^3, having crank-pins b', b^2, and b^3, respectively. The crank B^2 constitutes the middle portion of the crank-shaft, and between it and each of the end cranks B′ and B^3 are journal portions b^4, which rest in the bearings *a* at the upper ends of the standards A′.

The driving-gear C is secured to the crank-shaft just outside of one of said standards A′ and between the end crank-pin b' and the adjacent journal b^4. To permit of this arrangement, the crank B^4 is made of reduced thickness and provided with a surrounding annular rim or flange b^5, made concentric with the journals b^4. The hub *c* of the gear C is counterbored to receive said flange b^5, leaving a central web *c′*, through which and through the flange suitable bolts c^2 are passed to clamp the gear securely in place. The web *c′* is furthermore shown as recessed at c^3 on its inner or counterbored side to receive the thickness b^6 of the crank B^4, where it projects beyond the face of the flange b^5, and the opposite side of the web is shown as thickened or raised correspondingly, as at c^4, to preserve the strength of the web notwithstanding such recess. An aperture c^5 is provided in the web at the apex of the raised portion c^4 to receive the crank-pin b', which projects through said aperture and engages the adjacent connecting rod or pitman in the same manner as though the gear were otherwise located.

The construction thus described is well calculated to resist the several stresses to which the shaft is subjected, and which are various and constantly changing. In a single-acting triplex pump, for example, two of the cranks will be resisting loads applied in the same direction during a portion of their working stroke, but the load will be applied to the forward crank before it is applied to the following crank, and correspondingly the forward crank will be relieved of the load in advance of the following crank, while the third crank will begin its working stroke at a point intermediate to the relief of the first two cranks from their loads. The crank-shaft is thus

subjected to continually changing, bending, and torsional forces that tend to produce a wearing of the shaft which, if not prevented, is almost certain to eventuate in distortion and breakage. In a double-acting pump the varying stresses are doubly complicated and severe, and it has been found almost impossible to economically produce a durable pump of this character with any previous design of crank-shaft. With my improvement, however, the strains upon the middle crank are resisted by a bearing on each side of the crank, while each end crank is supported by the immediately-adjacent bearing on its inner side, and is but little affected except by the strain of its own connecting-rod. The three cranks are integral with each other, so that there are no keyed or other joints to loosen or offer points of weakness where fracture or distortion is liable to occur, and the location of the gear, as described, applies the driving power in a most effective manner at a point comparatively close to the middle of the shaft or near the center of the system of resisting forces to which it is subjected. Whatever weakening results in the particular form shown from the reduced thickness of the crank to which the gear is applied is fully made up by its surrounding flange and by the fact that the gear itself is bolted securely to the flange and practically supports and sustains the crank as though made an integral part thereof. Shafts made as described are ordinarily cast in steel, and when thus made are comparatively inexpensive, although of the strongest possible construction, and effective and durable double as well as single acting triplex pumps may readily be constructed when provided with the improvements thus described.

The gear C is herein shown as actuated by a pinion D, the supporting-shaft d of which is provided at its opposite end with tight and loose pulleys d^2 and d^3 to engage a driving-belt. To permit the pinion D to be adjusted with relation to the gear C, so as to perfectly intermesh therewith, the shaft d is journaled in the bearings e of a vertically-movable plate or frame E. The latter is provided with elongated bolt-holes e' and is secured by clamping-bolts e^2, which pass through the holes e' and clamp the plate against suitable bearing-faces a^2, provided on the standards A′ of the pump-frame. Horizontal lugs a^3 are formed at the lower edge of the bearing-faces a^2 and receive vertical adjusting-screws e^3, which engage the lower edge of the plate E and help to sustain the weight of the parts and the thrust of the gears. Obviously, by loosening the clamp-bolts e^2, turning the screws e^3 as may be necessary, and tightening up the clamping-bolts again the shaft d may be moved nearer to or farther from the driving-shaft and a most accurate adjustment of the intermeshing gears may thus be effected.

It will be understood that, if found desirable, a second driving-gear may be secured to the crank-shaft at the opposite end thereof from the first gear and in the same manner, a second pinion being correspondingly provided on the counter-shaft to intermesh therewith, and by a further application of the same general ideas gears may be provided at intermediate points, if necessary.

I claim as my invention—

1. The combination with a shaft terminating in an integral crank arm and pin, and formed with a concentric flange on the crank-arm, of a gear provided with a central web concentrically recessed to fit over said flange, and having an eccentric aperture through which said terminal crank-pin projects, and clamping devices between the web and flange.

2. An integral crank-shaft for triplex pumps comprising a middle and end cranks and a journaled portion between the middle crank and each end crank, the end-crank pins constituting the extremities of the integral crank-shaft, a concentric flange on one end crank, a concentrically-recessed gear fitting over said flange, an eccentric aperture in said gear to receive the adjacent end-crank pin, and clamping devices between the gear and flange.

3. A crank-shaft for power-pumps comprising journal and crank portions, a flange on one of the cranks concentric with the journals, a gear fitting concentrically against said flange and apertured to permit the crank-pin to project through it, and securing means between the hub and flange.

4. In a triplex pump the combination with the cylinders and plungers of a crank-shaft provided with intermediate and end cranks connected with said plungers and with journal portions resting in bearings between the cranks, a flange on one crank concentric with the journal, a gear fitting concentrically against said flange, securing means between the hub and flange, and an aperture in said hub through which the crank-pin projects.

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