

July 26, 1949.

L. W. COLE

2,477,441

TOY GEAR

Filed Oct. 19, 1946

3 Sheets-Sheet 1

Fig. 1.

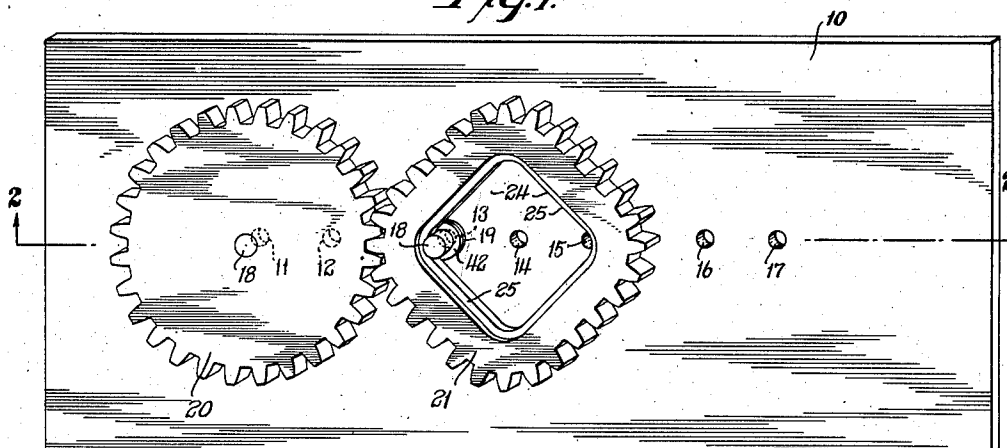


Fig. 2.

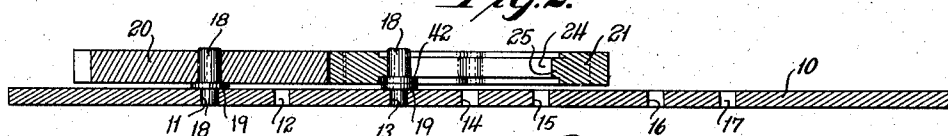


Fig. 3.

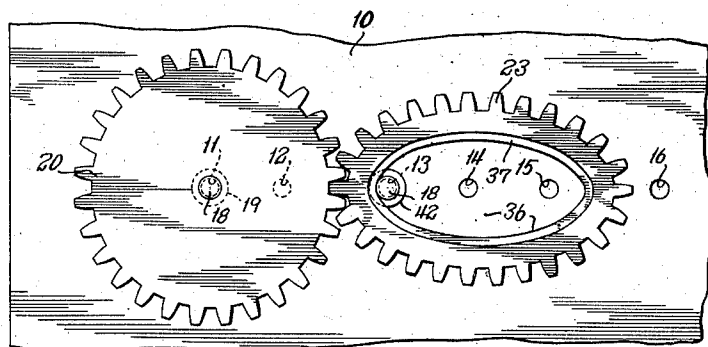
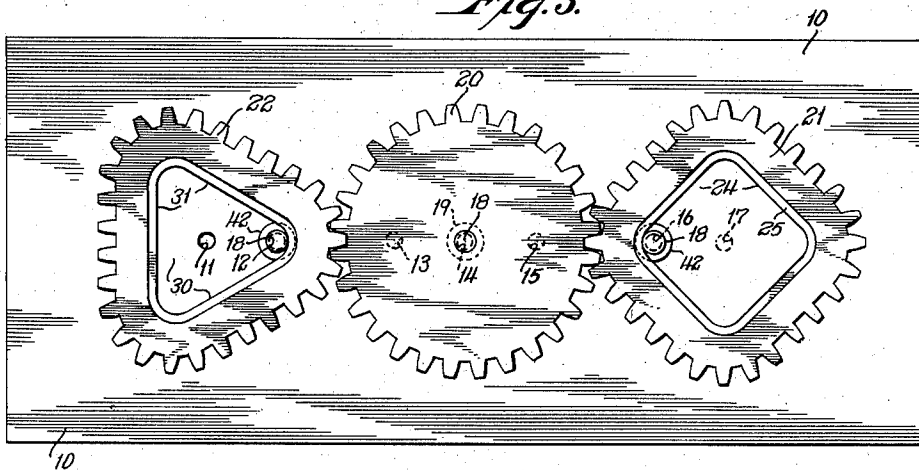


Fig. 4.

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Fig. 5.

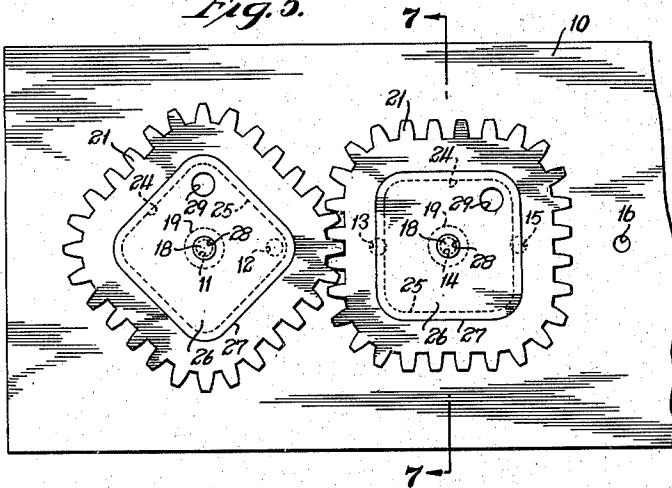


Fig. 6.

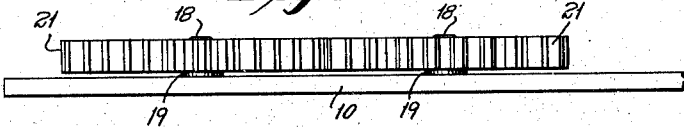


Fig. 8.

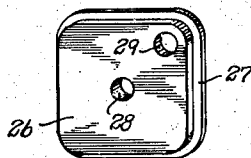


Fig. 9.

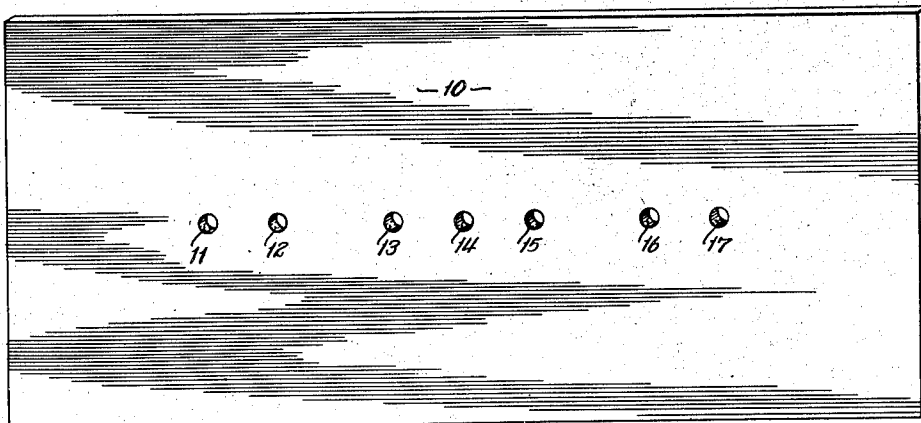
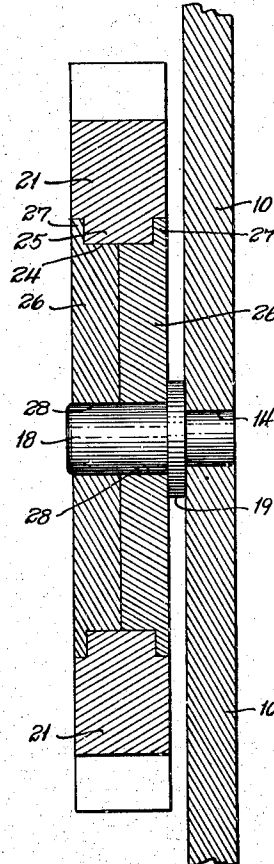


Fig. 7.



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Fig. 10.

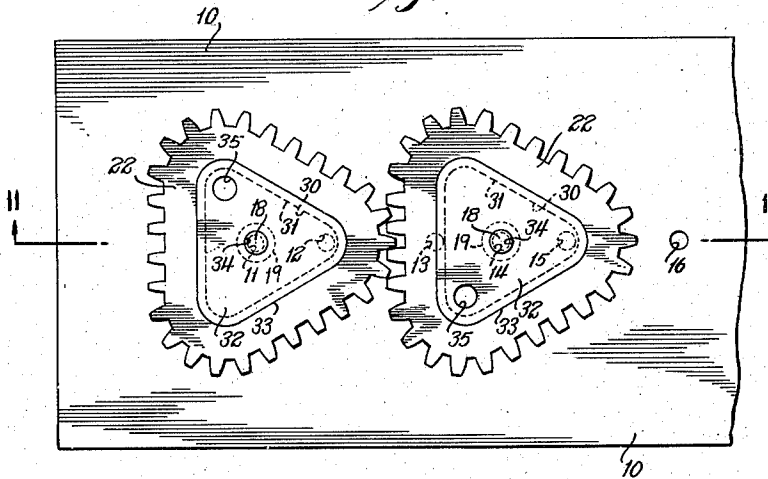


Fig. 11.

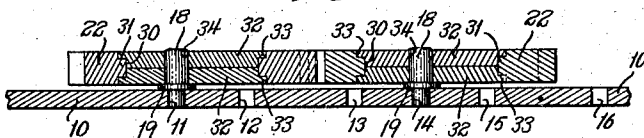


Fig. 12.

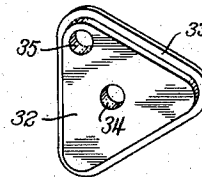


Fig. 13.

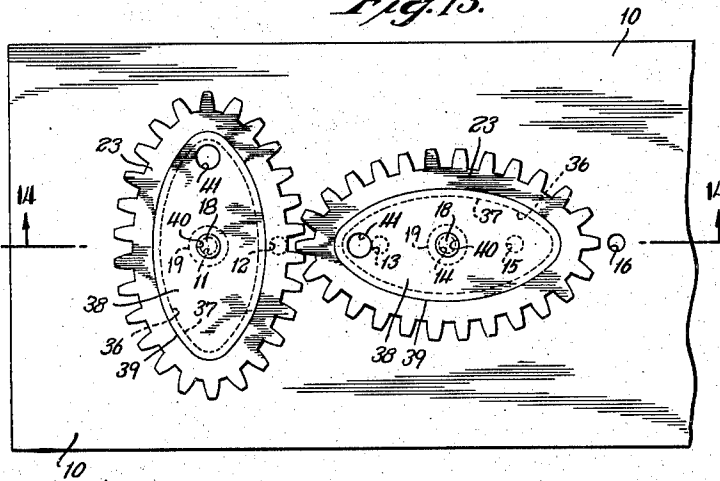


Fig. 15.

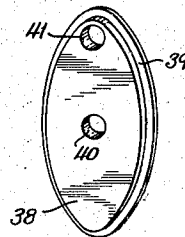
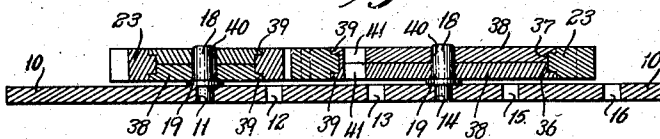


Fig. 14.



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UNITED STATES PATENT OFFICE

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TOY GEAR

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Application October 19, 1946, Serial No. 704,409

6 Claims. (Cl. 35-13)

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The present invention relates to improvements in gears and relates more particularly to toy gears.

One of the main objects of the present invention is to provide toy gears which will serve not only to entertain but also to instruct in the mechanical arts.

Another object of the present invention is to provide superior toy gears whereby various types of gears may be intermeshed to instruct in the functioning thereof, and to afford entertainment.

A further object of the present invention is to provide gears of the character referred to whereby non-circular gears may be intermeshed with each other and/or with circular gears to enable a student to visually observe the effects of the resultant coaction.

Still another object of the present invention is to provide at a low cost for manufacture, a toy gear-set having its components so related that variable speed-drives and the like are demonstrated.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a broken perspective view of a mounting-plate having mounted thereon for rotation a circular gear and a coacting rectangular gear;

Fig. 2 is a sectional view taken on the line 2-2 of Fig. 1;

Fig. 3 is a plan or face view of the mounting-plate and a gear-set comprising a circular gear, a triangular gear and a rectangular gear;

Fig. 4 is a broken plan or face view of the mounting-plate having a circular gear and an elliptical gear mounted thereon;

Fig. 5 is a broken plan or face view of two intermeshing rectangular gears mounted upon the mounting-plate but with their respective centering-plates in place to permit turning movement about their respective centers;

Fig. 6 is an edge view of the assembly of Fig. 5;

Fig. 7 is a broken sectional view on an enlarged scale and taken on the line 7-7 of Fig. 5;

Fig. 8 is a perspective view of one of the centering-plates for the rectangular gears;

Fig. 9 is a perspective view of the mounting-plate;

Fig. 10 is a view similar to Fig. 5 but showing

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two triangular gears, each provided with their respective triangular centering-plates;

Fig. 11 is a sectional view taken on the line 11-11 of Fig. 10;

Fig. 12 is a perspective view of one of the centering-plates for the triangular gears of Figs. 10 and 11;

Fig. 13 is a view similar to Figs. 5 and 10 but showing two intermeshing elliptical gears, both of which are provided with their respective elliptical centering-plates;

Fig. 14 is a sectional view taken on the line 14-14 of Fig. 13; and

Fig. 15 is a perspective view of one of the centering-plates of the elliptical gears of Figs. 13 and 14.

For the purpose of holding a plurality of gears in meshing relationship, a mounting-plate generally designated by the reference character 10, is preferably employed.

In the instance shown, the mounting-plate 10 is formed with a series of seven (more or less) spaced sockets or passages 11, 12, 13, 14, 15, 16 and 17, each of which is adapted to receive one of a plurality of corresponding guide-studs 18. Each of the said guide-studs 18 is formed intermediate its respective opposite ends with an annular spacing-flange 19 which is adapted to seat against the top or forward face of the mounting-plate 10 when a given guide-stud is inserted into any one of the sockets 11 to 17 inclusive.

For use in conjunction with the mounting-plate 10 and the guide-studs 18, it is preferred to provide a plurality of circular gears 20, a plurality of rectangular gears 21, a plurality of triangular gears 22, and a plurality of elliptical gears 23, though a lesser number of gears and types thereof will provide an entertaining and instructive set.

Each of the rectangular gears 21 is formed centrally with a substantially-rectangular clearance-opening 24 extending through the gear from face to face. Formed within the clearance-opening 24 and extending slightly inwardly toward the center of the gear, is a stop-rib 25 narrower than the thickness of the gear of which it forms a part and having its respective opposite faces set inwardly with respect to the adjacent faces of the gear. The inner surface of the stop-rib 25 extends in parallelism with the pitch-line of the gear 21 of which it forms a feature and provides a guide-surface for purposes as will hereinafter appear, and having a length in a peripheral direction less than the peripheral length of said pitch-line.

For the purpose of closing the clearance-opening 24 in a given rectangular gear 21, two (more or less) centering-plates 26 (Figs. 5, 7 and 8) may be employed. Each of the said centering-plates is formed around its edge with a relatively-thin flange 27 which is flush with one face and which is adapted to seat against the adjacent face of the stop-rib 25 of a given gear 21 in the manner illustrated in Fig. 7. Preferably and as shown, two similar centering-plates are arranged in opposition in the clearance-opening 24 in a given gear 21 and may be held therein by friction or in any other desired manner.

Each centering-plate 26 above referred to is provided centrally with a bearing-passage 28 and is also provided with an eccentric-receiving passage 29 located eccentrically with respect to the said central bearing-passage 28.

Each of the triangular gears 22 above referred to is formed centrally with a substantially-triangular clearance-opening 30 extending through the said gear from face to face. Formed within the clearance-opening 30 and projecting toward the center of the gear is a stop-rib 31 which is narrower than the thickness of the gear of which it forms a part and has its respective opposite faces set inwardly with respect to the adjacent faces of the gear. The inner surface of the stop-rib 31 provides a guide-surface which extends in parallelism with the pitch line of the gear 22 of which it forms a feature in a manner similar to the inner face of the stop-rib 25 of the rectangular gears 21. The said guide-surface has a length in a peripheral direction materially less than the peripheral length of the said pitch-line.

For the purpose of closing the clearance-opening 30 in a given triangular gear 22, two (more or less) centering-plates 32 (Figs. 10, 11 and 12) may be employed. Each of the said centering-plates 32 is generally of triangular outline to snugly fit the triangular clearance-opening 30 in a given gear 22 and is provided around its edge, in a position flush with one face, with a flange 33 which is adapted to have its inner face seated against the adjacent face of the stop-rib 31 in a manner similar to the seating of a centering-plate 26 against the stop-rib 25 of the rectangular gears 21 before described.

Preferably, each triangular centering-plate is formed centrally with a bearing-passage 34 and is also formed adjacent its perimeter with an eccentric-receiving passage 35, as is shown in Figs. 10 and 12.

Like the rectangular gears 21 and the triangular gears 22, the elliptical gears 23, before referred to, are each provided with a central clearance-opening 36 which in this instance, however, is of elliptical form and generally conforms in contour to the pitch-line of the teeth of the gear 23 of which it is a feature.

Formed within the clearance-opening 30 and projecting toward the center of the gear, is a stop-rib 37 which, like the stop-ribs 25 and 31 before referred to, is narrower than the thickness of the gear of which it forms a part and has its respective opposite faces set inwardly with respect to the adjacent faces of the gear. The inner surface of the stop-rib 37 serves as a guide-surface and extends in parallelism with the pitch-line of the gear 23 of which it forms a feature. The length of the said guide-surface in a peripheral direction is materially less than the said pitch-line.

Like the rectangular gears 21 and triangular gears 22, the elliptical gears 23 are each provided

with two (more or less) centering-plates 38 which, however, in this instance are of elliptical outline complementing the elliptical outline of the elliptical gear and snugly fitting with a friction fit within the elliptical clearance-opening 36 thereof.

Each centering-plate 38 is formed upon its edge in a position flush with one face, with a flange 39 extending entirely around its perimeter. The said flange 39 is adapted to have its inner face seated against the adjacent face of the stop-rib 37, in a manner similar to the seating of the previously described centering-plates 26 and 32.

Preferably and as shown, each elliptical centering-plate 38 is formed centrally with a bearing-passage 40 and is formed eccentrically adjacent its periphery with an eccentric-receiving passage 41.

Preferably the gears 21, 22 and 23 have their respective clearance-passages extending completely therethrough though not necessarily so, since each of said gears may be otherwise provided with an inwardly-facing guide-surface which extends in substantial parallelism with the respective pitch-lines.

The functioning of the elements of Figs. 1 and 2

The various elements above described may be assembled in different relationships such, for instance, as that shown in Figs. 1 and 2. In this arrangement, a guide-stud 18 is installed (by friction or otherwise) in the socket or passage 11 of the mounting-plate and a circular gear 20 is mounted upon the said guide-stud with capacity for rotation with respect thereto. Another guide-stud 18 is installed in the socket or passage 13 in the mounting-plate 10 in a position closely adjacent the periphery of the circular gear 20. A rectangular gear 21, from which its centering-plates 26 have been omitted, is slipped over the last-mentioned guide-stud 18 after a spacing-washer 42 has been first slipped over the said guide-stud.

Now when the circular gear 20 is turned in any suitable manner, the rectangular gear 21 will be turned by the said gear 20 through an irregular path, since the inner face of its stop-rib 25 will ride along the surface of the adjacent guide-stud 18. As before pointed out, the inner face of the stop-rib 25 is substantially parallel throughout its length with the pitch-line of the rectangular gear of which it forms a part.

If desired, the rectangular gear 21 may be turned through its irregular path, to thus, in turn, drive the circular gear 20.

The functioning of the elements of Fig. 3

In Fig. 3, three guide-studs 18 are respectively installed in the sockets or passages 12, 14 and 16 of the mounting-plate 10. A triangular gear 22 (minus its centering-plates 32) is slipped over the particular guide-stud 18 which is installed in the socket 11. A circular gear 20 is installed upon the particular guide-stud 18 mounted in the socket 14. Slipped over the guide-stud 18 in the socket 16 of the mounting-plate 10 is a rectangular gear (minus its centering-plates 26) in position to mesh with the said gear 20.

Now when the circular gear 20 is turned it will cause both the triangular gear 22 and the rectangular gear 21 to turn in their respective irregular paths around the particular guide-studs 18 extending into their respective clearance-openings 30 and 24.

Instead of propelling the triangular gear 22

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and the rectangular gear 21 by means of the circular gear 20 in the assembly shown, the remaining two gears may be propelled by applying force to either the said triangular gear 22 or the rectangular gear 21.

The functioning of the elements of Fig. 4

In Fig. 4, two guide-studs 18 are respectively installed in the sockets or passages 11 and 13 of the mounting-plate 10. Mounted for rotation upon the guide-stud 18 in the socket 11 is a circular gear 20, while slipped over the guide-stud 18 of the socket 13 is one of the elliptic gears 23.

Now when the circular gear 20 is propelled, it will cause the complementary elliptical gear 23 to ride around the guide-stud 18 which projects into its clearance-opening 35 from the socket 13 in the mounting-plate 10.

If desired, the elliptic gear 23 may be first turned to thereby cause the rotation of its complementary circular gear 20.

The functioning of the members of Figs. 5, 6, 7 and 8

In the organization now being described, two guide-studs 18 are respectively installed in the sockets or passages 11 and 14 of the mounting-plate 10. Two rectangular gears 21 are shown as each provided with two centering-plates 26. The assemblies each comprising a rectangular gear 21 and its two centering-plates 26, are respectively installed upon the guide-studs 18 for concentric rotation.

Now when either of the two rectangular gears is turned, it will effect the turning of the other at irregular rates of movement, due to the constantly changing radius of contact between the teeth of the meshing rectangular gears.

The functioning of the elements of Figs. 10, 11 and 12

In the figures just referred to, two guide-studs 18 are shown as respectively mounted in the sockets 11 and 14 of the assembly-plate 10.

Two triangular gears 22 each with its two centering-plates 32 installed in its clearance-opening 30, are shown as mounted on the said guide-studs in intermeshing relationship. The mounting referred to is effected by slipping the bearing-passages 34 of the aforesaid centering-plates over the guide-studs in question.

Now when either one of the triangular gear assemblies has manual force applied to it, it will cause the turning movement of the other at varying rates of speed as the radius of coaction changes.

The functioning of the elements of Figs. 13, 14 and 15

Two guide-studs 18 are shown as respectively installed in the sockets 11 and 14 of the assembly-plate 10 and each thereof extends into the aligned bearing-passages 40 of an adjacent pair of elliptical centering-plates 38. Each pair of centering-plates 38 is installed in the elliptical clearance-passage of one of the elliptical gears 23.

Now when either one of the elliptic gear assemblies is turned, it will propel the other thereof at varying ratios of speed due to the changing radius of coaction.

The respective eccentric-receiving sockets 29, 35 and 41 of the various centering-plates 26, 32 and 38 are adapted to receive any suitable stud or the like by means of which one gear-unit may be connected by a link to another gear-unit to produce further interesting and instructive effects.

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The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A convertible non-circular toy gear-unit for coaction with other similar gears of a toy gear-set and including in combination: a gear having substantially radially-projecting integral teeth arranged on a non-circular pitch-line and provided within the confines thereof with a substantially continuous non-circular inwardly-facing guide-surface for engagement with a guide-stud or the like; the said non-circular guide-surface being of less peripheral length than the peripheral length of the non-circular pitch-line of the gear and extending in substantial parallelism therewith; and a removable and replaceable centering-member provided substantially centrally with bearing-means, the said centering-member being extendable across the central portion of the gear to convert the same for rotation about substantially its center.

2. A convertible non-circular toy gear-unit for coaction with other similar gears of a toy gear-set and including in combination: a gear having substantially radially-projecting integral teeth arranged on a non-circular pitch-line and provided within the confines thereof with a substantially continuous non-circular clearance-opening for the reception of a guide-stud or the like and extending through the gear from face to face, the said clearance-opening having a lateral boundary-surface of less peripheral length than the peripheral length of the non-circular pitch-line of the gear and extending in substantial parallelism therewith; and a removable and replaceable centering-member provided substantially centrally with bearing-means, the said centering-member being attachable to the said gear and extendable across the clearance-opening therein to convert the gear for rotation about substantially its center.

3. A convertible non-circular toy gear-unit for coaction with other similar gears of a toy gear-set and including in combination: a gear having substantially radially-projecting integral teeth arranged on a non-circular pitch-line and provided within the confines thereof with a substantially continuous non-circular clearance-opening for the reception of a guide-stud or the like and extending through the gear from face to face, the said clearance-opening having a lateral boundary-surface of less peripheral length than the peripheral length of the non-circular pitch-line of the gear and extending in substantial parallelism therewith; and a pair of complementary removable and replaceable centering-members each provided substantially centrally with bearing-means, the said centering-members being attachable to the said gear and extendable respectively across the opposite ends of the clearance-opening therein to convert the gear for rotation about substantially its center.

4. A convertible non-circular toy gear-unit for coaction with the other similar gears of a toy gear-set and including in combination: a gear having substantially radially-projecting integral teeth arranged on a non-circular pitch-line and provided within the confines thereof with a sub-

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stantially-continuous non-circular inwardly-facing guide-surface for engagement with a guide-stud or the like, the said non-circular guide-surface being of less peripheral length than the peripheral length of the non-circular pitch-line of the gear and extending in substantial parallelism therewith; a removable and replaceable centering-member provided substantially centrally with bearing-means, the said centering-member being extendable across the central portion of the said gear to convert the gear for rotation about substantially its center; and eccentric-drive means carried by the said centering-member in a position eccentric with respect to its said bearing-means.

5. A convertible non-circular toy gear-unit for coaction with other similar gears of a toy gear-set and including in combination: a gear having substantially radially-projecting integral teeth arranged on a non-circular pitch-line and provided within the confines thereof with a substantially-continuous non-circular clearance-opening for the reception of a guide-stud or the like and extending through the gear from face to face, the said clearance-opening having a lateral boundary-surface of less peripheral length than the peripheral length of the non-circular pitch-line of the gear and extending in substantial parallelism therewith; a pair of removable and replaceable centering-members each provided substantially centrally with bearing-means, the said centering-members being attachable to the said gear and extendable respectively across the opposite ends of the clearance-opening therein to convert the gear for rotation about substantially its center; and two eccentric-drive means re-

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spectively carried by the said centering-members and positioned thereon eccentrically with respect to the bearing-means of the given centering-member.

6. A convertible non-circular toy gear-unit for coaction with other similar gears of a toy gear-set and including in combination: a gear having substantially radially-projecting integral teeth arranged on a non-circular pitch-line and provided within the confines thereof with a non-circular clearance-opening for the reception of a guide-stud or the like and extending through the gear from face to face, the said gear being formed in its said clearance-opening with a stop-rib providing an inwardly-facing boundary-surface of less peripheral length than the peripheral length of the non-circular pitch-line of the gear and extending in substantial parallelism therewith; and a removable and replaceable centering-member provided substantially centrally with bearing-means, the said centering-member being attachable to the said gear and extendable across the clearance-opening therein to convert the gear for rotation about substantially its center.

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