Aug. 18, 1936. I. SHORT 2,051,498

REDUCTION GEAR

Filed May 29, 1935

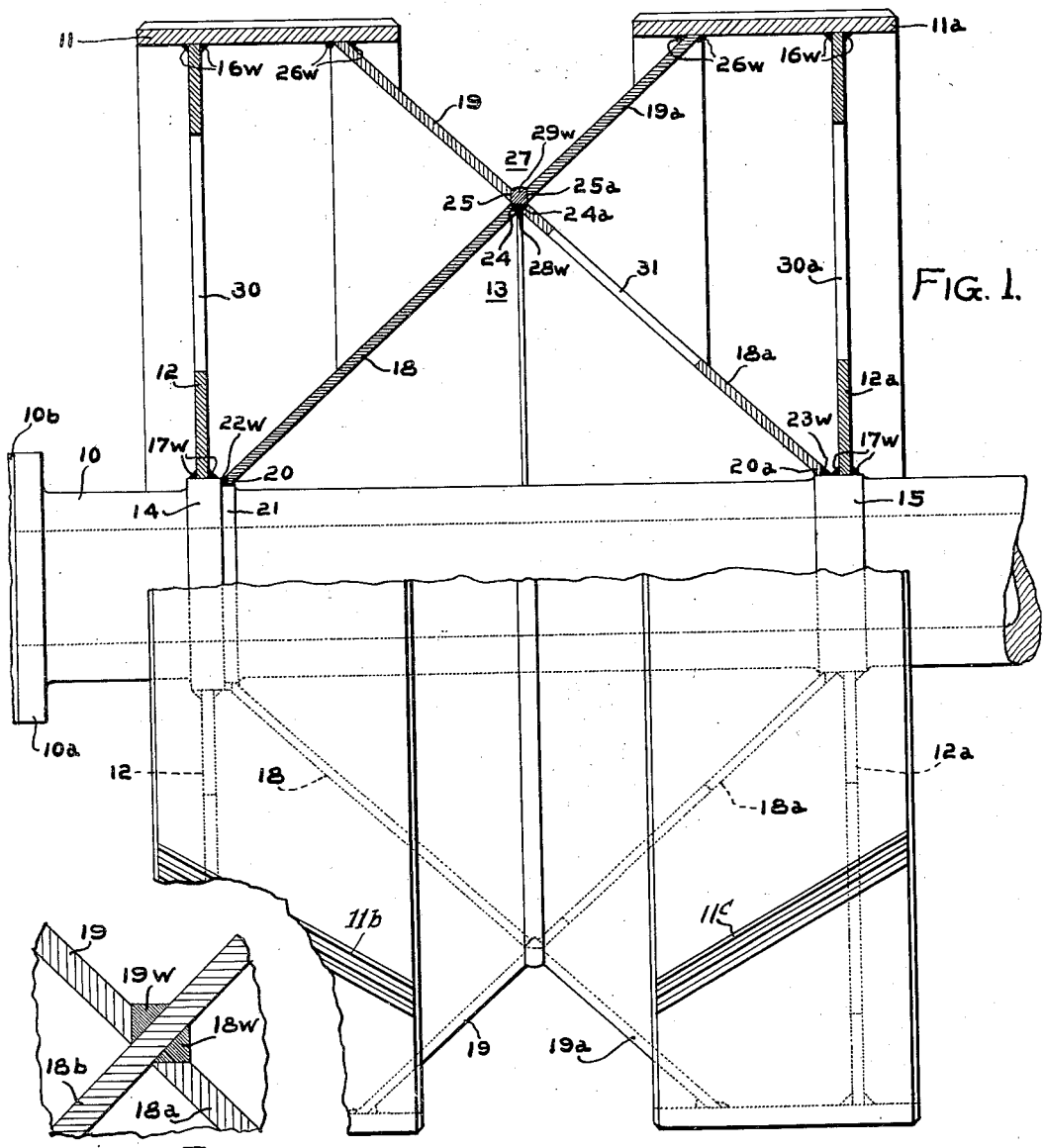


FIG. 1.

FIG. 5.

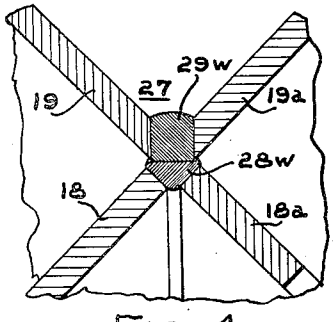


FIG. 4.

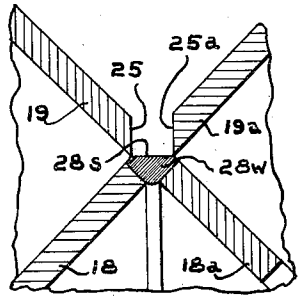


FIG. 3.

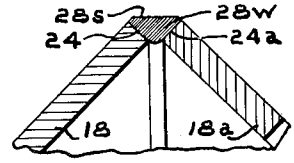


FIG. 2.

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REDUCTION GEAR

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Application May 29, 1935, Serial No. 24,047

3 Claims. (Cl. 74—439)

My invention relates to gears, more particularly of the marine reduction type, and it has for an object to provide a relatively strong and light driven gear.

The driven gear of a marine reduction gear is ordinarily comprised by a pair of spaced rims supported from a spindle. Heretofore, the supporting means has been commonly constituted by a cast structure. In my Patent No. 1,874,713, granted August 30, 1932, there is disclosed and claimed a form of fabricated center structure serving the purposes of the usual cast structure. In accordance with my present invention, I provide further improvements for gear centers of the general type disclosed and claimed in said patent, the fabricated center of the present invention being comprised entirely by plate elements and being arranged in such manner that a simpler design results. My improved gear center is comprised by outermost radial webs and an intermediate web structure, the intermediate web structure including pairs of aligned conical web elements arranged to constitute intersecting conical webs having their outer edges joined internally of the gear rims and having their inner edges joined externally to the spindle.

A further object of my invention is to provide a gear having a fabricated center, the center including intersecting conical webs joined to the rims and to the spindle so as to provide a strong and relatively light unitary gear structure.

A further object of my invention is to provide a fabricated center for a gear and including outermost webs and an intermediate web structure, the intermediate web structure being comprised by intersecting conical webs joined to the rims and to the spindle of the gear.

A further object of my invention is to provide a unitary gear structure comprising a pair of spaced toothed rims and a spindle with a fabricated center autogenously connected thereto, the center having its component parts so arranged that the rims are strongly held in their positions against deflection in all directions while at the same time preserving a very light structure.

These and other objects are effected by my invention, as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a view, partly in section and partly in elevation, and showing my improved gear;

Fig. 2 is a detail view showing the weld connection of the basal ends of the inner conical web elements;

Fig. 3 is a view showing the juxtaposed apical ends of the outer conical web elements encompassing the juxtaposed basal ends of the inner conical web elements;

Fig. 4 is a view similar to Fig. 3, but showing the final annulus of weld metal for joining the juxtaposed ends of the inner and outer conical web elements together; and,

Fig. 5 is a modified form of construction for forming the intermediate web structure.

Referring now to the drawing more in detail, in Fig. 1, I show a spindle 10 having a pair of axially spaced rims 11 and 11*a*, provided with helical teeth 11*b* and 11*c*, respectively, which are inclined in opposite directions, and a fabricated center structure including outer-most steel plate webs 12 and 12*a* and an intermediate steel plate web structure, at 13.

The outermost webs 12 and 12*a* are comprised by plate elements shaped to fit internally of the gear rims and externally of the spindle, the spindle preferably having annular enlargements providing seats 14 and 15 for the inner edges of the webs. The outer edges of the plates are preferably connected internally of the rims by means of welds 16*w* and externally of the seats 14 and 15 by means of welds 17*w*.

The intermediate web structure is comprised by inner conical web elements 18 and 18*a* and outer conical web elements 19 and 19*a*. The apical ends 20 and 20*a* of the inner conical web elements 18 and 18*a* respectively, encompass the spindle, the latter preferably having a seat 21 for the apical end 20 and the apical end 20*a* preferably encompassing the seat 15. As shown, the apical ends 20 and 20*a* are connected to the spindle by means of welds 22*w* and 23*w*. The basal ends 24 and 24*a* of the inner conical web elements 18 and 18*a* are juxtaposed. The outer conical web elements 19 and 19*a* have their apical ends 25 and 25*a* juxtaposed and encompassing the juxtaposed basal ends 24 and 24*a*, and the basal ends of the outer conical web elements are joined internally of the rims 11 and 11*a* by means of weld connections 26*w*. The juxtaposed basal ends 24 and 24*a* and the apical ends 25 and 25*a* of the inner and outer conical web elements are connected together by an annular composite weld structure, at 27, the weld structure being comprised by an inner annular weld 28*w* joining the basal ends of the inner conical web elements 18 and 18*a* and by an outer annular weld 29*w* which is joined both to the weld 28*w* and to the juxtaposed apical ends 25 and 25*a* of the conical web elements 19 and 19*a*.

Thus, it will be seen that the inner conical web elements 18 and 18*a* are aligned, respectively, with the outer conical web elements 19*a* and 19 so as to constitute an intermediate web structure comprised by intersecting conical webs, the conical webs intersecting approximately at right angles and being joined to the spindle adjacent to the radial web junctions and being joined to the gear rims internally of the latter, to afford effective cross bracing of the gear.

In fabricating the gear, after the radial web 12 is placed on the spindle and welded thereto, then the inner conical web elements 18 and 18a are placed in position, the apical ends 20 and 20a being welded to the spindle and the ends being connected by the weld 28w. The weld 28w is finished to provide a cylindrical surface 28s so as to permit the ready positioning of the outer conical web elements 19 and 19a, so that the juxtaposed ends 25 and 25a will encompass the juxtaposed ends of the inner conical web elements 18 and 18a as shown in Figs. 1, 3, and 4. The space between the juxtaposed ends 25 and 25a is filled with weld metal so as to constitute the weld 29w, the latter not only joining the juxtaposed ends 25 and 25a, but also being joined to the weld 28w, whereby the juxtaposed ends of the inner conical web elements and of the outer conical web elements are joined together by the annular metallic weld structure, at 27. Next, the radial web 12a is placed on the spindle and connected thereto by means of the weld 17w.

The outer radial edges of the outermost radial webs 12 and 12a and the intermediate web structure, at 13, are machined so as to properly fit within the gear rims. The gear rims are then placed in position and the welds at 16w and 26w are then made. To facilitate welding, the radial plates 12 and 12a are provided with openings 30 and 30a to afford internal access. Also, the conical web element 18a is shown as provided with an opening 31 to afford access for internal welding.

As shown in Fig. 1, the coupling 10a for connecting the gear spindle to the propeller shaft 10b is disposed at the left hand side, with the result that the torque is transmitted entirely by the radial webs 12 and 12a and by the cone 18, the cone 18a serving very largely as a brace or stiffening member, in consequence of which the opening 31 may be provided in the cone 18a without impairing its strength for its operative purposes.

In Fig. 5, I show a modified form wherein, instead of a composite cone 18, 19a joining the rim 11a and the spindle at a point adjacent to the radial web 12, as shown in Fig. 1, a single cone 18b is employed, the cones 18a and 19 being welded thereto, as shown at 18w and 19w. An advantage for this form is that the cone transmitting torque is comprised by a single piece of metal.

From the foregoing, it will be apparent that I have devised a reduction gear having a gear center which is entirely fabricated and which is joined to the rims and to the spindle so as to constitute a single autogenously connected structure. Not only may material of high and dependable quality be used, but the material may be so disposed as to be very stiff and strong. Stiffness and strength are aided very largely by the intermediate web structure, particularly because the latter is comprised by conical web elements, a conical web being relatively stiff in all directions. The intersecting conical webs cross-brace the gear rims in such a manner that deflection of the gear center is strongly resisted in all directions.

Since the crossed conical webs are each overlapped by both gear rims, not only is the arrangement compact, but is inherently strong, stiff and light and adequate compressive and tension strength is afforded by the cross-bracing to prevent lateral deflection of the rims.

While I have shown my invention in two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a gear, a pair of spaced rims having opposed helical teeth, a spindle, means for supporting the rims from the spindle including steel plate outer webs and an intermediate fabricated web structure, the outer webs having their outer edges joined circumferentially to and internally of the gear rims and having their inner radial edges joined circumferentially to and externally of the spindle, and said intermediate web structure including steel plate conical webs connected circumferentially to the rims and to the spindle, said conical webs intersecting and joined together approximately at right angles to define inner conical elements joined to the spindle and outer conical elements joined to the rims and the inner and outer conical elements of each conical web being alined.

2. In a gear, a pair of spaced rims having opposed helical teeth; a spindle; and means for supporting the rims from the spindle and comprising outer radial steel plate webs having their outer edges welded internally of the rims and having their inner edges welded to the exterior of the spindle and an intermediate fabricated steel plate web structure; said intermediate web structure including inner conical web elements having their apical ends welded to the spindle and having juxtaposed basal ends, outer conical web elements having their basal ends welded internally of the rims and having juxtaposed apical ends encompassing the juxtaposed basal ends of the inner conical web elements, and means for joining together said juxtaposed basal and apical ends of the inner and outer conical web elements, respectively, so that the inner and outer conical web elements are aligned to provide conical webs having their inner ends joined to the spindle and their outer ends joined to the rims and which intersect approximately at right angles to provide effective cross bracing of the gear.

3. In a gear, a pair of rims having opposed helical teeth; a spindle; and means for supporting the rims from the spindle and comprising outermost steel plate webs and an intermediate fabricated steel plate web structure; said outermost webs being radially disposed and having their outer circumferential edges welded to the rims internally of the latter and having their inner circumferential edges welded to the spindle externally of the latter and said intermediate web structure including inner conical web elements having their apical ends encompassing and welded to the spindle and adjacent to the connections of the spindle and the outermost webs and having juxtaposed basal ends, outer conical web elements having their basal ends welded internally of the gear rims and having juxtaposed apical ends encompassing the juxtaposed basal ends of the inner conical web elements, and an annulus of weld metal for joining together said juxtaposed basal and apical ends of the inner and outer conical web elements, respectively, so that the inner and outer conical web elements are arranged in aligned pairs to provide conical webs joined to the rims and to the spindle and which intersect approximately at right angles and are joined together to afford effective cross-bracing of the gear.

IRA SHORT.