No. 694,395. Patented Mar. 4, 1902.

# C. W. LEVALLEY.

## CASTING SPROCKET WHEELS.

(Application filed Jan. 7, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 3.

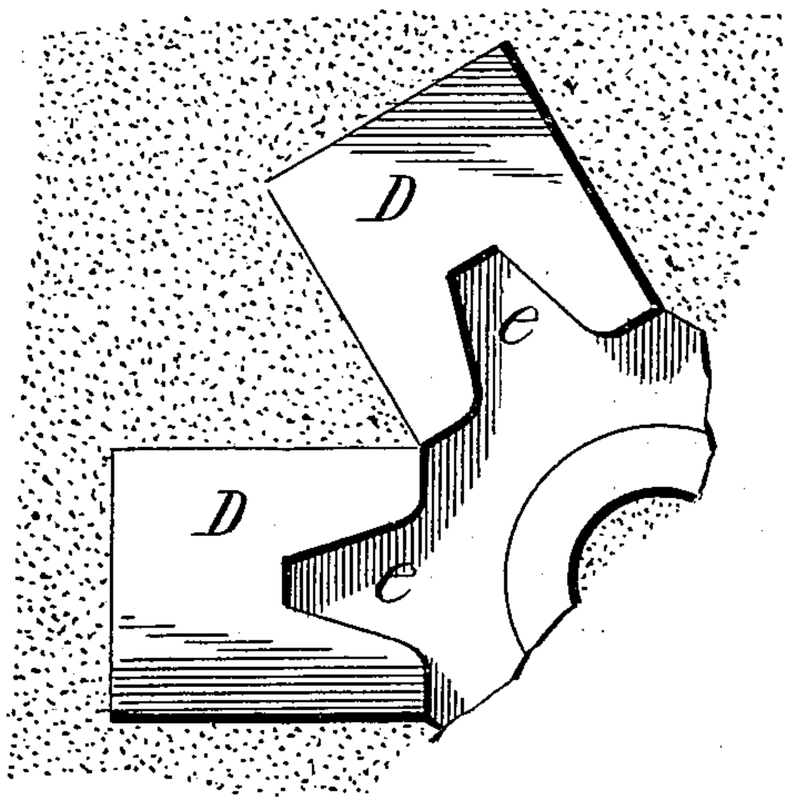


Fig. 4.

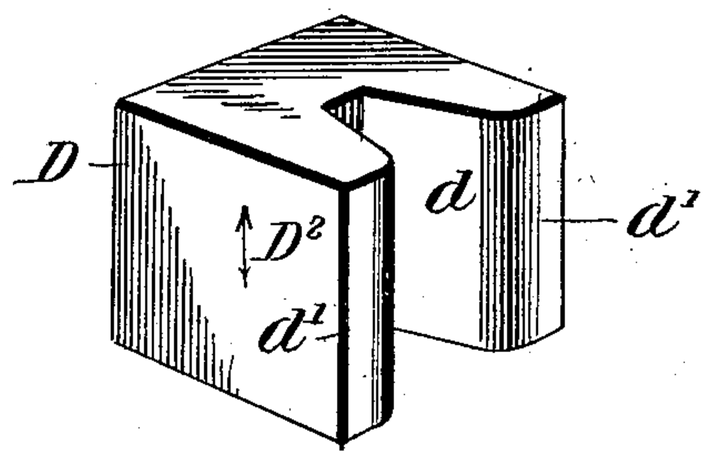


Fig. 5.

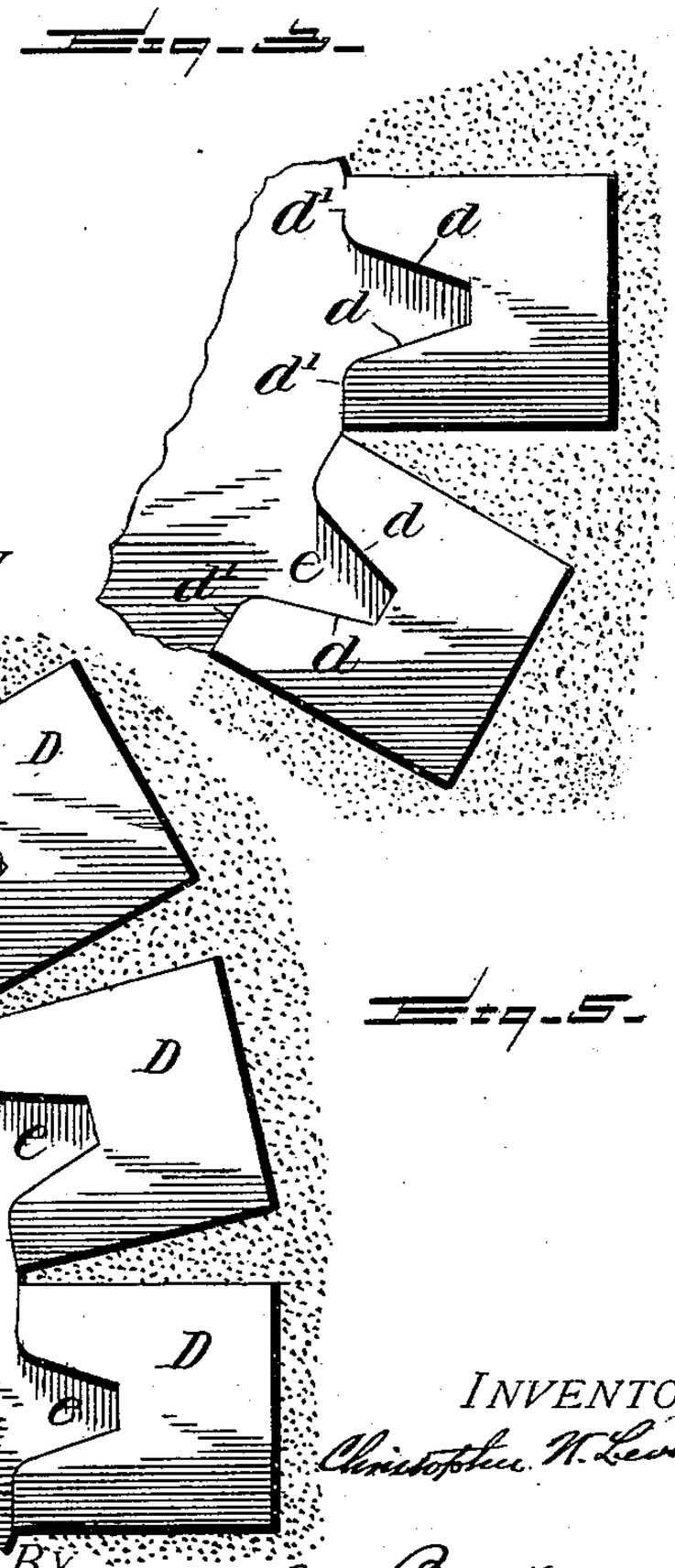


Fig. 1.

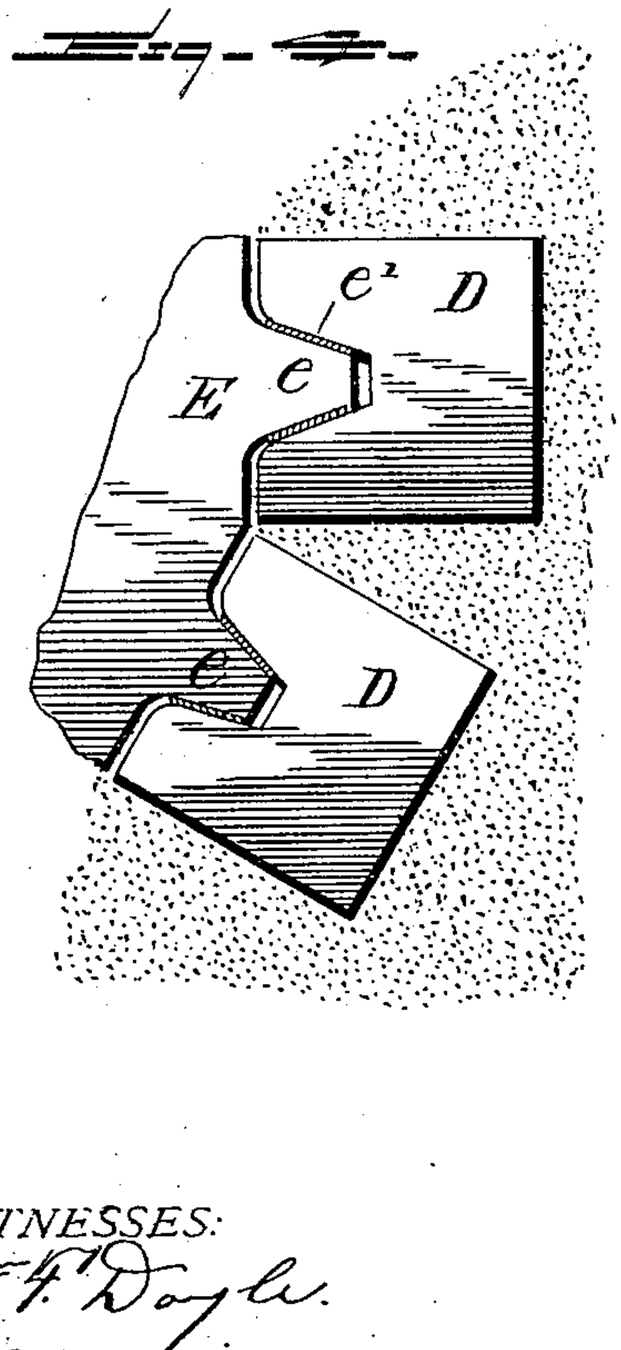


Fig. 2.




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## CASTING SPROCKET WHEELS.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

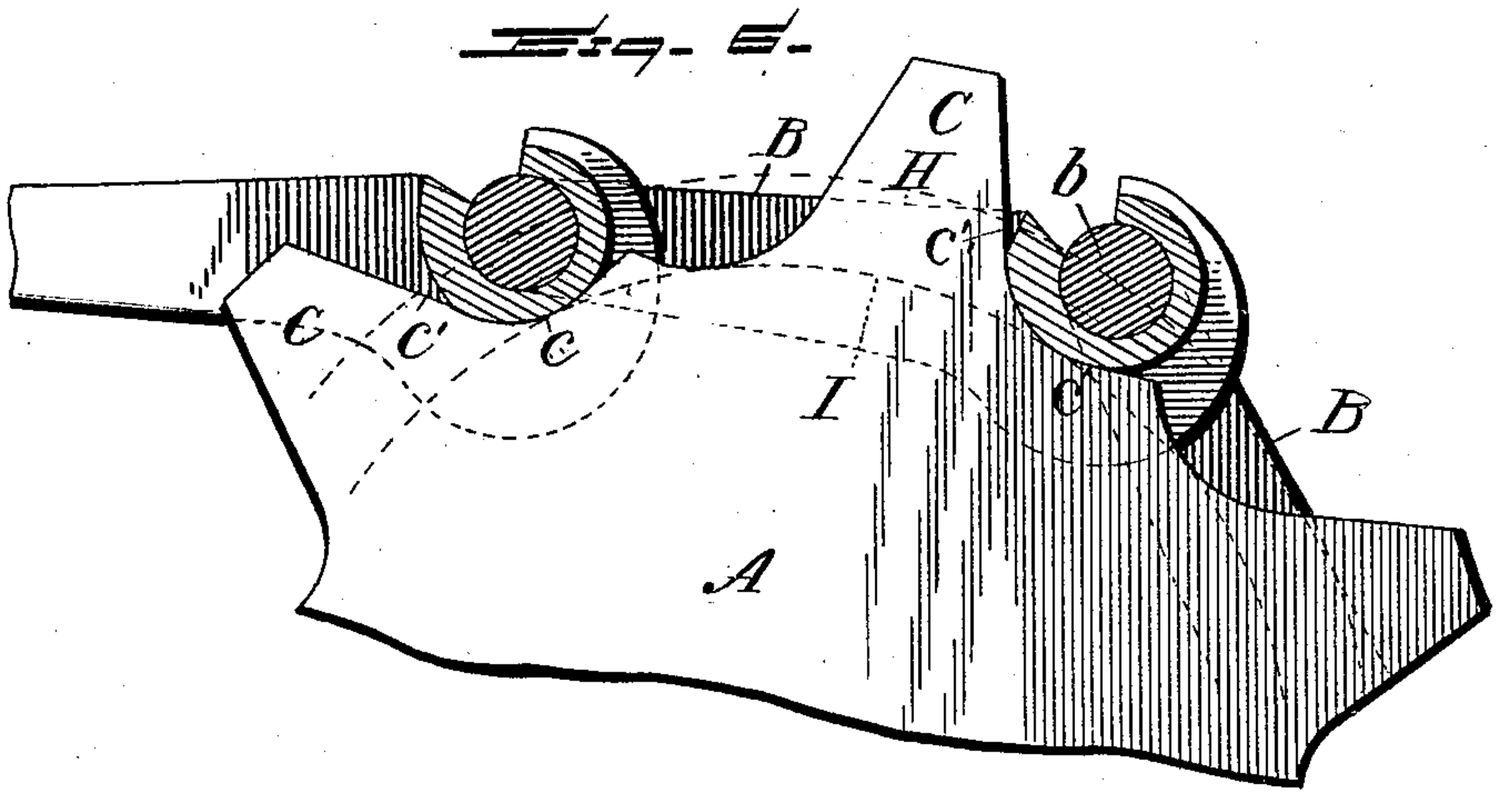
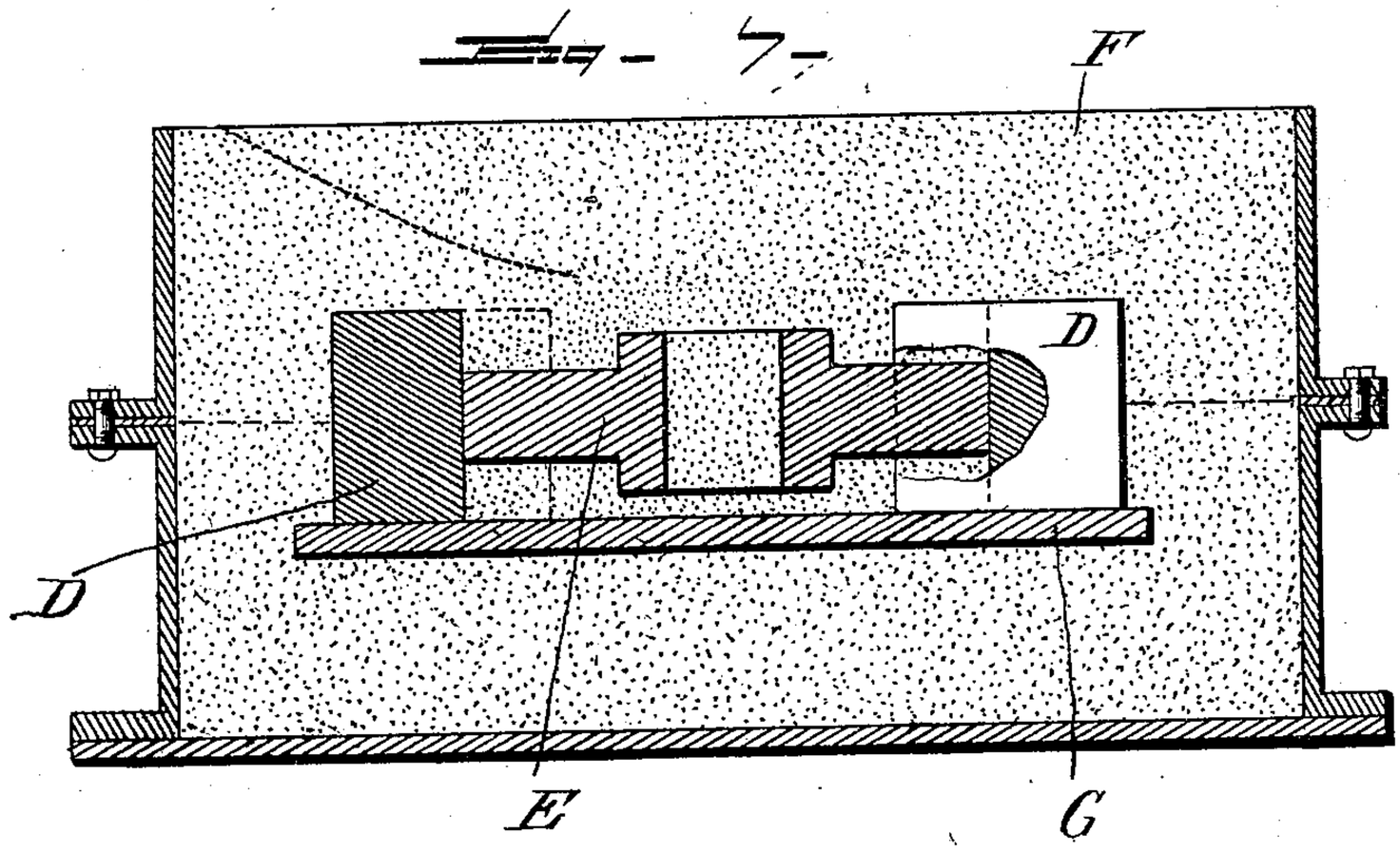



Fig. 7.

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# UNITED STATES PATENT OFFICE.

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## CASTING SPROCKET-WHEELS.

SPECIFICATION forming part of Letters Patent No. 694,395, dated March 4, 1902.

Application filed January 7, 1899. Serial No. 701,442. (No model.)

*To all whom it may concern:*

Be it known that I, CHRISTOPHER W. LEVALLEY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Casting Sprocket-Wheels, of which the following is a specification, reference being had therein to the accompanying drawings.

This present invention relates to the manufacture of toothed gear-wheels, and more particularly to that kind of such wheels known as "sprocket-wheels," which are used in connection with drive-chains for power-transmitting purposes.

It has been demonstrated that sprocket-chains are subject to excessive wear at two parts particularly, these being the side or working faces of the teeth and the peripheral portions of the wheel adjacent to the bases of the teeth, as it is with these parts of the wheel that the articulating portions of the chain particularly engage.

My invention has for its object to produce a mold for use in the casting of toothed wheels, particularly sprocket-wheels, which mold comprises a series of separate and independent chills for the individual teeth of the wheels, these chills being constructed as will be specifically pointed our hereinafter and so that they operate to chill, and therefore harden, the surface of the metal of the wheel at those points or portions where the wear is the greatest—that is to say, the working faces of the sprocket-teeth and also the periphery of the wheel adjacent to the bases of the teeth.

It is well understood that in order to secure the least friction and utmost efficiency the pitch of the drive-chain and of the wheel with which it engages should be the same. As the engaging faces of the teeth of the wheel wear away the pitch of the wheel is changed, and therefore it has been proposed to chill the working faces of the teeth to reduce as far as possible the wear of the teeth. It is also evident that when the wearing-surfaces of the periphery of the wheel adjacent to the bases of the teeth and with which the cross parts of the link engage wear away the pitch of the wheel will be varied or the proper engagement of the chain with the wheel will be interfered with, for the reason that the bearing-surfaces for the links of the chain upon the periphery of the wheel will have changed their relation to the proper engaging surfaces for the links of the chain with the teeth of the wheel. The proper relations of these two important wearing or bearing surfaces should be maintained in all wheels, whatever their size or number of teeth, made for a particular size and kind of chain, and these relations should be maintained as nearly as possible throughout the life of the wheel, and I therefore construct my mold so that these wearing-surfaces shall be chilled and hardened during the process of casting the wheel.

In the accompanying drawings, Figure 1 is a perspective view of an individual chill such as I have invented and used in the working of my invention. Figs. 2 to 5, inclusive, are detached plan views of molds for the casting of sprocket-wheels of different sizes embodying my invention, Fig. 2 being for a wheel provided with six sprocket-teeth, Fig. 3 for a wheel with twelve sprocket-teeth, and Fig. 5 for a wheel with twenty-four sprocket-teeth. Fig. 4 illustrates a feature of the invention, which will be later described. Fig. 6 is a plan view of a portion of a wheel made according to my invention and in engagement with which I have represented a short section of drive-chain. Fig. 7 is a central vertical section of a mold for casting a wheel embodying my invention.

Referring first to Fig. 6, A represents the body of a sprocket-wheel, and C the teeth thereof. B B indicate the links of a sprocket or drive chain adapted to engage with the wheel. For the purposes of illustration I have chosen a well-known type of chain in which each link is of a single piece, having opposite side bars, an end bar at one end, and a hook at the opposite end. In the drawings, *b b* indicate the cross articulating parts of the chain, which are in this instance composed of a side bar and an engaging hook. The pitch of the chain is the distance between the axes of the articulating parts, and the pitch of the wheel with which this chain engages should be the same as that of the chain. The cross parts of the chain engage with the wearing-surfaces of the teeth at *c'*, and I have by the dotted line H indicated a circle which includes the wearing-surfaces *c'* of the teeth,

and which I term the "pitch-circle." *c* designates the parts of the periphery of the wheel at the bases of the teeth with which the cross portions of the chain engage. The dotted line I indicates a circle struck from the center of the wheel, which cuts these wearing portions *c*, and which I term the "base-circle." As pointed out hereinbefore, it is necessary to the proper working of the chain upon the wheel that the wear at the portions *c' c* of the chain should be reduced to a minimum, and these portions of the wheel are chilled by means which I will presently describe. It is evident that the distance between the circles H and I taken upon any radial line must be the same whatever the size of the wheel—that is, whether it have many or few teeth—because it is the surfaces *c* which operate to support the chain and so sustain it that the articulating parts thereof shall be maintained in the pitch-circle H and shall properly engage with the wearing-surfaces *c'* of the wheel. This is true notwithstanding the fact that the relations of the teeth to each other vary with each difference in the size of the wheel and the number of teeth which it has. This is clearly illustrated in Figs. 2, 3, and 5, where the pattern E may be taken to represent the wheel for the purposes of this consideration.

In the drawings, E represents the pattern, which is of the shape of the wheel desired to be produced and which is inserted in the sand (represented at F) in the way commonly followed in the art of casting metal.

D represents a chill, which is preferably of the form and construction represented in Fig. 1.

In operating my invention the pattern E is properly placed and the chills are then placed around it, as represented in Figs. 1, 2, 5, and 7, one being placed over each tooth *e* of the pattern. The sand is then packed around the pattern and the chills in the usual way and the pattern finally removed, leaving the chills firmly embedded in the sand and constituting a part of the mold. Each chill consists of a block of suitable material formed at one end with a recess adapted to accurately fit the tooth of the wheel which is to be formed. The inner walls *d* of this recess operate to chill the opposite working faces *c'* of the teeth C of the sprocket-wheel. The recessed end of the chill is formed with ends *d' d'*, which extend laterally beyond the recess and operate to form and to chill the peripheral wearing-surfaces *c* of the wheel adjacent to the bases of the teeth. The inner portions of the ends *d'* of the chill—that is, the portions which are next to the recess—are curved, while the outer or edge portions are substantially flat and approximately at right angles to a line which passes longitudinally through the center or axis of the recess in the chill. As the chill is an integral structure, the relations of the surfaces thereof which form and which chill the parts *c c'* of the wheel cannot vary relative to each other.

By using chills of the construction shown and described and one for each separate tooth of the wheel to be formed it is possible to use a single set of chills in the casting of wheels of different sizes notwithstanding the fact that the positions and relations of the teeth relative to each other vary with each change in the size of the wheel. This is clearly indicated in Figs. 2, 3, and 5.

The advantages incident to my invention as thus far described will be clearly understood. A single form of chill may be provided for the manufacture of all wheels to be used with chains of a particular type and size no matter what the size of the wheel may be. The chills operate to produce a wheel with hardened or chilled surfaces at the important wearing parts *c c'*, and these parts are always formed in proper relation to each other whatever be the size of the wheel, and, further, the wheel produced according to my invention may be run in either direction, the opposite sides of the teeth being counterparts of each other.

By reference to Figs. 1 and 7 it will be seen that the chills are much thicker than are the teeth which they form. By "thickness" I refer to the dimension indicated by the double arrow $D^2$ of Fig. 1. The advantages incident to this construction are that when a sand mold is used the sand may be rammed against the vertical or end surfaces *d'* of the chills as well as between the side faces thereof, both above and below the pattern E, and this operates to firmly hold the chills in place, reducing danger of accidental displacement to a minimum. In Fig. 7 the chills are represented as being supported upon a board G.

It is often desirable in making sprocket-wheels for a given style and size of chain that certain of the wheels should be a little larger than certain others, and thus have a slightly-greater pitch. Thus it is better to have the driving-wheel a little larger than the driven wheel. Again, if a new wheel is to be used in connection with an old chain or one which has become worn it is desirable that the wheel should be a trifle larger than a new wheel for the same chain. By means of my invention it is a very simple matter to slightly increase the size of the wheels and still make use of the same chills which are employed for wheels of slightly-smaller size. How this may be done is illustrated in Fig. 4 of the drawings. The same pattern E is employed as when it is desired to make a wheel of normal size and pitch; but the chills D are supported at a slight distance away from or beyond the teeth *e* of the pattern. In order to thus support the chills and to properly place them relative to the teeth E, I prefer to insert between the side faces of the teeth and the faces *d* of the chills liners or spacing-strips *e'*. These strips or pieces may be of paper, wood,

metal, or other suitable material and merely operate to temporarily hold the chills in proper position relative to the pattern until they have been set in the sand, after which such pieces are removed along with the pattern E. Other means for supporting the chills at a slight distance from and beyond the teeth of the pattern might be used; but the advantages incident to employing the strips or liners $e'$, owing to their simplicity, the ease with which they are used, and the accuracy with which slight changes in the positions of the chills may be made, are apparent.

It will be observed that the teeth of sprocket-wheels which my invention is adapted to produce are relatively far apart and that the chills are each formed with end faces $d'$, which extend laterally from the teeth, and that these laterally-extending faces are of a breadth less than half the space between the bases of the teeth of the wheels in the casting of which they are adapted to be used, with the result that while the chills operate to chill and harden the peripheral bearing-surfaces $c$ of the wheel for a sufficient distance on either side of each tooth the chills may still be used in the casting of wheels of different sizes without interfering one with the other, as will be clearly seen as by comparison of Figs. 2, 3, and 5.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. For the casting of sprocket-wheels a series of chills one for each tooth of the wheel, the chills being duplicates one of the other, and each recessed at one end and formed with the inner walls of the recesses arranged to form and chill the working sides of the teeth, and also formed with end faces $d'$, which extend laterally beyond the recesses in the chills and are arranged to form and to chill the periphery of the wheel adjacent to the bases of the teeth, the outer or edge portions of which end faces are substantially flat, substantially as set forth.

2. For the casting of wheels having teeth which are relatively far apart, a series of chills, one for each tooth of the wheel to be formed, the chills being duplicates one of the other and each recessed at one end whereby it forms and chills the working sides of a tooth, and also formed with end faces which extend laterally from the recess therein and which form and chill the parts of the periphery of the wheel adjacent to and on either side of each tooth, the width of the said laterally-extending end faces of the chills being less than half the distance between the bases of the teeth in the casting of which the chills are used, and the outer or edge portions of the said end faces being substantially flat, substantially as set forth.

3. For use in the casting of sprocket-wheels a series of recessed chills, one for each tooth of the wheel, the chills being formed with end faces $d'$ adapted to form and chill portions of the periphery of the wheel adjacent to the bases of the teeth, these faces of the chills being of a thickness greater than the thickness of the teeth which the chills form, and the outer or edge portions of such chill-faces being substantially flat, substantially as set forth.

4. The combination with a toothed pattern, of a series of recessed chills, one for each tooth arranged to fit over the teeth of the pattern, and means for supporting the chills in position to embrace the teeth of the pattern, but at a slight distance beyond the same, substantially as set forth.

5. The combination with a toothed pattern, of a series of recessed chills, one for each tooth and removable liners or spacing-pieces arranged between the teeth of the pattern and the walls of the recesses of the chills whereby the positions of the chills relative to the pattern may be slightly varied, substantially as set forth.

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

CHRISTOPHER W. LEVALLEY.

Witnesses:
V. I. KLOFANDA,
JOSEPH LOCH.