F. C. OLIN.

CRANK AND YOKE CONNECTION.

APPLICATION FILED JULY 5, 1907.

908,605. Patented Jan. 5, 1909.

3 SHEETS—SHEET 1.

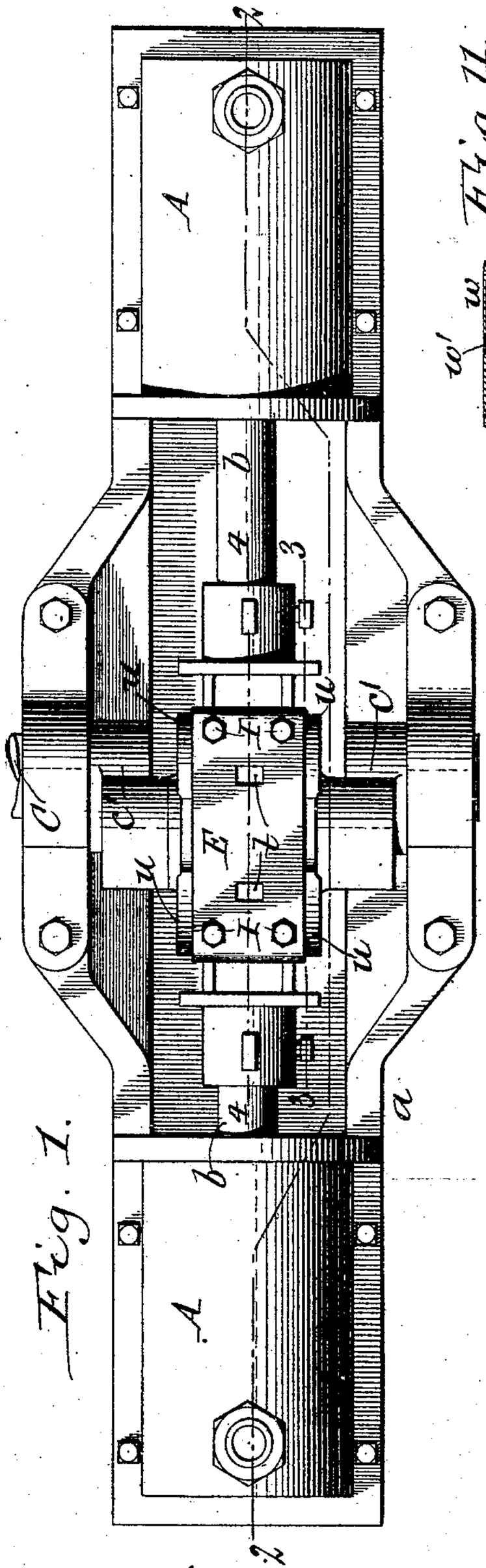


Fig. 1.

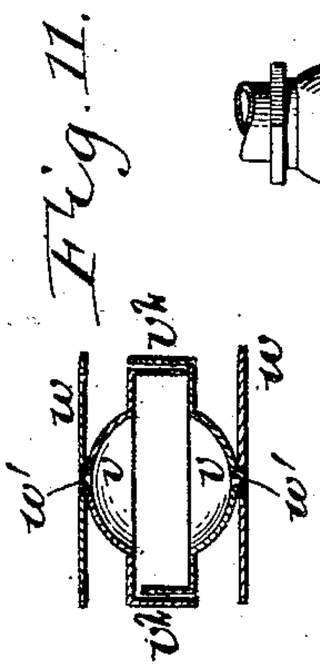


Fig. 11.

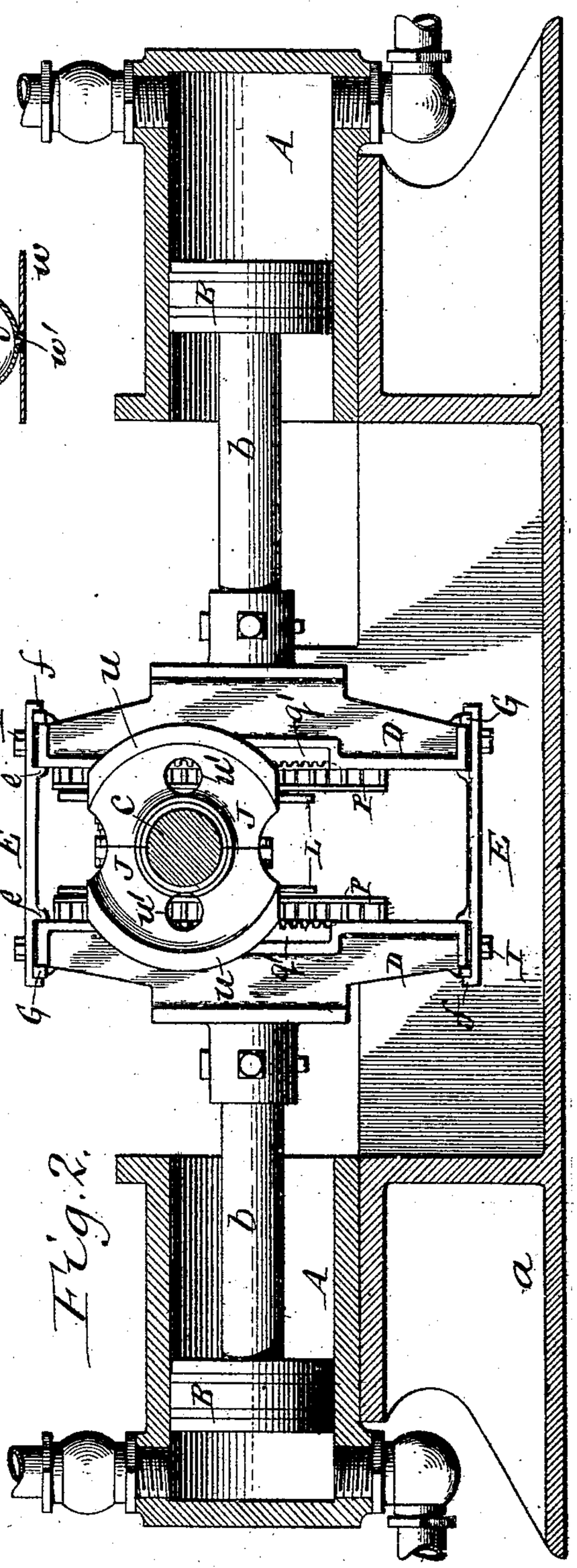


Fig. 2.

Witnesses.
Richard Sommer.
Gustave W. Hopp.

Inventor
Fred C. Olin
by Geyer & Popp
Attorneys

F. C. OLIN.

CRANK AND YOKE CONNECTION.

APPLICATION FILED JULY 5, 1907.

908,605.

Patented Jan. 5, 1909.

3 SHEETS—SHEET 2.

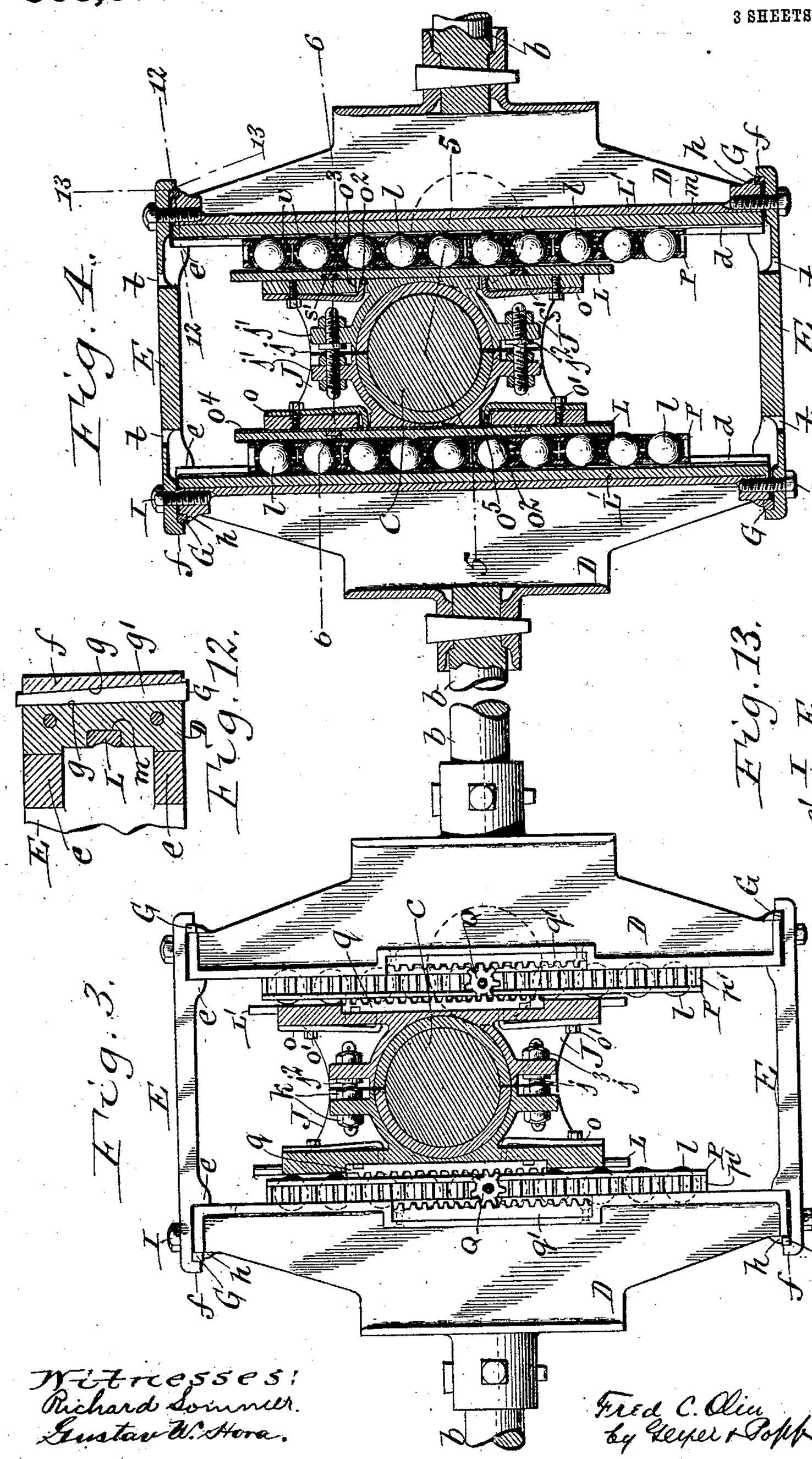


Fig. 4.

Fig. 12.

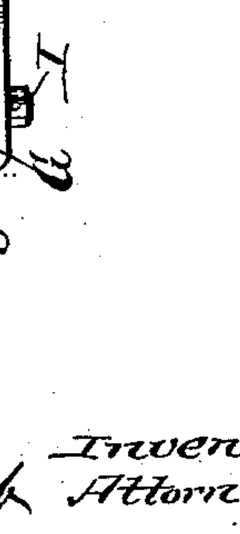


Fig. 13.

Fig. 3.

Witnesses:
Richard Sommer.
Gustav W. Hoya.

Fred C. Olin Inventor
by Geyer & Poppe Attorneys.

F. C. OLIN.

CRANK AND YOKE CONNECTION.

APPLICATION FILED JULY 6, 1907.

908,605. Patented Jan. 5, 1909.

3 SHEETS—SHEET 3.

Fig. 5.

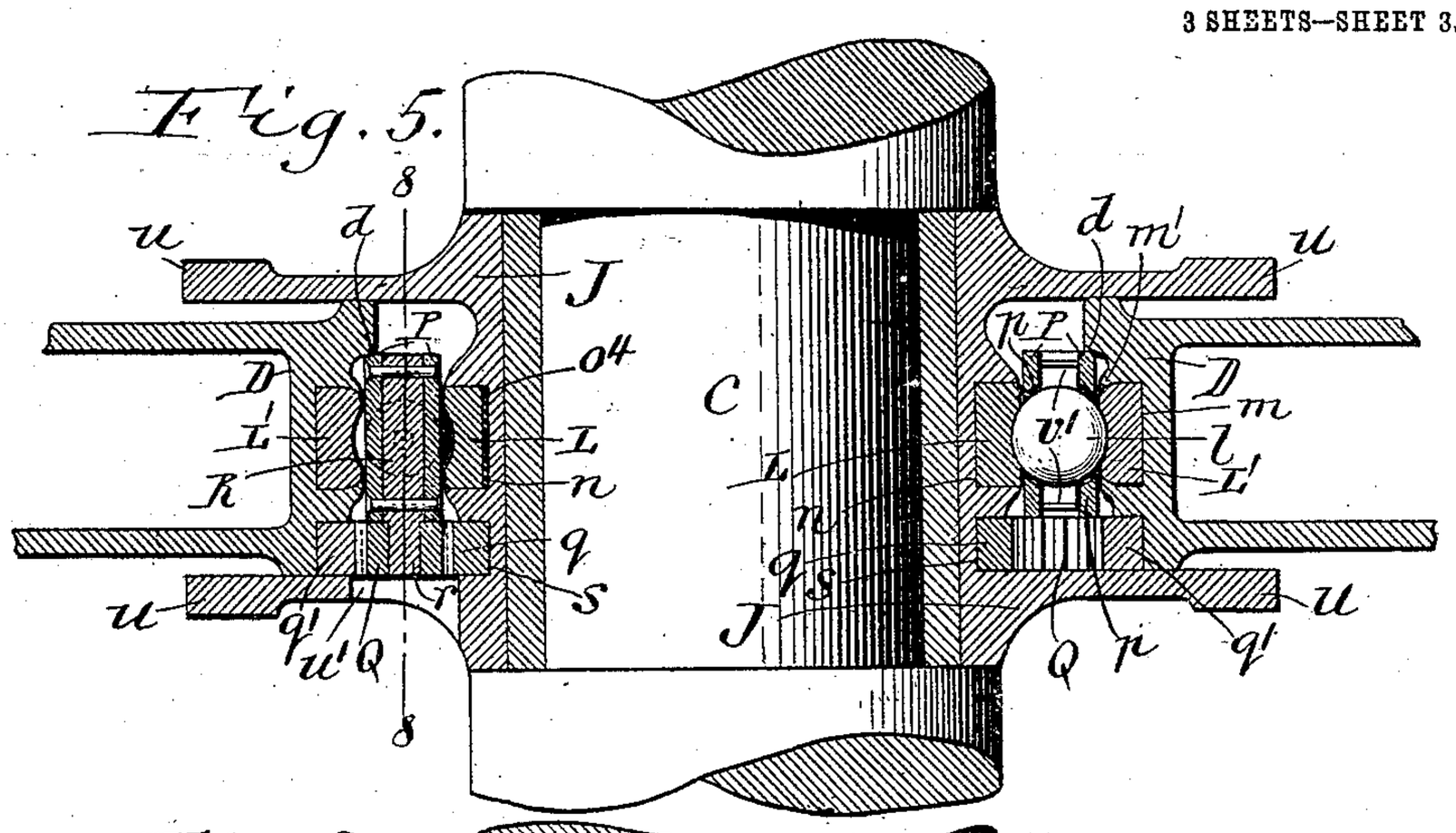


Fig. 6.

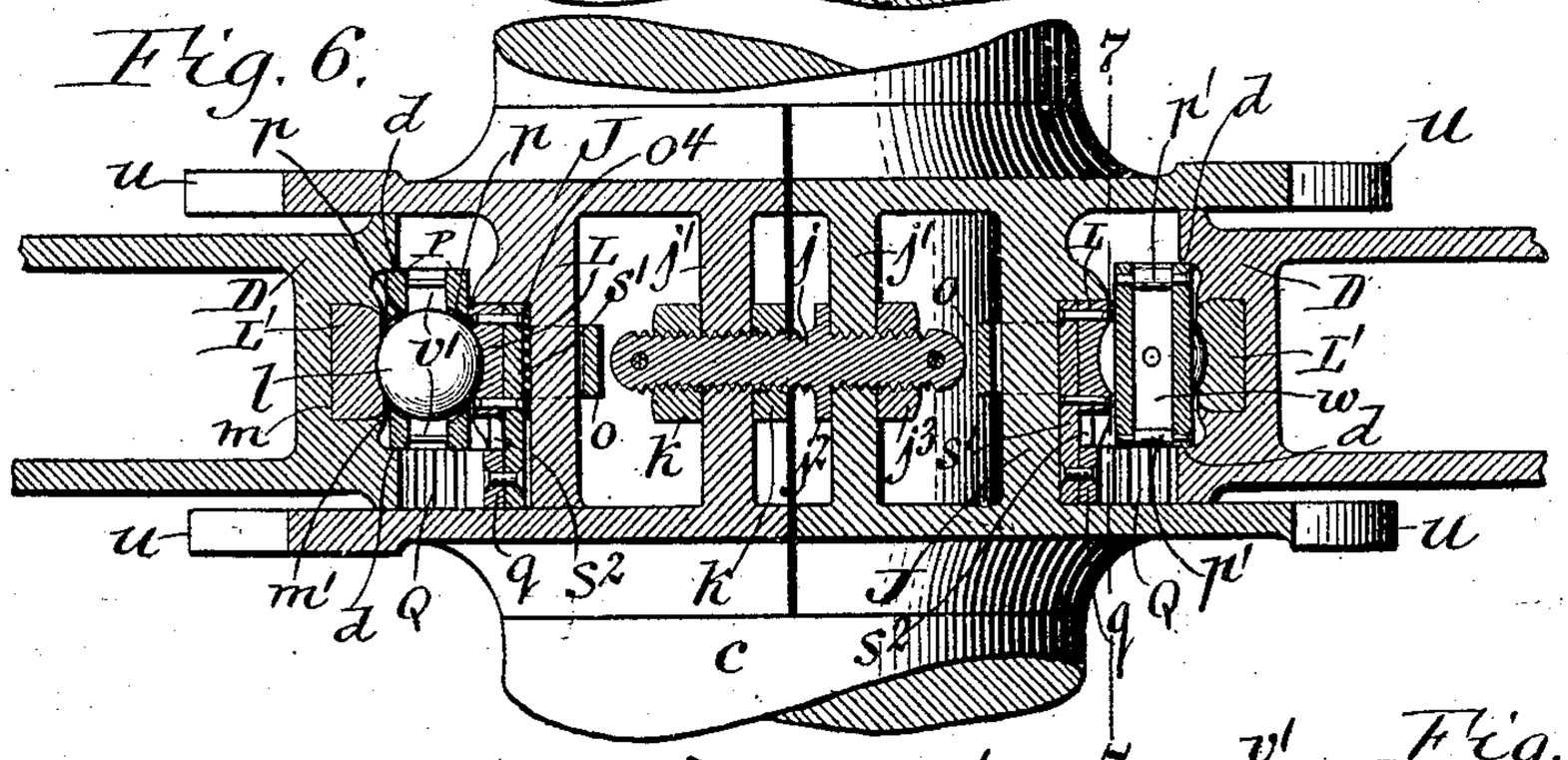


Fig. 7.

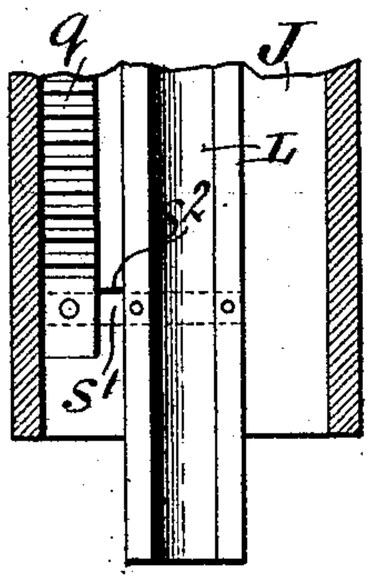


Fig. 8.

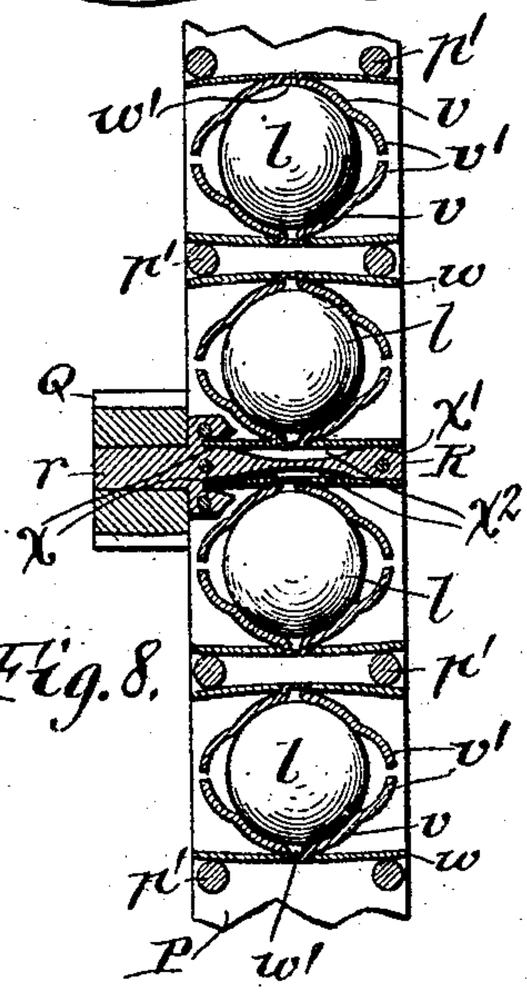


Fig. 9.

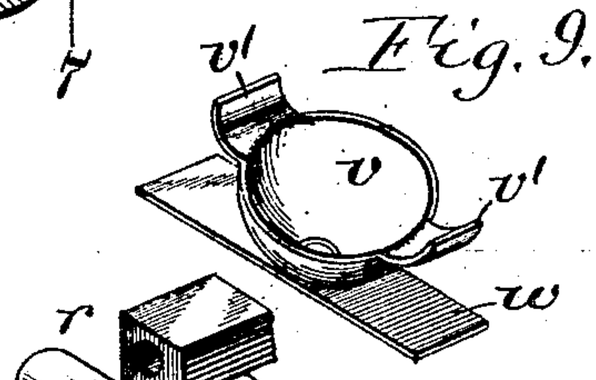
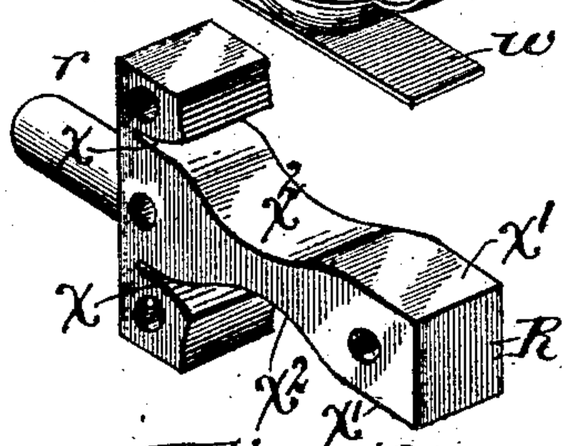


Fig. 10.



Witnesses:
Richard Sommer.
Gustav W. Hora.

Inventor
Fred C. Olin,
by Geyer & Popp
Attorneys

UNITED STATES PATENT OFFICE.

FRED C. OLIN, OF BUFFALO, NEW YORK.

CRANK AND YOKE CONNECTION.

No. 908,605. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed July 5, 1907. Serial No. 382,166.

To all whom it may concern:

Be it known that I, FRED C. OLIN, a citizen of the United States, and resident of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Crank and Yoke Connections, of which the following is a specification.

This invention relates to a crank and yoke connection and has the objects to provide a rolling bearing of improved construction which relieves the friction between the slide and guide bars; to provide improved means for taking up the wear or slack between these parts and to improve the means for connecting the guide bar and the tie bars of the yoke.

In the accompanying drawings consisting of three sheets: Figure 1 is a top plan view showing my improved crank and yoke connection applied to a pump. Fig. 2 is a vertical longitudinal section of the same taken in line 2—2, Fig. 1. Figs. 3 and 4 are fragmentary vertical longitudinal sections, on an enlarged scale, taken in the correspondingly numbered line in Fig. 1. Figs. 5 and 6 are fragmentary horizontal sections, on an enlarged scale, taken in the correspondingly numbered lines in Fig. 4. Fig. 7 is a fragmentary vertical section taken in line 7—7, Fig. 6. Fig. 8 is a fragmentary vertical section, on an enlarged scale, taken in line 8—8, Fig. 5. Fig. 9 is a detached perspective view of one of the ball holders and tension springs. Fig. 10 is a similar view of one of the blocks which support the controlling pinions on the ball cages. Fig. 11 is a detached view showing a modified construction of the ball holders. Fig. 12 is a fragmentary longitudinal section, on an enlarged scale, in line 12—12, Fig. 4. Fig. 13 is a cross section, on an enlarged scale, in line 13—13, Fig. 4.

Similar letters of reference indicate corresponding parts throughout the several views.

In the drawings, my improved crank and yoke connection is applied to a pump for the purpose of illustrating the use of the same, but this invention is applicable to crank and yoke connections generally regardless of the character of the machine of which it forms a part.

The pump shown in the drawings consists essentially of two opposing horizontal cylinders or barrels A, A mounted on a base *a*, pistons or plungers B, B reciprocating in said cylinders and having plunger rods *b* projecting toward each other, and a crank shaft C arranged between the cylinders and having the wrist *c* on its arms c^1 operatively connected with the opposing ends of the plunger rods *b* by my improved crank and yoke connection.

The yoke containing part of my improvements consists essentially of two upright guide bars D, D which are arranged transversely to the line of movement of the yoke, and each connected on the central part of its outer side with the adjacent end of one of the plunger rods in any suitable manner, and two horizontal tie bars E, E connecting corresponding ends of the guide bars.

Various means may be employed for connecting the tie bars with the guide bars, that shown in the drawings being preferred for this purpose and constructed as follows:—

Each tie bar extends with its opposite ends across the corresponding outer ends of the guide bars and is provided on its inner side with shoulders or lugs *e* which bear against the inner sides of the guide bars, as shown in Figs. 2, 3 and 4. At its outer ends each tie bar is provided with inwardly projecting shoulders or lugs *f* which overhang the outer sides of the guide bars at the respective ends thereof.

G represents wedges which form part of the means for coupling the tie bars and guide bars and each of which is provided with two lengthwise converging sides or faces *g*, *g* and two longitudinal parallel sides or faces g^1, g^1 alternating with the converging faces. One of these wedges is driven transversely between the corresponding parts of a tie bar and a guide bar so that its converging faces engage with the horizontally opposite outer side of the guide bar and the lug *f* on the tie bar while its parallel faces engage with the vertically opposite shoulder *h* on the outer side of said guide bar and the inner side of the tie bar, as shown in Figs. 4, 12 and 13. Upon thus driving the wedge between the respective sides and shoulders of these bars, the inner shoulder *e* of the tie bar is firmly drawn against the inner side of the guide bar. These parts are held in this position by means of vertical clamping bolts or screws I arranged between the shoulders *e* and *f* of the tie bar and entering the end of the guide bar. The thickness or width of each

clamping wedge between its parallel sides is preferably slightly greater than the distance from the shoulder *h* on the guide bar to the outer ends of the latter so that the tie bar is prevented from bearing hard on its inner side against the end of the guide bar, as shown in Figs. 3 and 4, and thus cause the wedge to be clamped between the tie bar and guide bar upon tightening the clamping screw, thereby preventing the wedge from becoming loose.

J, J represent the two sections of the slide which receives the wrist of the crank shaft and reciprocates vertically between the guide bars of the yoke. The division between these slide sections is vertically in line with the axis of the wrist and the same are adjustably connected and drawn against opposite sides of the wrist by means of two clamping devices each of which connects the two slide sections on one side of the wrist and is preferably constructed as follows:—

j represents a horizontal clamping screw passing through perforated lugs or ears j^1 on the corresponding ends of the slide sections. This screw is rigidly connected with one of these lugs by means of a collar or shoulder j^2 formed on the screw and bearing against one side of this lug, and a clamping nut j^3 arranged on the screw and bearing against the opposite side of said lug. This screw is also adjustably connected with the lug of the other slide section by means of adjusting nuts *k*, *k* applied to said screw and bearing against opposite sides of the last mentioned lug. Upon backing up on one of the clamping nuts *k* and tightening the other, the relative distance between the two slide sections may be adjusted so that the circular bearing faces on the opposing sides of the same engage properly with the wrist journaled in the slide and take up any wear between the same.

Between the opposing sides of each slide section and the corresponding guide bar is arranged a rolling bearing which preferably consists of a vertical row of balls *l* which engage on opposite sides with vertical tracks L, L^1 arranged on the opposing sides of the respective slide section and guide bar. These tracks are preferably made of hardened steel or other suitable material so as to render the same more durable. Each outer track L^1 is preferably arranged in a longitudinal groove *m* formed on the inner side of its guide bar and held therein preferably by turning the edges of the guide bar on opposite sides of the groove *m* over the track, as shown at m^1 Figs. 5 and 6. Each inner track L is arranged loosely in a longitudinal groove *n* formed on the inner side of its respective slide section and is constantly pressed outwardly against the companion row of balls so as to take up any wear or looseness between the respective slide section and the wrist and any slight wear which may occur in the rolling bearing. The preferred means shown in the drawings, for thus pressing the inner track constantly against the respective row of balls consists of two leaf springs which are arranged on the slide section on opposite sides of the wrist and each of which is secured at one end of its body *o* to the slide section by a screw o^1 while its opposite end is provided with a finger or nose o^2 projecting through an opening o^3 in the slide section into engagement with the back of the inner track, as shown in Figs. 4 and 6. A yielding pressure is thus exerted against the inner tracks of the balls which causes the same to be automatically shifted, thereby elastically clamping the balls and also taking up any slight wear in the rolling bearings between the slide and the yoke. When the wear on these parts is considerable, shims consisting of thin strips of metal or other material may be slipped between the back of the inner tracks and the take-up springs so as to permit the latter to act properly. Such a shim o^4 is shown between the left slide section and the companion inner track in Fig. 4, and this shim is provided with an opening o^5 through which the nose o^2 of one of the take-up springs passes for holding the shim in place without requiring any special device for this purpose.

For the purpose of holding the balls in each rolling bearing the proper distance apart, a ball retaining device is provided which is constructed as follows:

P, P represent two vertical retaining bars arranged on opposite sides of each row of balls and provided with corresponding pairs of openings *p* through which the balls project on diametrically opposite sides into engagement with their respective tracks. The two retaining bars of each row of balls are held the proper distance apart by means of a plurality of transverse pins p^1 which connect the same, two of such pins being preferably arranged on opposite sides of each ball at the ends of the bars and in the spaces between the balls, and forming with said bars a retaining cage or basket for said balls. Each of these cages engages at the longitudinal edges of its outer bars with longitudinal flanges or shoulders *d*, *d* on the guide bars of the yoke as shown in Figs. 4, 5 and 6, thereby preventing these cages from being tilted or displaced laterally while in use. Both cages are positively moved lengthwise of the tracks as the slide reciprocates within the yoke so as to prevent displacement of the balls relatively to the tie bars and insure the proper bearing of the slide against the yoke at all times. This is preferably effected by means of a controlling gear pinion Q pivotally mounted on each ball cage and meshing on opposite

sides with a gear rack q mounted on the adjacent slide section and a gear rack q^1 mounted on the corresponding guide bar. As the slide reciprocates, its gear racks turn the pinions and cause them to roll on the gear racks of the yoke alternately in opposite directions. As the pinions are rotated they move bodily in the same direction as the slide but only one half as far as the slide. By this means the rolling bearings are prevented from slipping and are held positively in their proper position. By providing the guide shoulders d, d on the guide bars for engagement with opposite longitudinal sides of the cages, it is possible to reciprocate the same by employing but a single gear rack on each cage without liability of tilting the same laterally.

Each of the controlling pinions is preferably mounted midway on the outer side of its ball cage, the preferred means for this purpose consisting of a block R which is secured between the retaining bars in the space between the adjacent innermost balls and provided with a laterally projecting pin r on which the pinion is journaled. That part of the supporting block adjacent to the pivot pin r is made as long as possible so as to obtain the maximum bearing surface and permit of receiving at least three rivets, at this end of the block, as shown in Fig. 8, for holding the same in place in the cage and preventing displacement of the same while its pinion is being operated upon the gear racks.

The gear racks on the guide bars are secured to the latter but the gear racks on the slide sections are preferably adjustably mounted on the latter so that the slide sections may be moved toward the wrist or crank pin for preserving the proper relation of these parts when any wear occurs on the crank pin or wrist or its bearing in the slide sections calling for adjustment and also for taking up any slight wear in the rolling bearings. This is preferably effected by arranging the slide gear racks in upright grooves s on the outer sides of the slide sections and connecting each slide gear rack at its upper and lower ends with the back of the corresponding slide track by means of cross pieces or bars s^1, as shown in Figs. 4, 6 and 7. Each of these cross pieces is preferably arranged in a notch s^2 formed in the solid portion of the slide section between the grooves n, s therein which receive the companion inner track and gear rack, as shown in Fig. 7, thereby holding this track and gear rack against longitudinal movement on the respective slide section.

The guide bars and slide sections are made as short as possible, consistent with strength, for securing compactness but to insure the proper transmission of the thrust from the slide to the yoke or vice versa it is desirable to make the tracks of the slide longer than is permissible by the space between the tie bars. For this reason the latter are provided with openings t which are in line with the slide tracks and which receive the ends of these tracks at either end of their reciprocating movement with the slide.

In order to prevent the end portions of the slide sections from springing away from the rolling bearings and compel its tracks to bear uniformly against the balls throughout their length, these end portions are braced by means of stiffening flanges or ribs u which are arranged lengthwise on opposite sides of the slide sections, each flange projecting lengthwise along the adjacent outer side of the respective ball bearing and guide bar. By this means the pressure is distributed uniformly over the entire length of the slide and yoke and increases the durability of the same accordingly. The stiffening ribs or flanges of the slide sections adjacent to the controlling racks and pinions are provided with openings u^1 through which the pinions may be passed in assembling and dismembering the machine.

In order to hold the balls of the rolling bearing reliably in engagement with the cooperating bearing surfaces of the tracks on the slide and yoke and at the same time permit them to yield so as to readily adapt themselves to any variations or inaccuracies of workmanship as well as the inertia thrust the following means are provided:—

v represents a plurality of substantially semispherical cups or holders two of which engage with the opposite sides of each ball between the retaining bars of each cage. On its outer or back side each of these ball holders or cups is secured to the central part of a leaf tension spring w which bears at its opposite ends against the adjacent two cross pins p^1 of the ball cage in the case of all ball holders excepting the two innermost ones. The connection between each holder and its spring is preferably effected by stamping or forming an integral outwardly projecting teat w^1 on the central part of the holder and riveting the same in an opening in the spring, as shown in Fig. 8. On opposite sides of each ball holder and projecting laterally therefrom in the same direction as the ends of its tension spring, are two retaining ears or lugs v^1. These ears may be either curved, as shown in Fig. 8, or bent to form an angle, as shown in Fig. 11, so that the opposite longitudinal edges thereof extend in a direction lengthwise of the inner sides of the retaining bars. The width of these retaining lugs and that of the tension springs is nearly the same as the space between the retaining bars of the ball cage, whereby the tension springs and retaining

lugs are caused to engage loosely with the inner sides of the retaining bars and each ball holder is prevented from tipping or shifting its position laterally toward or from either of the ball tracks. By this means the balls are reliably held in engagement with the tracks. In the absence of this provision the end balls of the rolling bearings would be liable to spring away from the tracks on the guide bars when these balls are uncovered and relieved from the pressure of the inner tracks on their inner sides, causing the end balls to be again quickly moved against the outer tracks when the slide tracks again move against the inner side of the balls, thereby causing hammering and wear of the parts. As shown in Figs. 3 and 8, the retaining lugs of the ball holders on opposite sides of each ball are arranged end to end which construction affords sufficient contact of the same with the inner sides of the retaining bars to prevent lateral displacement of the balls. If desired, the area of contact between the retaining lugs on the ball holders and the retaining bars of the cages may be increased by constructing the lugs of companion holders so that they overlap each other, as shown at v^2 in Fig. 11.

The innermost ball holders have their tension springs arranged on opposite sides of the supporting block R and each of these springs is held in place by engaging one of its ends in a flaring slit x formed at large end of the supporting block while its opposite end engages with a shoulder x^1 at the opposite narrow end of said block, sufficient clearance being provided on the central part of said block by means of a recess x^2 on opposite sides thereof to permit the adjacent tension springs to have the necessary freedom of movement or play.

While this spring and yoke connection is represented in the drawings between a crank shaft and two horizontal pump cylinders for transmitting movement from the former to the latter, it is obvious that the same is equally applicable to a construction in which the yoke moves vertically and also to a construction in which the power is transmitted from the yoke to the slide as would be the case if this crank and yoke connection were employed in a gas engine.

I claim as my invention:

1. A crank and yoke connection comprising a reciprocating slide, guide bars arranged on opposite sides of the slide, tie bars extending past corresponding ends of the guide bars and each end of each tie bar having one shoulder which bears against one side of the adjacent guide bar and another shoulder which is separated by an intervening space from the opposite side of said guide bar, and means for securing each tie bar to each guide bar comprising a wedge arranged in said space and bearing with its opposite sides against the adjacent shoulder of the tie bar and the adjacent side of the guide bar and a screw connecting said tie and guide bars, substantially as set forth.

2. A crank and yoke connection comprising a reciprocating slide, guide bars arranged on opposite sides of the slide and each having outer shoulders which face toward the ends of said bars, tie bars extending past corresponding ends of the guide bars and each end of each tie bar having an inner shoulder which engages the inner side of the adjacent guide bar and an outer shoulder which is separated by an intervening space from the outer side of the respective guide bar, and means for securing each tie bar to each guide bar comprising a wedge arranged in one of said spaces and having two parallel longitudinal faces which engage with the inner side of the tie bar and one of said end facing shoulders on the guide bar and two longitudinal converging faces which alternate with the parallel faces and engage respectively with the outer side of the guide bar and the respective outer shoulder on the tie bar, the thickness of said wedge between its parallel sides being greater than the distance from said end facing shoulder on the guide bar to the outer end of the latter, and a screw connecting said tie bar and guide bar, substantially as set forth.

3. A crank and yoke connection comprising a guide bar, a slide, a track adjustably mounted on the slide, a track arranged on the guide bar, rolling members interposed between said tracks, and means operating to press the slide track and slide apart consisting of a leaf spring secured at one end to the slide and provided at its opposite end with a finger which projects laterally through an opening in the slide into engagement with the track thereon, substantially as set forth.

4. A crank and yoke connection comprising guide bars, tie bars connecting the ends of said guide bars and having openings, a slide reciprocating between said guide bars, tracks arranged on the slide and adapted to pass with their ends into said openings, tracks mounted on the guide bars, and rolling members interposed between the tracks on the slide and the tracks on the guide bars, substantially as set forth.

5. A crank and yoke connection comprising a guide bar, a slide, rolling members interposed between said bar and slide, a cage for said rolling members, gear racks arranged on said slide and bar, and a pinion mounted on said cage and meshing on opposite sides with said racks, substantially as set forth.

6. A crank and yoke connection comprising a guide bar, a slide, a track adjustably mounted on said slide, a track on the guide

bar, rolling members interposed between said tracks, a spring device arranged on the slide and operating to press the same and the track thereon apart, a cage for said rolling members, a gear rack arranged on the guide bar, a gear rack adjustably arranged on said slide and connected with the track thereon, and a pinion pivoted on said cage and meshing on opposite sides with said racks, substantially as set forth.

7. A crank and yoke connection comprising a guide bar, a slide, a track adjustably mounted on said slide, a track on the guide bar, rolling members interposed between said tracks, a spring device arranged on the slide and operating to press the same and the track thereon apart, a cage for said rolling members, a gear rack arranged on the guide bar, a gear rack adjustably arranged on said slide cross pieces arranged in recesses in said slide and connecting the track and rack thereon, and a pinion pivoted on said cage and meshing on opposite sides with said racks, substantially as set forth.

8. A crank and yoke connection comprising a guide bar having inwardly facing shoulders, a slide, rolling members arranged between the slide and bar, and a cage for said rolling members engaging on its opposite sides with said shoulders of the bar, substantially as set forth.

9. A crank and yoke connection comprising a guide bar provided on opposite sides with inwardly facing shoulders, a slide, rolling members arranged between the slide and bar, a cage for said rolling members engaging on opposite sides with said shoulders of the bar, a controlling pinion mounted on one side of said cage, and gear racks mounted on the guide bar and slide respectively and meshing with opposite sides of the pinion, substantially as set forth.

10. A crank and yoke connection comprising two guide bars, a sectional slide guided between said bars, tracks arranged on the slide and guide bars, rolling members interposed between said tracks, a shim arranged between said slide and the track thereon and having an opening, and a spring secured to the slide and projecting through the opening in the shim into engagement with the track on the slide, substantially as set forth.

11. A crank and yoke connection comprising a guide bar, a slide having flanges on its opposite sides which extend along opposite sides of the guide bars, rolling members interposed between said bar and slide, a cage for said rolling members, gear racks arranged on said slide and bar, and a pinion mounted on said cage and meshing on opposite sides with said racks, the flange adjacent to said gear racks and pinion having an opening for the passage of said pinion, substantially as set forth.

12. A crank and yoke connection comprising a guide bar, a slide, a row of balls interposed between said slide and guide bar, a cage which receives said balls, and a pair of spherical holders engaging with opposite sides of each ball and mounted on said cage, substantially as set forth.

13. A crank and yoke connection comprising a guide bar, a slide, a row of balls interposed between said slide and guide bar, a cage which receives said balls, a pair of spherical holders engaging with opposite sides of each ball and mounted on said cage, and springs interposed between each holder and the cage, substantially as set forth.

14. A crank and yoke connection comprising a guide bar, a slide, a row of balls interposed between said slide and guide bar, a cage for said balls comprising two connected retaining bars arranged on opposite sides of the balls and provided with openings through which the balls project, spherical holders engaging with said balls and having ears which engage with the inner sides of said retaining bars, and springs mounted on said cage and operating to press the holders against said balls, substantially as set forth.

15. A crank and yoke connection comprising a guide bar, a slide, a row of balls interposed between said slide and guide bar, a cage for said balls comprising two connected retaining bars arranged on opposite sides of the balls and provided with openings through which the balls project, spherical holders engaging with said balls and having ears which project from said holders in a direction lengthwise of the retaining bars and engage with the inner sides of the latter, and springs mounted on the cage and pressing said holders against the balls, substantially as set forth.

16. A crank and yoke connection comprising a guide bar, a slide guided on said bar, balls interposed between said slide and guide bar, a cage for said balls, spherical holders engaging with said balls and each provided with an integral teat, and a spring bearing against an abutment on the cage and having an opening in which said teat is riveted, substantially as set forth.

17. A crank and yoke connection comprising a guide bar, a slide, a row of balls interposed between said slide and guide bar, a cage for said balls comprising two connected retaining bars arranged on opposite sides of the balls and provided with openings through which the balls project, spherical holders engaging with said balls and having ears which project from said holders in a direction lengthwise of the retaining bars and engage with the inner sides of the latter, and leaf springs each secured centrally to the back of a holder and engaging with its

longitudinal edges against the inner sides of the retaining bars while their opposite ends bear against the connections between said retaining bars, substantially as set forth.

18. A crank and yoke connection comprising a guide bar, a slide, a row of balls interposed between the slide and guide bar, a cage for said balls comprising two connected retaining bars arranged on opposite sides of the balls and having openings through which the balls project, spherical holders engaging with said balls, leaf springs secured to said holders and bearing against the connections between said retaining bars, a block secured between the retaining bars and having slits and shoulders at opposite ends which receive the ends of the leaf springs of adjacent holders, a pinion pivoted on said block, and gear racks mounted on the slide and guide bar and meshing with opposite sides of said pinion, substantially as set forth.

Witness my hand this 2nd day of June, 1907.

FRED C. OLIN.

Witnesses:
THEO. L. POPP,
ANNA HEIGIS.