(No Model.) 3 Sheets—Sheet 1.

# H. HESS.

## SHAFT COUPLING.

No. 566,980. Patented Sept. 1, 1896.

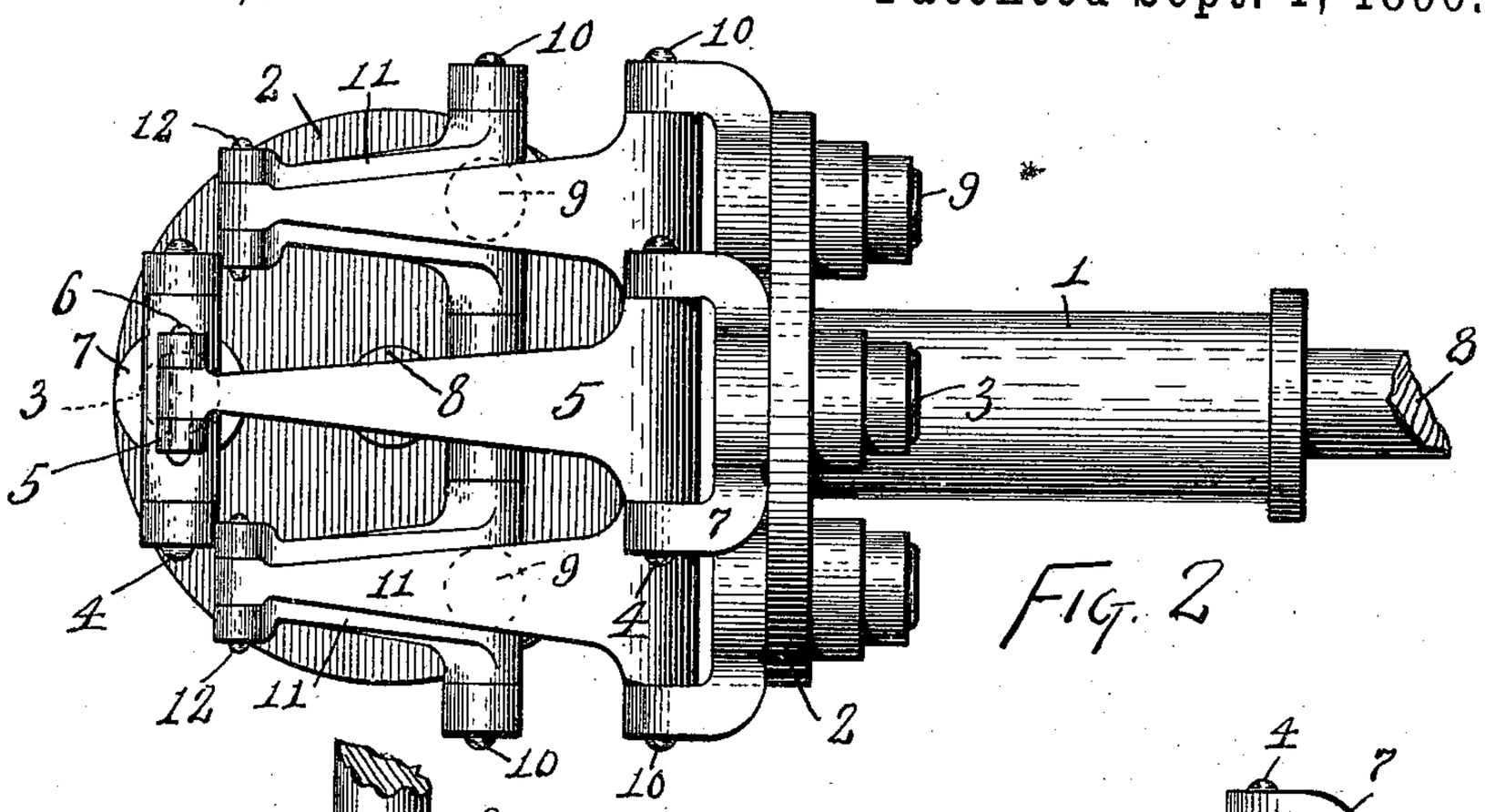


FIG. 2

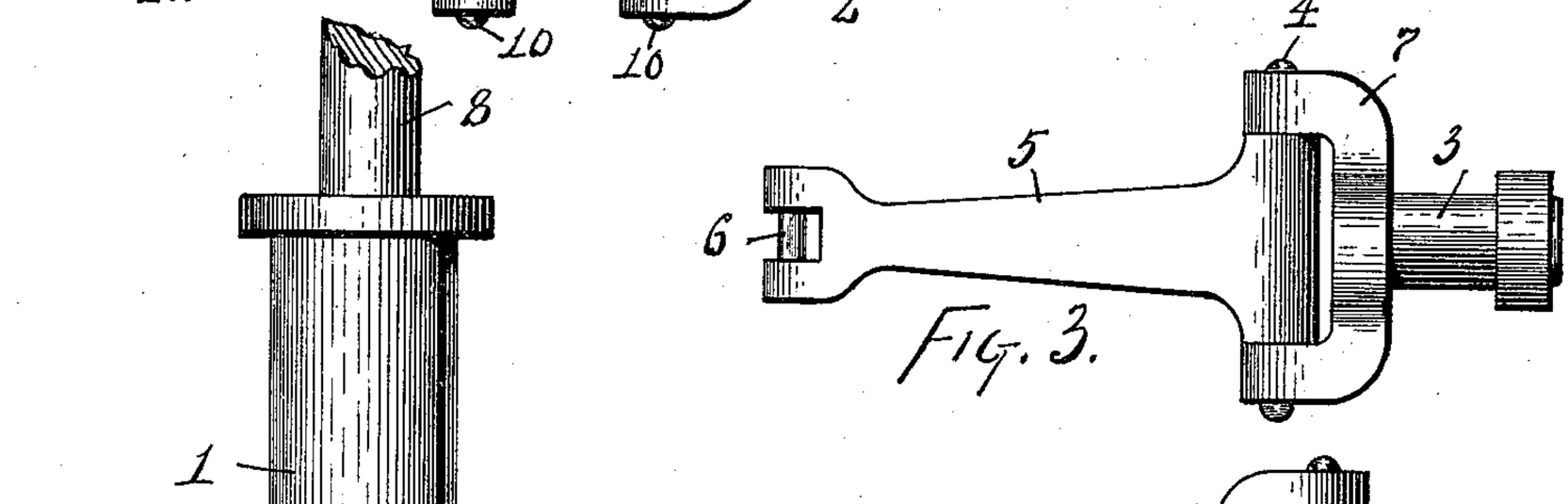


FIG. 3.

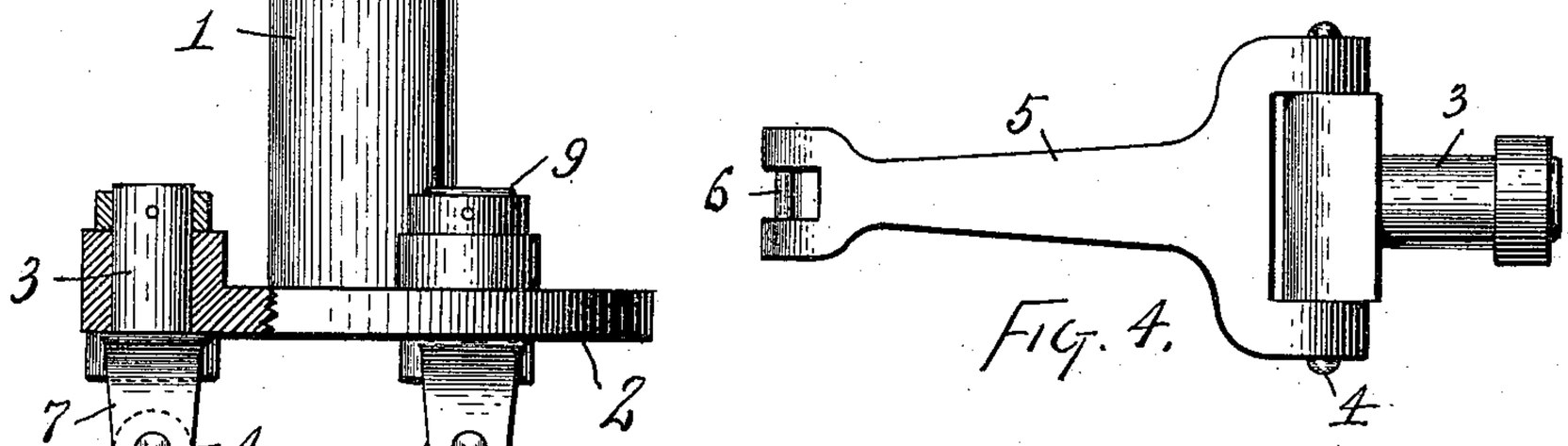


FIG. 4.




FIG. 1.

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(No Model.) 3 Sheets—Sheet 2.

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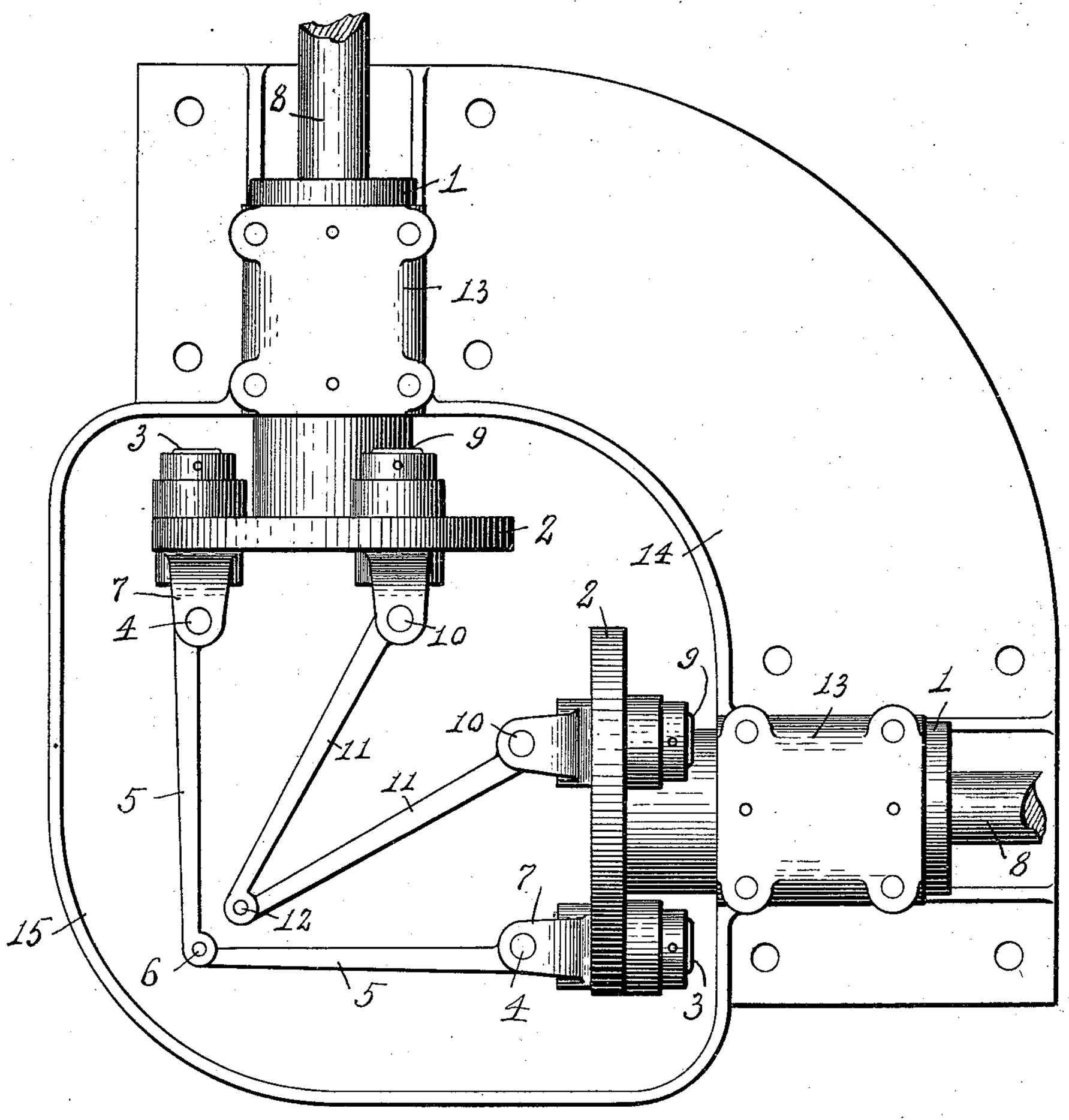


FIG. 5.

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(No Model.) 3 Sheets—Sheet 3.

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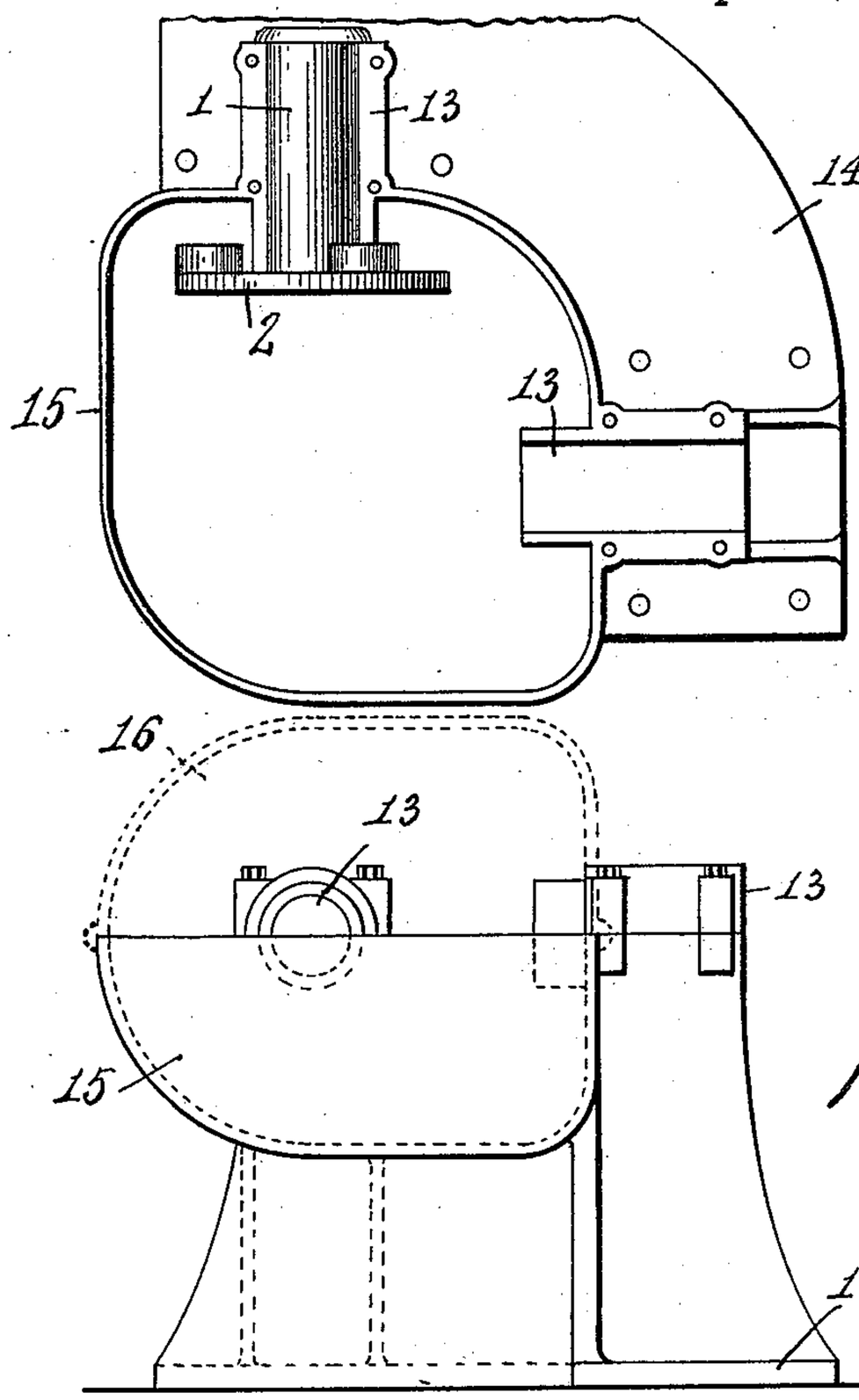


FIG. 6.

FIG. 7.

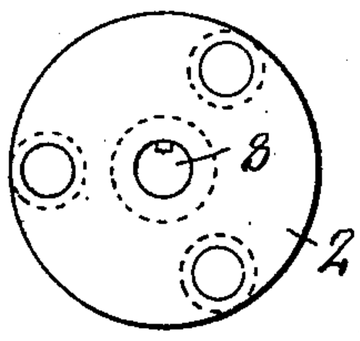


FIG. 8.

FIG. 9.

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# UNITED STATES PATENT OFFICE.

HENRY HESS, OF HAMILTON, OHIO.

## SHAFT-COUPLING.

SPECIFICATION forming part of Letters Patent No. 566,980, dated September 1, 1896.

Application filed January 25, 1896. Serial No. 576,772. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY HESS, of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Shaft-Couplings, of which the following is a specification.

This invention pertains to improvements in shaft-couplings designed for the transmission of power and motion between two shafts arranged at an angle to each other.

My improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a plan of a shaft-coupling embodying my invention; Fig. 2, a side end elevation of the same; Fig. 3, a side elevation of one of the driving-arms; Fig. 4, a side elevation of one of the driving-arms modified in construction; Fig. 5, a plan similar to Fig. 1, but showing the coupling mounted in a suitable housing adapted for use where the coupling is to be employed on two shafts having a fixed angular relationship to each other; Fig. 6, a plan of the housing of Fig. 5; Fig. 7, a side elevation of this housing; Fig. 8, a face view of one of the driving-disks, and Fig. 9 a plan of a housing suited for employment in cases where the two shafts are coupled at a variable or selective angle to each other.

In the drawings, but confining attention for the present exclusively to Figs. 1, 2, 3, and 4, 1 indicates a pair of journals, one at the end of each of the pair of shafts which is to be coupled, the axes of these journals being at right angles to each other and in a common horizontal plane, the journals being assumed as supported in suitable bearings; 2, a driving-disk fast on the inner end of each of the journals 1 and forming each a crank-pin carrier; 3, a pair of crank-pins, one journaled in each of the disks 2; 4, a vertical pivot carried by the inner end of each of the crank-pins 3, parallel with the planes of disks 2; 5, a pair of driving-arms, with their heels connected with the respective crank-pins 3 by means of the pivots 4; 6, a pivot parallel with pivots 4, uniting the outer ends of arms 5; 7, forks carried by the inner ends of journals 3 to support the pivots 4, these forks straddling the inner ends of the arms 5, as shown in Figs. 1, 2, and 3, Fig. 4, however, illustrating an equivalent construction, in which the forks are formed upon the arms 5 and straddle heads upon the journals 3; and 8, the two shafts between which motion is to be transmitted, these shafts being either parts of or adjuncts of the journals 1.

Figs. 1 and 2 may now be studied with reference solely to the parts which have been thus far referred to, namely, the two shafts, the two journals properly supported in bearings, a crank-pin journaled in the disk of each journal, and a pair of arms 5, pivoted together and to the crank-pins. If one of the journals 1 be turned, its crank-pin 3 will be carried around in a circular path. Assume power to be applied to turn the journal 1 at the right of Fig. 1, and that the crank-pin 3 pertaining to that journal is in its outermost position, as shown in Fig. 1, and that the direction of rotation is such as to carry that crank-pin upwardly. As this crank-pin rises it forces its arm 5 to rise, and, consequently, forces the other arm and other crank-pin to rise and the other disk to turn in correspondence with the first disk. As the two crank-pins rise in their circular paths of motion they move inwardly, during which motion the arms 5 vibrate upon their pivots while still transmitting motion from the first to the second crank-pin. During the rotation of the disks the pivot 6 will move in a vertical plane in which lies the intersection of the axes of the two shafts, and the connecting-point 6 of the two arms 5 will describe in that plane a crank-path having somewhat the form of an ellipse with symmetrical ends and non-symmetrical sides. While the crank-pins 3 are rising through the outer portions of their path or descending through the inner portions of their paths, the arms are capable of properly transmitting the motion, but when the crank-pins are on their upper or lower centers there are dead-points. Hence the arrangement thus far described is adapted for the transmission of motion of complete rotation only when the second or driven shaft is provided with a fly-wheel to aid in overcoming the dead-centers. The motion transmitted by the arms 5 is such as to insure equal angular velocities for two shafts.

I do not contemplate the general use of the coupling as thus far described and calling for

the employment of a fly-wheel where the shafts are to make complete rotation. While the system is useful where the shafts make but partial rotations, or where a fly-wheel is employed upon the second shaft, I provide for the perfect transmission of entire rotations without the use of a fly-wheel. This matter will now be explained by further reference to the drawings, proceeding with which 9 indicates other crank-pins journaled in the disks, the drawings showing each disk as thus provided with three crank-pins; 10, pivots carried by these additional crank-pins, similar to and parallel with pivots 4; 11, driving-arms similar to arms 5 and similarly connected with their appropriate crank-pins 9; and 12, pivots connecting the outer ends of the arms 11 in pairs, after the manner of pivot 6.

While one connected pair of crank-pins is at the dead-center of its path another pair is in position for efficient work. The outer connected ends of the arms all move in the same vertical plane and describe the same peculiar crank-path. There is no limit to the number of pairs of crank-pins and connecting-arms which may be employed, except such limit as may be imposed by the necessity for finding room for the parts. Increasing the number of pairs of crank-pins and arms obviously reduces the transmitting strains imposed upon the individual members.

Explanation will now be made of exemplifying means for supporting the bearings 1.

The coupling shown in Figs. 1 and 2 may be considered as a self-contained structure ready for the reception of the shafts in connection with which it is to operate, in which case the shafts 8 may be socketed into the journals 1 or into disks 2, Fig. 8 showing one of the disks as fitted to receive its shaft, the journals 1 becoming practically the journals of the shafts, regardless of whether they be an individual part of the disks or of the shafts. In practice, however, I prefer to form the journals 1 as integral parts of the disks and to mount the coupling as a whole in a suitable housing ready for the reception of the shafts, which shafts will then find journals provided for them at the coupling. In most cases of practical transmission the two shafts will be at right angles to each other, in which case the housing for the coupling may have its two bearings in fixed relationship to each other.

Proceeding with the drawings, 13 indicates the two bearings for the journals 1; 14, a sole-plate on which these bearings are rigidly supported by being integrally formed therewith or fixedly secured thereto, the bearings and their support forming a housing for the journals; 15, a half-casing disposed below the intersection of the axes of the two bearings and adapted to form a lower chamber portion for the coupling, and 16 a removable half-casing to complete the inclosure of the coupling.

In the illustrations the two bearings 13, the sole-plate 14, and the casing portion 15 are cast integrally. The coupling mounted in such a housing as this finds a rigid support well adapted for the maintenance of the two journals in fixed angular relationship to each other. In the drawings the two shafts have been assumed as at an angle of ninety degrees to each other, but the coupling will work with perfection at other angles, and it is obvious that the housing of Figs. 6 and 7 (shown as suited for shafts at ninety degrees to each other) might be constructed for use with shafts having a fixed relative angle other than ninety degrees.

In some cases the angle at which the shafts work might need to vary, or while the angle of the shafts might be fixed it might not be known at the time of the construction of the coupling just what that angle would be. In such cases the housing may have its bearings adjustable, as will be understood from Fig. 9, in which 17 is the sole-plate, provided with bolt-grooves 18, arranged as arcs struck from the line of intersection of the two shafts, and 18 the two bearings secured to the sole-plate and adjusted at desired angles to each other. Either or both of the bearings may be adjusted upon the sole-plate to suit the desired angularity of the two shafts with reference to each other.

I claim as my invention—

1. In a shaft-coupling, the combination, substantially as set forth, of a pair of journals with their axes in a common plane and intersecting, a crank-pin carrier, as a disk, carried by each journal, a crank-pin journaled in each carrier, a pivot carried by each crank-pin with its axis at right angles to that of the crank-pin, a pair of driving-arms connected each at its heel with one of said pivots, and a pivot connecting the remaining ends of the two driving-arms and disposed parallel with the other pivots.

2. In a shaft-coupling, the combination, substantially as set forth, of a pair of journals with their axes in a common plane and intersecting, a crank-pin carrier, as a disk, carried by each journal, an equal number of crank-pins journaled in each carrier, a pivot carried by each crank-pin with its axis at right angles to that of such crank-pin, driving-arms each connected at its heel with one of said pivots, and pivots connecting the remaining ends of the driving-arms in pairs and disposed parallel with the other pivots.

3. In a shaft-coupling, the combination, substantially as set forth, of a housing supporting a pair of bearings in rigid relationship with their axes in a common plane and intersecting, a journal in each of said bearings, a crank-pin carrier, as a disk, carried by the inner end of each journal, a crank-pin journaled in each carrier, a pivot carried by each crank-pin with its axis at right angles to that of such crank-pin, a pair of driving-arms connected each at its heel with one of

said pivots, and a pivot connecting the remaining ends of the two driving-arms and disposed parallel with the other pivots.

4. In a shaft-coupling, the combination, substantially as set forth, of a housing rigidly supporting a bearing, a second bearing rigidly supported by said housing with its axis in the plane of and intersecting the axis of the first bearing in adjustable angular relationship thereto, a journal in each of said bearings, a crank-pin carrier, as a disk, carried by each journal, a crank-pin journaled in each carrier, a pivot carried by each crank-pin with its axis at right angles to that of such crank-pin, a pair of driving-arms connected each at its heel with one of said pivots, a pivot connecting the remaining ends of the two driving-arms and disposed parallel with the other pivots.

5. In a shaft-coupling, the combination, substantially as set forth, of a housing supporting two bearings with their axes in a common plane and intersecting, a casing supported by said housing and forming a chamber at the inner ends of the two bearings, a journal mounted in each bearing and socketed for the reception of the ends of shafts, a crank-pin carrier, as a disk, carried by each journal, an equal number of crank-pins journaled in each carrier, a pivot carried by each crank-pin with its axis at right angles to such crank-pin, driving-arms each with its heel connected with one of said pivots, and pivots connecting the remaining ends of the driving-arms in pairs and disposed parallel with the other pivots.

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Witnesses:
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