No. 652,142. Patented June 19, 1900.

# S. W. ROBINSON.

## RIGHT ANGLE SHAFT COUPLING.

(Application filed Sept. 29, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

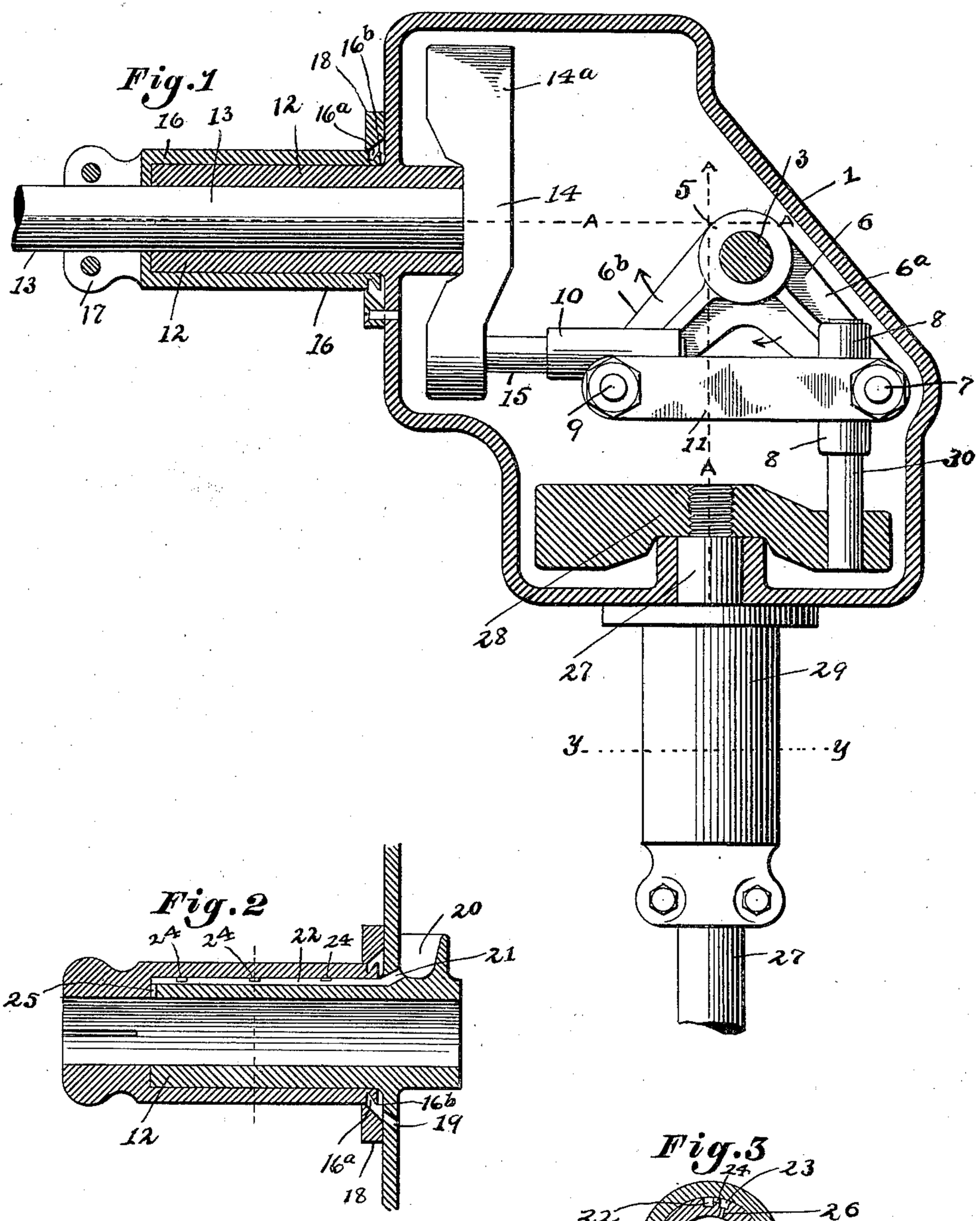


Fig. 2




Fig. 3

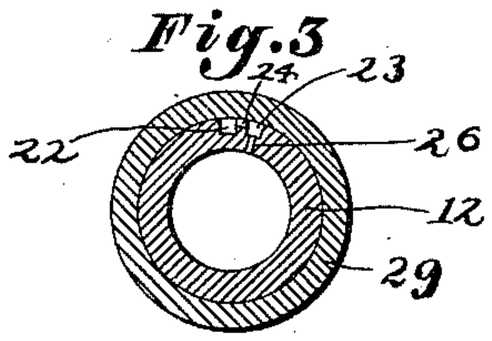


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Fig. 4

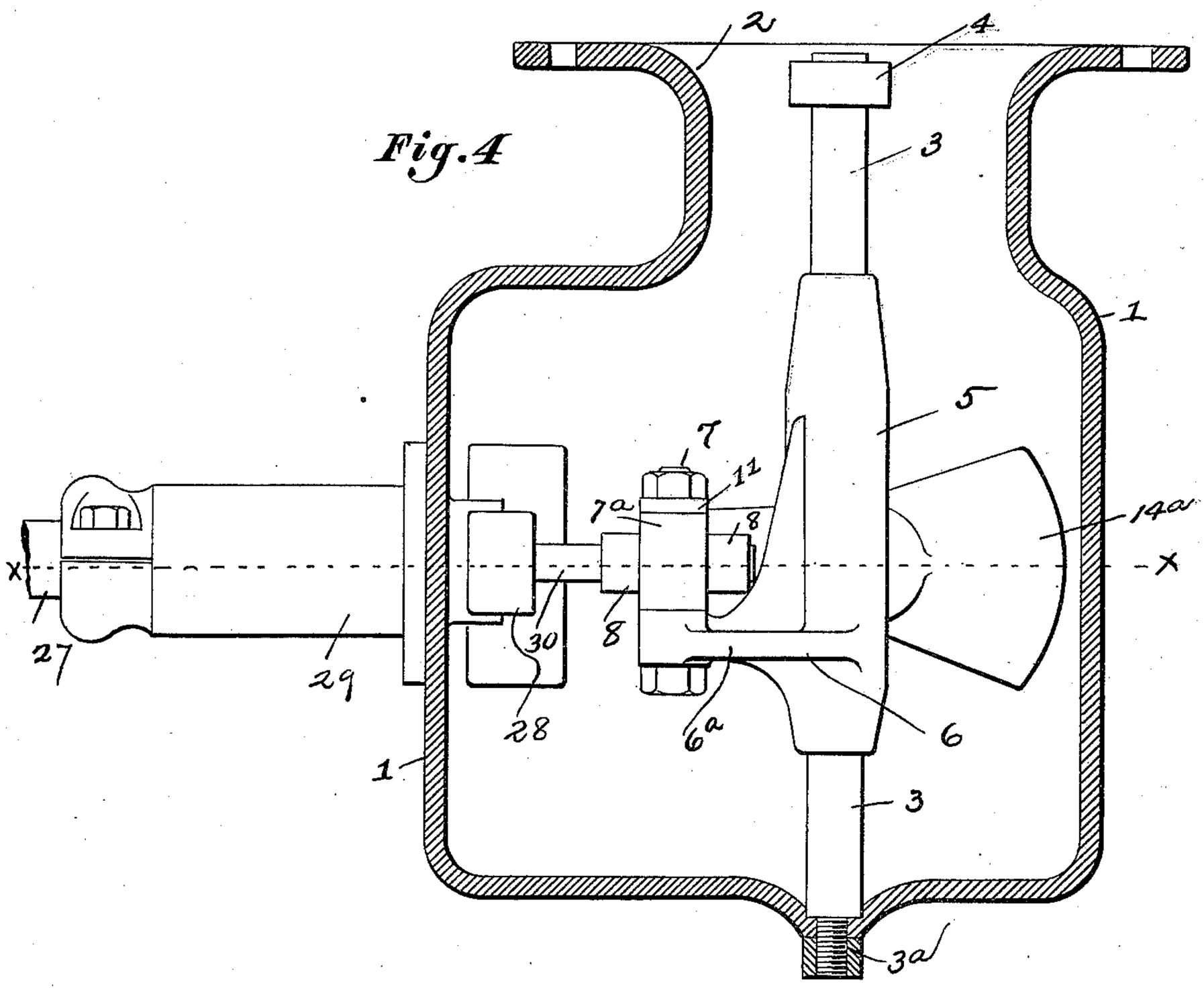
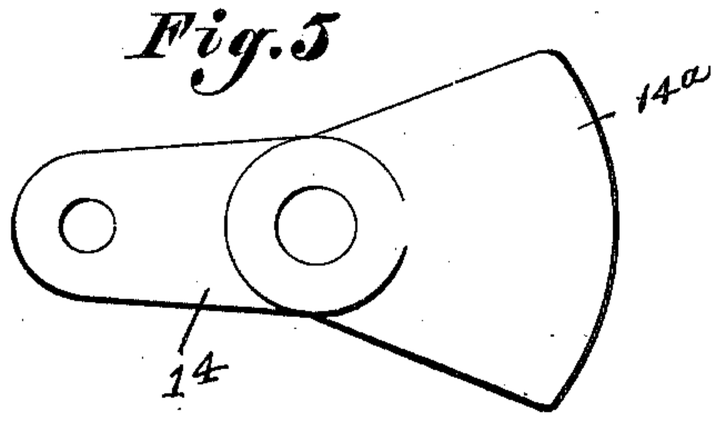



Fig. 5

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# UNITED STATES PATENT OFFICE.

STILLMAN W. ROBINSON, OF COLUMBUS, OHIO.

## RIGHT-ANGLE SHAFT-COUPLING.

SPECIFICATION forming part of Letters Patent No. 652,142, dated June 19, 1900.

Application filed September 29, 1899. Serial No. 732,031. (No model.)

*To all whom it may concern:*

Be it known that I, STILLMAN W. ROBINSON, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Right-Angle Shaft-Couplings, of which the following is a specification.

My invention relates to the improvement of shaft-couplings of that class which are adapted to communicate motion from one shaft to another when the same are arranged at an angle with each other; and the objects of my invention are to provide a coupling of this class wherein improved means are produced for transmitting rotary motion from one shaft to another when said shafts are extending at right or other angles with each other, to provide a comparatively-noiseless coupling which will operate without unusual friction, to so construct and arrange said coupling mechanism as to impart a steady and uniform motion to the shaft to which the power is contributed, to so arrange and construct the parts of my device as to insure a positive and easy operation, and to produce other improvements, the details of construction of which will be more fully pointed out hereinafter. These objects I accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 is a horizontal section of my device on line *x x* of Fig. 4, a portion of the elements, however, being shown in plan. Fig. 2 is a detail longitudinal section through one of the shaft-bearings. Fig. 3 is a transverse section on line *y y* of Fig. 1. Fig. 4 is a vertical section through the casing of my device, showing the mechanism therein in elevation; and Fig. 5 is a detail view in elevation of one of the swinging weighted arms which I employ in the manner hereinafter described.

Similar numerals refer to similar parts throughout the several views.

In carrying out my invention I employ a suitably-shaped casing, which is indicated at 1, this casing preferably being formed with a flanged upper end neck portion 2, which is adapted to be bolted or otherwise secured to and suspended from a suitable supporting-framework.

3 represents a vertical stationary shaft, the upper end of which is supported in a suitable keeper or bracket 4, which projects from the inner side of the neck portion 2 of the casing, and the lower threaded termination of which extends through the bottom of the casing and is provided on the outer side of the latter with a nut $3^a$. Upon the shaft 3 is mounted to slide a vertical sleeve 5, the latter having formed therewith a bell-crank 6, of which $6^a$ and $6^b$ are the arms. At its outer end the arm $6^a$ carries a vertical pin 7, the tubular casing $7^a$ of which is rigidly connected with the center of the length of a horizontal bearing-tube 8. The arm $6^b$ also carries on its outer end a vertical pin 9, the casing of which is centrally connected or formed with a horizontal bearing-tube 10, which extends in a direction at right angles with the tube 8.

11 represents a connecting or tie bar, the ends of which are respectively journaled on the pins 7 and 9.

With one side of the casing 1 I provide a horizontal tubular bearing 12, the latter being provided with a short inwardly-projecting portion and a longer outwardly-projecting portion, as shown. Bearing in and extending through this tubular projection 12 is a power-shaft 13, the latter having secured on its inner end within the casing the central portion of an arm 14, this arm, as indicated more clearly in Fig. 5 of the drawings, having one of its ends enlarged or weighted, as shown at $14^a$. The remaining end of the arm 14 has extending at right angles therewith a pin 15, which fits and slides within the tubular bearing 10. Rotatably mounted upon the outwardly-projecting portion of the case-bearing extension 12 is a sleeve 16, the outer projecting end of which is provided with separated clamp extensions 17, through which a clamping connection of the sleeve and power-shaft 13 is attained. As indicated more clearly in Fig. 1, the inner end of the sleeve 16 terminates at such point as to leave a slight space between said sleeve end and the wall of the casing. It will also be observed that in forming the said sleeve I produce therein adjacent to its end a peripheral recess or notch $16^a$, which results in said sleeve terminating in a peripheral tooth $16^b$. About the inner end portion of the sleeve

thus recessed and secured to the wall of the casing 1 is a ring 18, the central opening of the latter being formed flaring or inclined, as shown. As indicated in Fig. 2 of the drawings, the annular space formed between the internally-inclined ring 18 and the notched portion of the sleeve 16 communicates with the interior of the casing through a port 19.

Formed on the inner projecting portion of the tubular bearing 12 is an oil-cup 20, with which communicates through the port 21 a longitudinal recess 22, formed in the periphery of the outer portion of the bearing. Adjacent to the groove or recess 22 and parallel therewith I provide a second similar groove or recess 23, the grooves 22 and 23 communicating at intervals through the medium of cross-ports 24, these ports gradually increasing in depth. The outer end of the groove 22 leads to the interior of the bearing-tube 12 through the medium of an end recess or port 25.

26 represents inwardly-extending ports, which at intervals connect the grooves 23 with the interior of the bearing-tube 12, one of these ports being shown in Fig. 3 of the drawings.

Bearing in the casing 1 and entering the same at an angle with the shaft 13 is a shaft 27, the latter carrying on its inner end within the casing an arm 28, corresponding in form with the arm 14. The shaft 27, as prescribed for the shaft 13, is provided with a tubular bearing, which corresponds and projects at an angle with the bearing 12, said bearing being surrounded and connected with a sleeve 29, which corresponds with the sleeve 16. The weighted arm 28 has connected with one end thereof a projecting pin 30, which works in the tubular bearing 8.

In order to illustrate the operation of my device, we will assume that motion is contributed to the shaft 13 in any desirable or well-known manner and that it is desirable to contribute this motion to the shaft 27. We will also assume that that end of the arm 14 which carries the pin 15 is moving downward in its rotary motion. This movement of said arm 14 and its pin 15 must result, as will readily be seen, in a downward sliding movement of the sleeve 5, an inward swinging movement of the arm $6^b$, and an inward swinging movement of the tubular bearing 10 of the pin 15, these parts thus moving in the directions indicated by the arrows in Fig. 1. It will also be observed that the movement above described results in a corresponding swinging movement of the bell-crank arm $6^a$ and sliding movement of the tubular bearing 8 on the pin 30 of the arm 28. On the upward movement of the pin-carrying end of the arm 14 it is obvious that the movement of the parts above described will be reversed. It will thus be seen that through the reciprocating and swinging movements of the sleeve 5 and bell-crank arms and the swinging and sliding movement of the tubular bearings 8 and 10 on the pins 15 and 30 the rotary motion of the shaft 13 is uniformly imparted to the shaft 27. In the manner above described it will be seen that simple, reliable, and effective means are provided for communicating motion from a power-shaft to another shaft at an angle therewith and that the means so employed are such as to insure uniformity and complete correspondence in the rotation of said shafts.

For the purpose of calling attention to one of the details of the construction herein shown I have shown on Fig. 1 of the drawings dotted lines, which are indicated at A A, these lines showing extensions or continuations of the axes of the shafts 13 and 27. It will be observed that the shortest distance between the dotted line A, which indicates an extension of the axis of the shaft 13, and the center of the shaft 3 is equal to the shortest distance between the center of said shaft 3 and the dotted line A, which indicates the axis extension of the shaft 27, and that the distances between the centers or axes of the shafts 9 and 7 and the axes of the tubular bearings 10 and 8 are identical with the said shortest distances between said lines A A and the center of said shaft 3. Through this relative arrangement of parts it will be apparent that I attain a perfect or uniform movement of the tubular bearings 10 on the pins 30 and 15. For instance, the distances between the outer ends of the tubular bearings 10 and 8 and the arms 14 and 28 will be the same as that indicated in the drawings when said arms are rotated until the pins are directly opposite or at points in horizontal alinement with the positions shown in said drawings.

In order to properly supply the shaft-bearings with oil, I have provided the oil-cup 20 and the oil-recesses, grooves, and ports hereinbefore described. In this connection it will be observed that oil from the cup 20 will pass through the groove or recess 22, from which the oil may escape through the cross-ports 24 into the recess or groove 23, and thence through the ports 26 to the surface of the shaft. It will also be observed that such oil as may run to the end of the recess 22 may pass to the shaft through the end port 25. Any surplus oil which is within the sleeve or between said sleeve and the tubular bearing 12 may escape into the annular space which is formed between the ring 18 and said sleeve. In seeping or dropping into this annular space it is obvious that the tooth-like projection $16^b$ will provide a dripping edge from which the oil may drop against the inclined inner surface of the ring 18 and escape through the opening 19 into the casing. It is evident that this tooth-like projection on the sleeve will at the same time serve to prevent the oil through centrifugal motion or otherwise working outward along the outer side of said sleeve, and in this connection it

will be seen that, if desired, I might employ one or more additional grooves $16^a$ and teeth $16^b$, the same being covered by an enlargement or increase in thickness of the ring 18.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an angle-shaft coupling, the combination with a frame, shafts journaled at right angles therewith, arms carried on said shafts and pins projecting from said arms, of a vertically-movable and swinging bell-crank and tubular bearings on said bell-crank arms adapted to receive loosely the shaft-arm pins, said parts being so arranged with relation to each other that the shortest distances between the centers of said bell-crank pins and said tubular pin-bearings will be equal to the shortest distances between imaginary extensions of the axes of said shafts and the center of the pivot-point of said bell-crank, substantially as specified.

2. In an angle-shaft coupling, the combination with a casing or frame, shafts journaled therein at an angle with each other, arms carried on said shafts and pins projecting from said arms, of a vertically movable and swinging bell-crank mounted in said frame or casing, vertical pins 9 and 7 carried on said bell-crank arms, sleeves surrounding said pins and tubular bearings 10 and 8 supported from and at right angles with said sleeves, said tubular bearings adapted to receive loosely the shaft-arm pins, substantially as specified.

STILLMAN W. ROBINSON.

In presence of—
C. C. SHEPHERD,
A. L. PHELPS.