No. 670,386. Patented Mar. 19, 1901.

C. H. HOWLAND-SHERMAN.

BEVEL OR MITER GEARING.

(Application filed June 28, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 2.

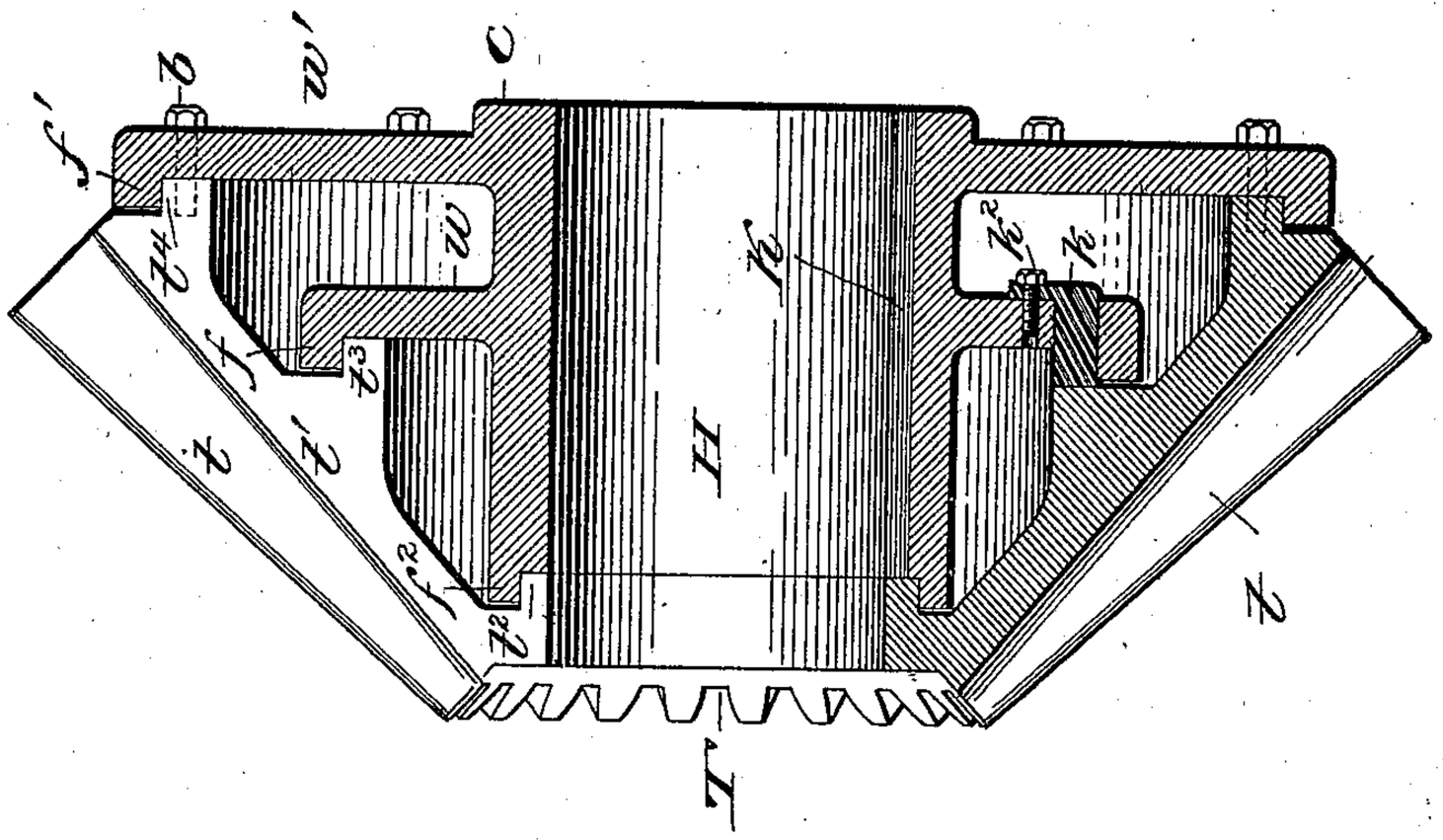

Fig. 1.

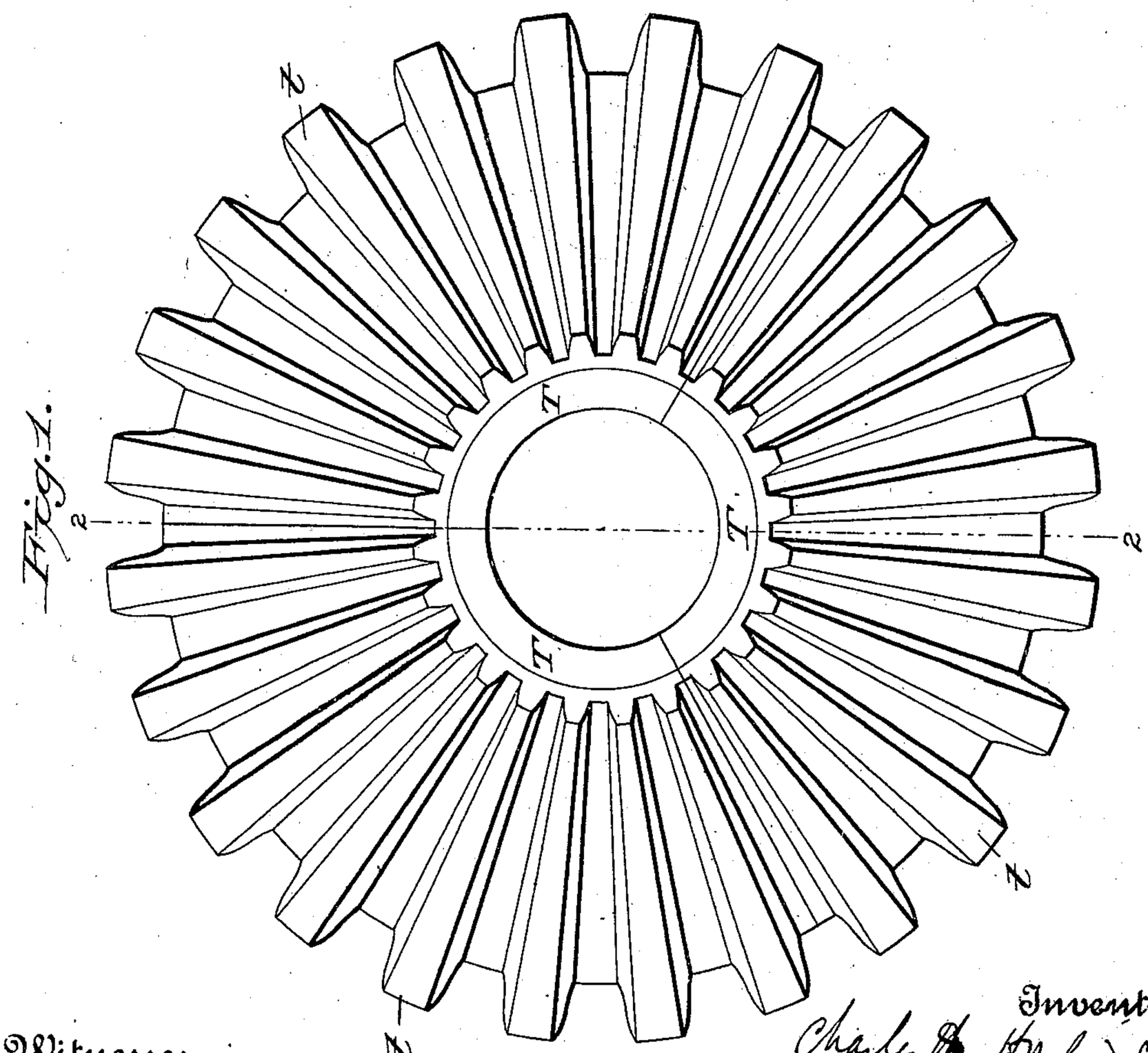

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Fig. 4.

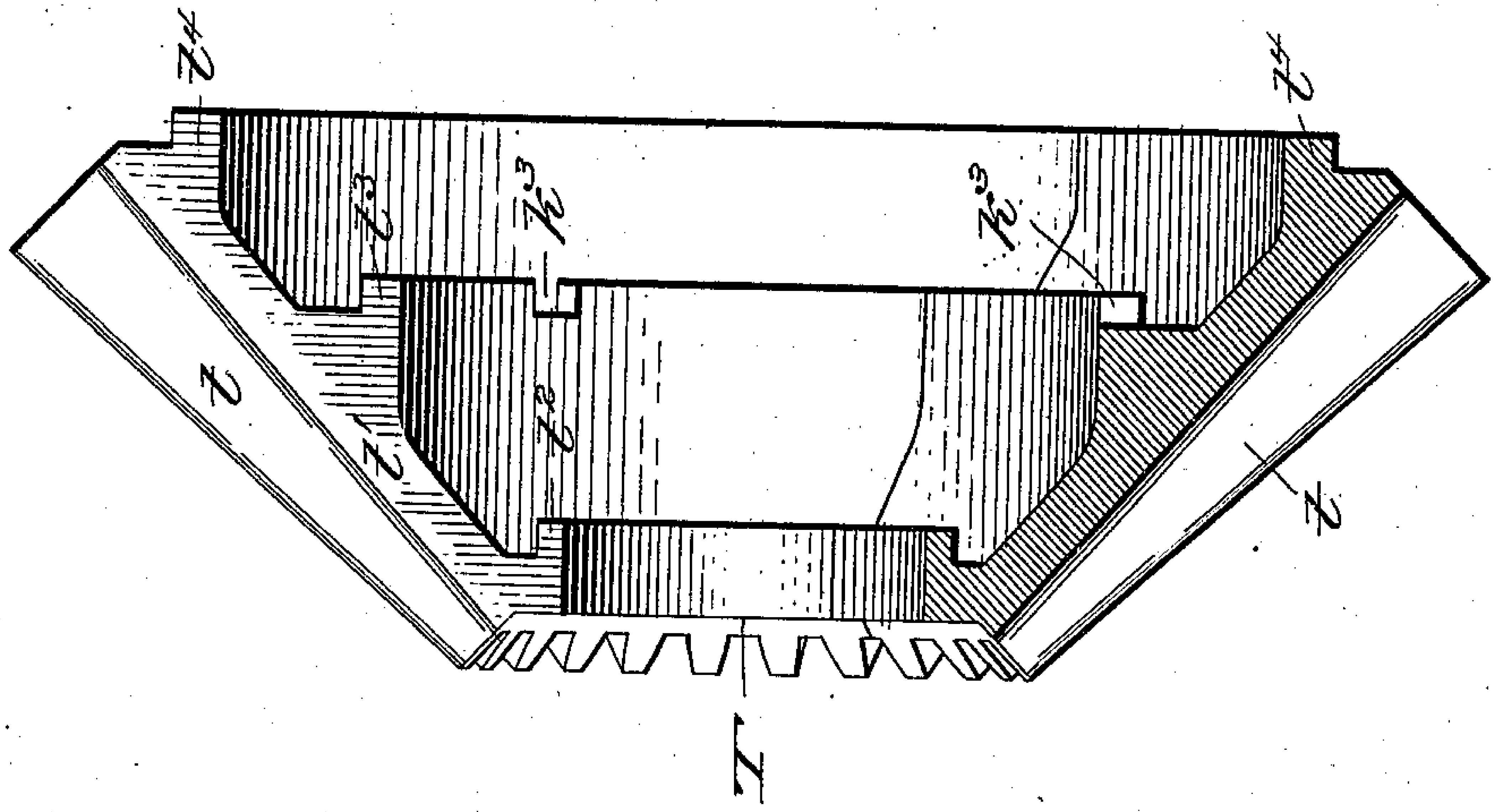
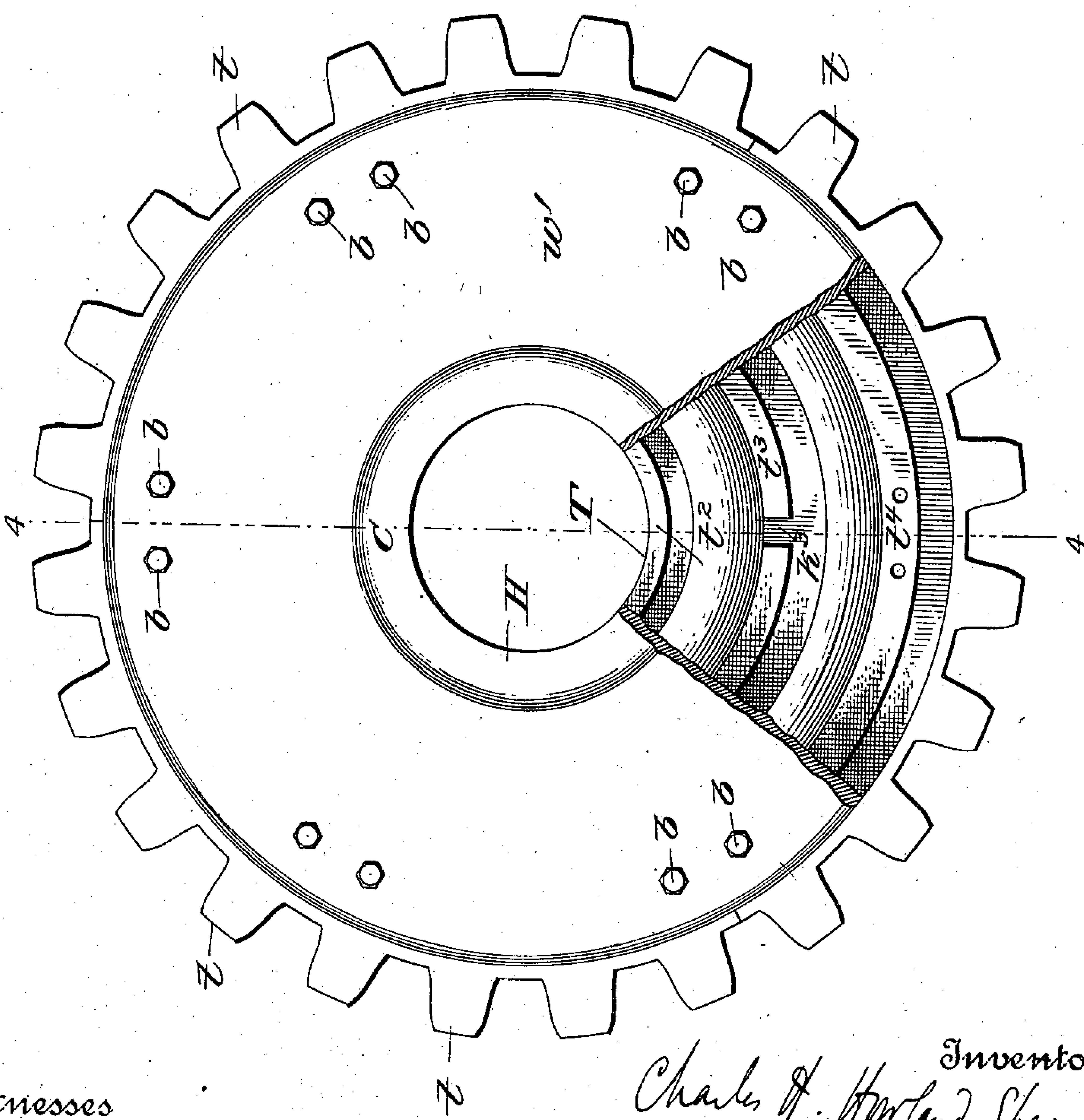


Fig. 3.



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3 Sheets—Sheet 3.

Fig. 6.

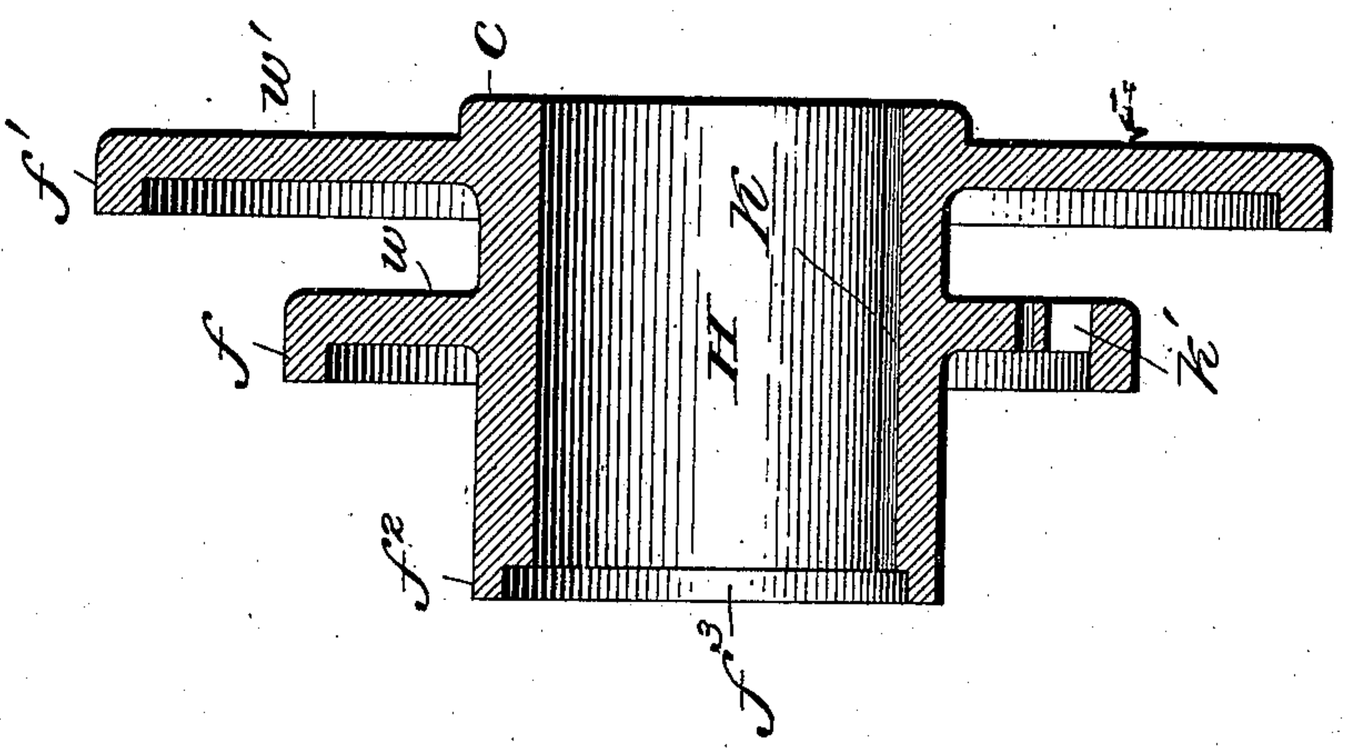
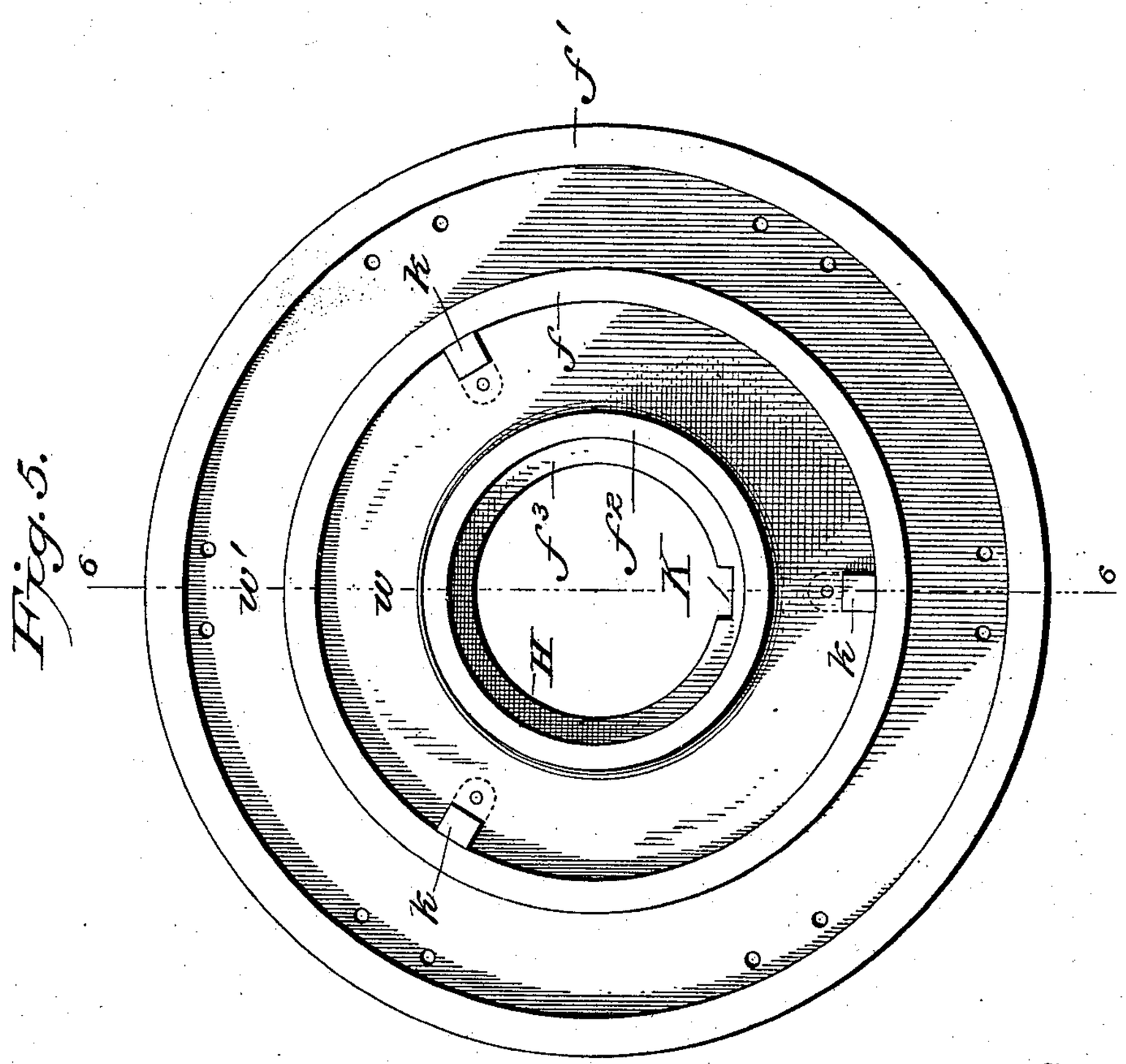


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES H. HOWLAND-SHERMAN, OF PATHFINDER, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-FOURTH TO GEORGE H. HOWARD, OF WASHINGTON, DISTRICT OF COLUMBIA, AND SAMUEL G. B. COOK, OF LONDON, ENGLAND.

BEVEL OR MITER GEARING.

SPECIFICATION forming part of Letters Patent No. 670,386, dated March 19, 1901.

Application filed June 28, 1900. Serial No. 21,956. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. HOWLAND-SHERMAN, a citizen of the United States, residing at Pathfinder, in the District of Columbia, have invented a new and useful Improvement in Bevel or Miter Gearing, of which the following is a specification, reference being had to the accompanying drawings and to the letters of reference marked thereon.

My invention relates to assembled bevel or miter gearing, having for its object to provide an economical bevel or miter structure susceptible of ready assembly upon an operative shaft and possessing greater strength than would be attainable by casting the gear in a single piece, while at the same time rendering practicable the substitution of new teeth upon a hub whose service is substantially indefinite in a manner easily understood by mechanics. I attain this object by the mechanism illustrated in the accompanying drawings, hereby made a part of this specification, in which—

Figure 1 is a front elevation of a bevel-gear made in accordance with my invention, showing the trifurcated toothed periphery. Fig. 2 is a section on the line 2 2 of Fig. 1 through the complete assembled gear. Fig. 3 is a rear elevation of the gear with a portion of the hub broken away to show the interior formation of the tooth-segments. Fig. 4 is a section on the line 4 4 of Fig. 3 through the tooth-segments in assembled position with the hub removed to more clearly exhibit the interior structure of the segments. Fig. 5 is a front elevation of the complete hub with the tooth-segments removed to show the hub details. Fig. 6 is a section through the hub alone on the line 6 6 of Fig. 5, exhibiting the details of its webs and flanges.

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

The hub H engages with the gear-shaft by means of any suitable key driven in a keyway K of the usual type, as indicated in Figs. 2, 5, and 6.

The hub H, Figs. 2, 5, and 6, is preferably cast as an integral member and has, preferably integral therewith, webs w w', having flanges f f', as particularly shown in Figs. 5 and 6, both of said webs and said flanges preferably running continuously around the hub. In gears of relatively small pitch diameter, such as that chosen for illustration in the accompanying drawings, the front end of the hub has merely a webless flange f^2, formed by the recess f^3 in the hub, as clearly indicated in Figs. 5 and 6; but it is evident that in gears of relatively larger pitch diameters the said flange f^2 would require to be sustained upon a web formed between it and the hub H in a manner precisely similar to the webs w w', sustaining the flanges f f'. This method of sustaining the web-and-flange structure gives perfect adaptability to all pitch diameters, as well as enabling the construction of gears of pitch diameters proportionately smaller in relation to the gear-shaft than would be feasible with a solid cast gear. The hub H also has upon its rear end, preferably cast integral therewith, a collar c for laterally facing against the collar of any pedestal or hanger which may be adjacent to the gear, said collar c projecting suitably to protect the bolts b from contact with contiguous machinery.

The tooth-segments T, Figs. 1, 2, 3, and 4, are preferably three in number, as shown in the drawings, for moderate-sized gears, but may be, of course, of other desired number for gears of larger pitch diameters. The teeth t may be cast integrally upon bases t', having interior circumferential flanges t^2 t^3 t^4, adapted to engage the exterior circumferential flanges f^2 f f' of the hub H, as clearly shown in assembly in Fig. 2 and in segmental structure in Fig. 4.

The tooth-segments T are prevented from rotating with relation to the hub H by the single shear of keys k, fixed in slots k', through the webs w, by tap-bolts k^2, and firmly engage in registering slots k^3, cut through the flanges t^3 of the tooth-segments T, as clearly shown in assembly in Fig. 2 and partially indicated in structure in Figs. 4, 5, and 6. The tooth-segments T are also fixed, both longitudinally and rotarily with respect to the hub H, by cap-bolts b, fitting in bores through the webs w'

and threaded into the flanges t^4 of said segments, as clearly indicated in Figs. 2 and 3. Clearances are preferably left between the front transaxial faces of the flanges f^2 f f' and the adjacent portions of the segment-base t in order that the segment-flanges t^3 t^4, &c., may be drawn directly against the webs w w' by the action of the cap-bolts b in assembling the segments to the hub and also for the not less important consideration of requiring only said flanges t^3, &c., and the front faces of said webs w, &c., to be finished for assembling the parts. This arrangement affords much economy in constructing the gear.

The shop practice of making this assembled bevel-gear is exceedingly simple. The hub H is preferably cast as a single piece integral with all its webs and flanges after the manner shown in Figs. 5 and 6 and is then chucked and interiorly bored out to fit its shaft and has its webs cleaned off to receive the flanges of the gear-segments at one operation on the lathe. The slotting out of the keyways and drilling for the cap-bolts then completes the hub. Similarly the tooth-segments T are cast as single pieces integral with all their flanges and are cleaned off at the ends to correct radial assembling faces. The complete segments for the entire gear are then chucked together after the manner indicated in Fig. 4 and simultaneously cleaned off on the lathe to face up against the webs and flanges of the hub at one operation. The positions for the cap-bolts b are then bored and tapped into the flanges f^4 of the tooth-segments and the segments drawn home to position on the hub by the bolts b, completing the gear, as shown in the several views. This entire process is very economical, as it requires no hand-finishing whatever, and the weight of the completed gear is no greater than that of ordinary solid cast gears of the kind.

The operation of my invention requires little explanation. The manner in which the tooth-segments are applied to and removed from the hub having been already indicated, the only structure requiring explanation is the particular function performed by the hub-flanges f f' with the corresponding segment-flanges t^3 t^4, &c. The hub-flanges have longitudinal positions with respect to the face of the gear and radial thicknesses with respect to their longitudinal positions, causing them to present a circumferential shear which is exactly proportionate to the progressive increase of the centrifugal bursting moments due to the increase of the radii at which the principal masses of the tooth-segments rotate reckoned from the centers of gravity of their moduli at points in said masses intersected by the planes of shear lying along the front faces of the webs w or referred to said webs, as w', as will be plainly evident from Fig. 2. The effect of this is to secure the lightest possible structure at large factors of safety and with substantial security from explosion, such as might readily attend the rotation of less-correctly made gears at much less circumferential velocities than this gear is designed to withstand.

Having thus described my invention, I claim—

1. Combined in a bevel or miter gear structure, a hub having flanged webs, tooth-segments having bases, said bases being provided with flanges adapted to engage the flanged webs of said hub, and means for securing said parts in engagement substantially as set forth.

2. Combined in a bevel or miter gear structure, a hub having flanged webs, tooth-segments having bases, said bases being provided with flanges adapted to engage the flanged webs of the hub, and means for longitudinally fixing and assembling said tooth-segments in engagement with the flanged webs of the hub, substantially as set forth.

3. Combined in a bevel or miter gear structure, a hub having flanged webs integral therewith, tooth-segments having bases, said bases being provided with integral flanges adapted to engage the flanged webs of the hub, keys for rotarily fixing said segments with relation to said hub, and means for longitudinally fixing and assembling said tooth-segments in engagement with the flanged webs of the hub, substantially as set forth.

4. Combined in a bevel or miter gear structure, a hub having flanged webs integral therewith, tooth-segments having bases, said bases being provided with integral flanges adapted to engage the flanged webs of the said hub, and cap-bolts for rotarily and longitudinally fixing and assembling said segments with relation to said hub, substantially as set forth.

5. Combined in a bevel or miter gear structure, a hub having flanged webs integral therewith, tooth-segments having bases, said bases being provided with integral flanges adapted to engage the flanged webs of said hub, keys for rotarily fixing said segments with relation to said hub, and cap-bolts for longitudinally and rotarily fixing and assembling said segments to said hub, substantially as set forth.

In testimony whereof I hereunto set my hand and seal.

CHARLES H. HOWLAND-SHERMAN. [L. S.]

Witnesses:
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C. B. BULL.