No. 716,870. Patented Dec. 30, 1902.

L. J. CRECELIUS.

PROCESS OF CASTING FINISHED PINIONS OR GEAR WHEELS.

(Application filed June 8, 1901. Renewed Oct. 20, 1902.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

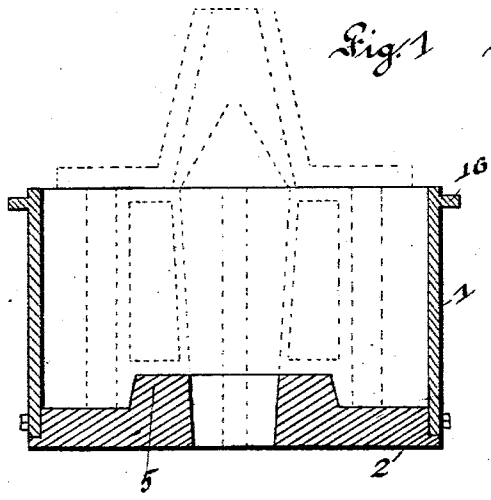


Fig. 2

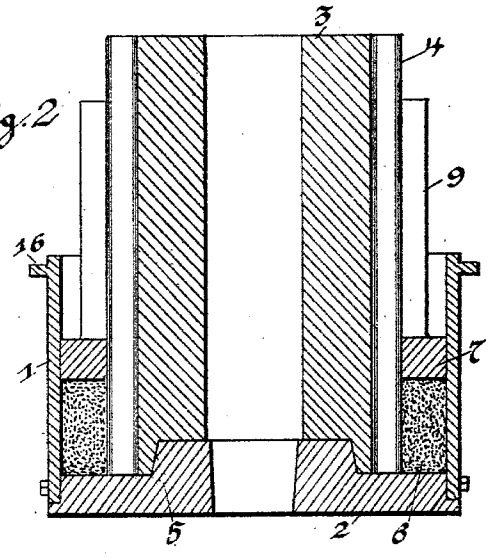


Fig. 3.

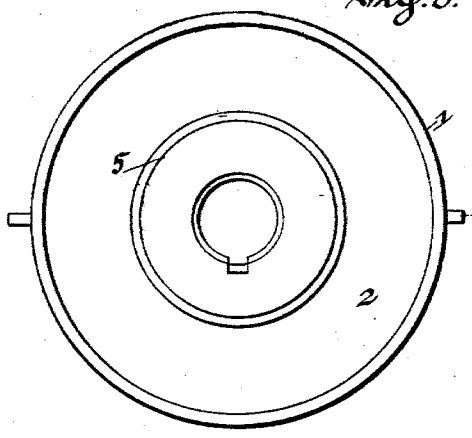
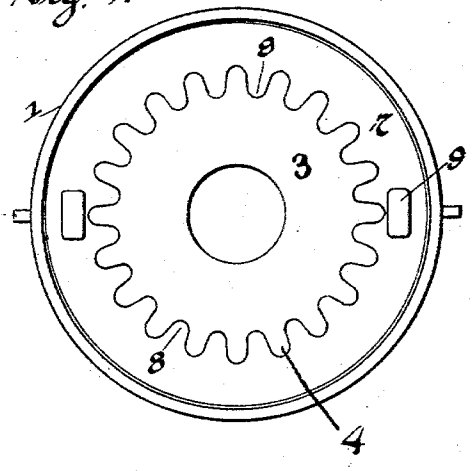


Fig. 4.



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(Application filed June 8, 1901. Renewed Oct. 20, 1902.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

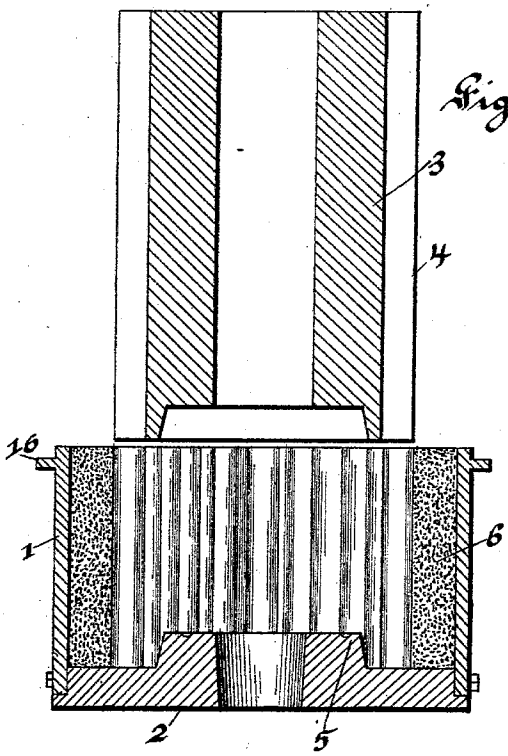


Fig. 6.

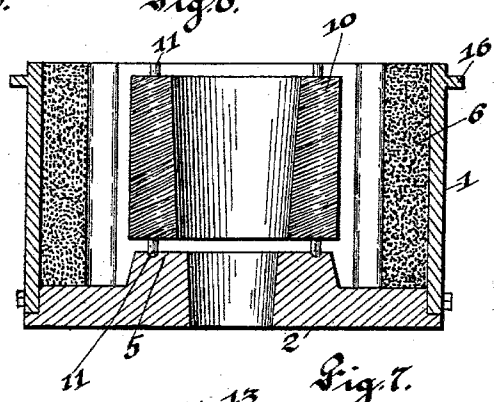


Fig. 7.

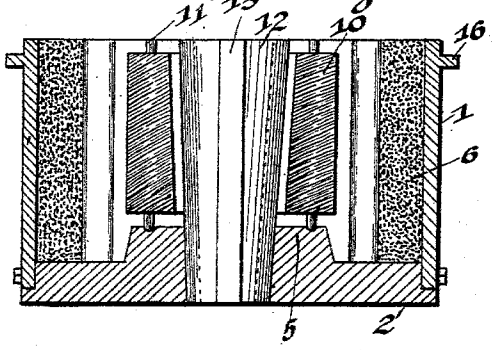


Fig. 9.

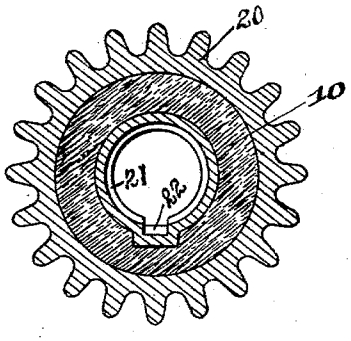
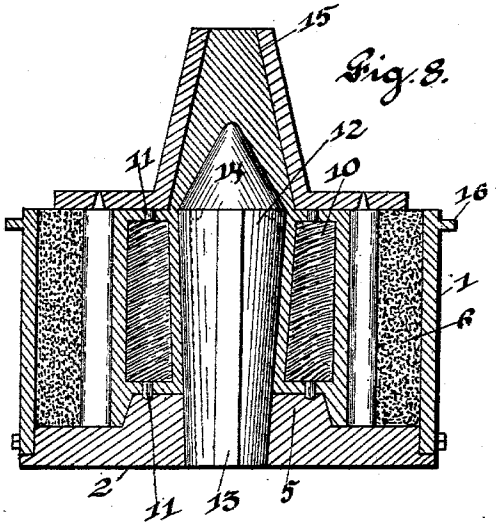


Fig. 8.



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UNITED STATES PATENT OFFICE.

LOUIS J. CRECELIUS, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO WILLIAM GRAYSON, OF ST. LOUIS, MISSOURI.

PROCESS OF CASTING FINISHED PINIONS OR GEAR-WHEELS.

SPECIFICATION forming part of Letters Patent No. 716,870, dated December 30, 1902.

Application filed June 8, 1901. Renewed October 20, 1902. Serial No. 128,083. (No model.)

To all whom it may concern:

Be it known that I, LOUIS J. CRECELIUS, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Processes of Casting Finished Pinions or Gear-Wheels, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to an improved process of casting finished pinions and gear-wheels; and it consists of the novel mode of procedure hereinafter described, and pointed out in the claims.

The object of my invention is to produce in an integral casting gear-wheels and pinions the teeth of which shall be finished smooth and true and the bore and other parts of which shall be finished accurately primarily and solely by the means used in the casting operation.

A further object of my invention is to produce such pinions and gear-wheels with an accurately-finished face primarily and solely by the casting operation.

A further object is to produce said pinions and gear-wheels devoid of the usual shrinkage, and yet having accurately spaced and finished teeth and other accurately-finished parts primarily and solely by the casting operation.

A further object is to produce said pinions and gear-wheels having a shell or skeleton of metal, such as bronze or steel, and the same having cast within themselves an annular core of refractory material which shall act to reinforce or strengthen said shell and greatly lighten and cheapen the same.

Figure 1 is a sectional side elevation of the improved molding-flask made use of. Fig. 2 is a similar view having the master-pattern in position therein and also showing the improved rammer in use. Fig. 3 is a plan view of the said flask. Fig. 4 is a plan view of the parts shown in Fig. 2. Fig. 5 is a sectional side elevation showing the flask after the same has been rammed and illustrating the said master-pattern in the act of being withdrawn. Fig. 6 is a similar view of the rammed flask having the annular core supported therein. Fig. 7 is a view identical with the last, except that it has a tapered mandrel in position therein. Fig. 8 is a view identical to the last with the exception that the gate and spreader are applied to the flask and the casting has been poured, the same being still located within the flask. Fig. 9 is a sectional plan view of a finished pinion or gear-wheel.

1 indicates a cylindrical flask, preferably made of metal, and fitted within its lower end is a head 2, the inner face of which is bored and turned accurately and highly polished to act as a mold-surface for one face of the pinions or gear-wheels to be cast thereon. Within this flask I next place a preferably metallic master-pattern 3, having a length considerably in excess of the depth of said flask and having machine-cut teeth 4 of the proper pitch and countersunk at its lower end, whereby it may be accurately fitted upon the raised center 5 of said head 2 and whereby the act of placing said pattern will also center it with relation to said center. Next I proceed to ram the flask in the manner shown in Fig. 2 by placing a body of refractory pulverulent material 6—say refractory carbon—within the annular space about said master-pattern and ramming the same by means of the annular rammer 7. Said rammer 7 has an external diameter corresponding to the internal diameter of said flask and is provided with a series of internal radial projections 8, which occupy the space between the teeth 4 of said master-pattern during the act of ramming. Said rammer is provided with opposite vertical handles 9, by means of which it may be lifted during use. After the flask has been fully filled the master-pattern 3 is withdrawn, as shown in Fig. 5, and then I place within the mold so formed an annular core 10, preferably made of some refractory material, such as common fire-clay, and this has suitable projections 11 at its ends for supporting it within the mold, so that when the metal is poured said metal may pass upon all sides of said core. Said core 10 has a tapered internal passage, in which is next placed the tapered metallic mandrel 12, which latter accurately fits said tapered passage, and which mandrel is provided with a lateral projection 13, which projects toward a corresponding recess in said core, so as to form a key-seat in the pinion or

gear to be cast. Said mandrel may of course be accurately finished and highly polished and preferably provided with a coating of suitable fireproof lubricant. I prefer graphitic carbon. It will be noted that said mandrel fits accurately the center bore of said head 2, which acts as a rigid support therefor. Mounted upon the upper end of said mandrel is a conical spreader 14, and mounted upon the upper face of the mold as finished is a common gate 15. The mold is now ready to be poured. However, prior to pouring, the entire mold, as shown in Fig. 8, is lifted by means of its projecting ears 16 and placed within a suitable furnace and heated to about 900° Fahrenheit and then quickly withdrawn and the metal poured therein, and while the metal is still fluid within the said mold I apply pressure thereon by means of any common press, and thereby slightly compress said fluid metal. This compression solidifies the fluid metal in the mold, and thereby causes every part of the casting to shrink uniformly. Finally the gate 15 is removed, the casting is removed from the mold, and its upper end is sawed off at a suitable point. The finished product is shown in section in Fig. 9. The finished product is indicated in Fig. 9 by the numeral 20, and it is provided with the filling or core 10, as above described, and has of course the tapered bore 21, having the key-seat 22, which latter is formed by the lateral projection 13 of the said metallic mandrel 12.

Of course it will be understood that the mandrel 12 should be removed after the end of the casting has been sawed off.

The advantages possessed by my invention are as follows:

First. I obviate the usual very large amount of labor required in producing machine-cut pinions and gears, and I produce a finished article direct from the mold.

Second. By my process I retain the strongest of the metal, which, as is well known, is always on the surface of castings.

Third. By making use of the annular strengthening-core within the casting I am thus enabled to dispense with fully one-third of the metal usually required and substitute therefor much lighter and cheaper material. The advantage of lightness in a high-speed pinion is well understood. In this connection I desire to state that I have found that in a core made of fire-clay or similar substances when burned prior to placing within the mold and then reheated, as described, the liquid metal will fill all the interstices of said core and firmly adhere, and thus make a solid mass of the core. The article thus cast will be found practically as strong as if it had been cast of solid metal.

Fourth. By slowly pouring the liquid metal into the heated mold, which permits all gases to develop and be discharged as the pouring proceeds, thereby preventing all blow-holes, honeycombs, &c., and assures an absolutely dense casting.

I do not herein claim the product of my improved process, as I have made the same the subject-matter of a copending application, filed October 7, 1901, Serial No. 77,790.

I claim—

1. The herein-described process of casting finished pinions and gear-wheels, which consists in first, forming a flask with a metallic head at its lower end turned and polished accurately and provided with a raised center 5 and a central bore; second, forming a metallic master-pattern with accurately-finished peripheral teeth and a countersunk recess at its lower end; third, mounting said master-pattern in said flask, so that said mold-surface will fit within said countersunk recess of the master-pattern; fourth, placing a body of refractory carbon within the annular space about said master-pattern and simultaneously ramming said refractory carbon into all the spaces between the teeth of said master-pattern by means of an annular rammer; fifth, removing said rammer; sixth, withdrawing said master-pattern; seventh, mounting within the central bore of said flask-head a tapered metallic mandrel provided with a lateral projection to form a key-seat in the casting; eighth, mounting a conical spreader upon the upper end of said metallic mandrel; ninth, mounting a gate upon the upper face of the finished mold; tenth, heating the mold to about 900° Fahrenheit, and pouring molten metal into the mold while the same is thus heated; substantially as specified.

2. The herein-described process of casting finished pinions and gear-wheels, which consists in first, forming a flask with a metallic head at its lower end turned and polished accurately and provided with a raised center 5 and a central bore; second, forming a metallic master-pattern with accurately-finished peripheral teeth and a countersunk recess at its lower end; third, mounting said master-pattern in said flask, so that said mold-surface will fit within said countersunk recess of the master-pattern; fourth, placing a body of refractory carbon within the annular space about said master-pattern and simultaneously ramming said refractory carbon in all the spaces between the teeth of said master-pattern by means of an annular rammer; fifth, removing said rammer; sixth, withdrawing said master-pattern; seventh, mounting within the central bore of said flask-head a tapered metallic mandrel provided with a lateral projection to form a key-seat in the casting; eighth, mounting a conical spreader upon the upper end of said metallic mandrel; ninth, mounting a gate upon the upper face of the finished mold; tenth, heating the mold to about 900° Fahrenheit, and pouring molten metal into the mold while the same is thus heated; and finally, applying pressure to the molten metal while in a fluid state within said mold; substantially as specified.

3. The herein-described process of casting finished pinions and gear-wheels, which con-

sists in first, forming a flask with a metallic head at its lower end turned and polished accurately and provided with a raised center 5 and a central bore; second, forming a metallic master-pattern with accurately-finished peripheral teeth and a countersunk recess at its lower end; third, mounting said master-pattern in said flask, so that said mold-surface will fit within said countersunk recess of the master-pattern; fourth, placing a body of refractory carbon within the annular space about said master-pattern and simultaneously ramming said refractory carbon into all the spaces between the teeth of said master-pattern by means of an annular rammer; fifth, removing said rammer; sixth, withdrawing said master-pattern; seventh, placing within the mold an annular core of fire-clay, having suitable projections at its ends for supporting it within the mold; eighth, mounting within said annular core and within the said bore of said flask-head, a tapered metallic mandrel provided with a lateral projection to form a key-seat in the casting; ninth, mounting a conical spreader upon the upper end of said metallic mandrel; tenth, mounting a gate upon the upper face of the finished mold; eleventh, heating the mold to about 900° Fahrenheit, and pouring molten metal into the mold while the same is thus heated; substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS J. CRECELIUS.

Witnesses:
ALFRED A. EICKS,
JOHN C. HIGDON.