

No. 786,248.

PATENTED MAR. 28, 1905.

F. COWDEN.  
CASTING.

APPLICATION FILED JULY 15, 1904.

FIG. 1.

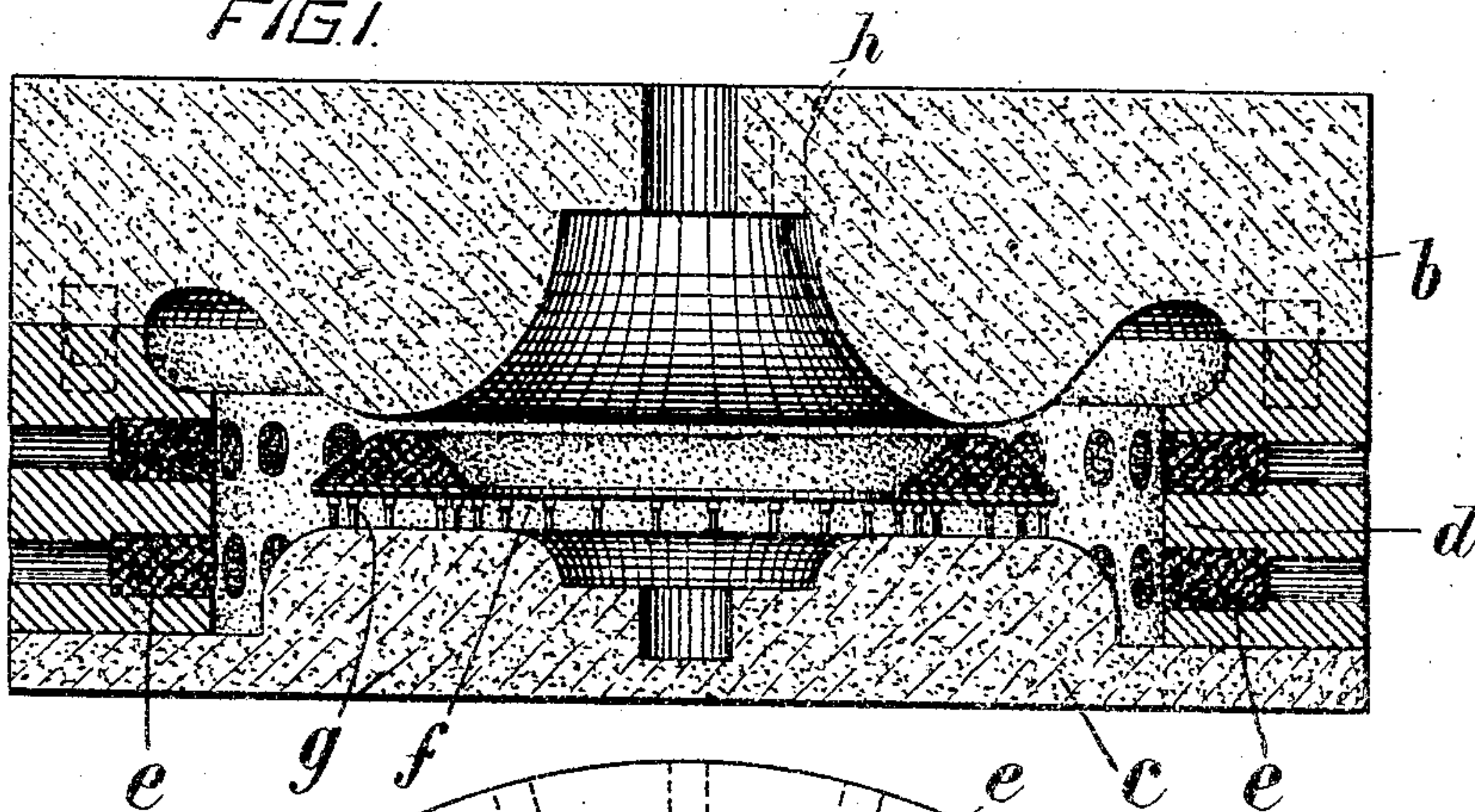


FIG. 2.

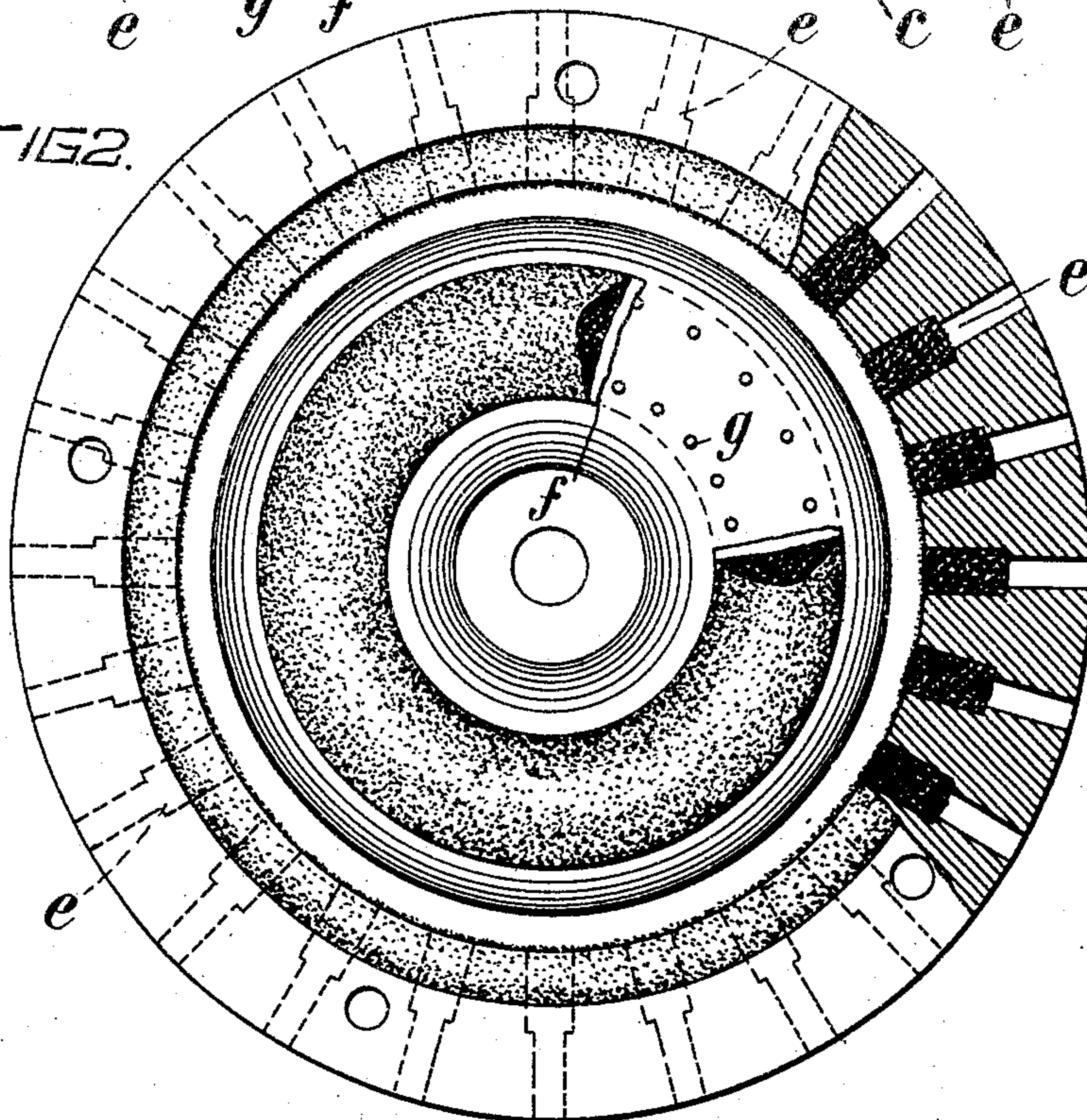
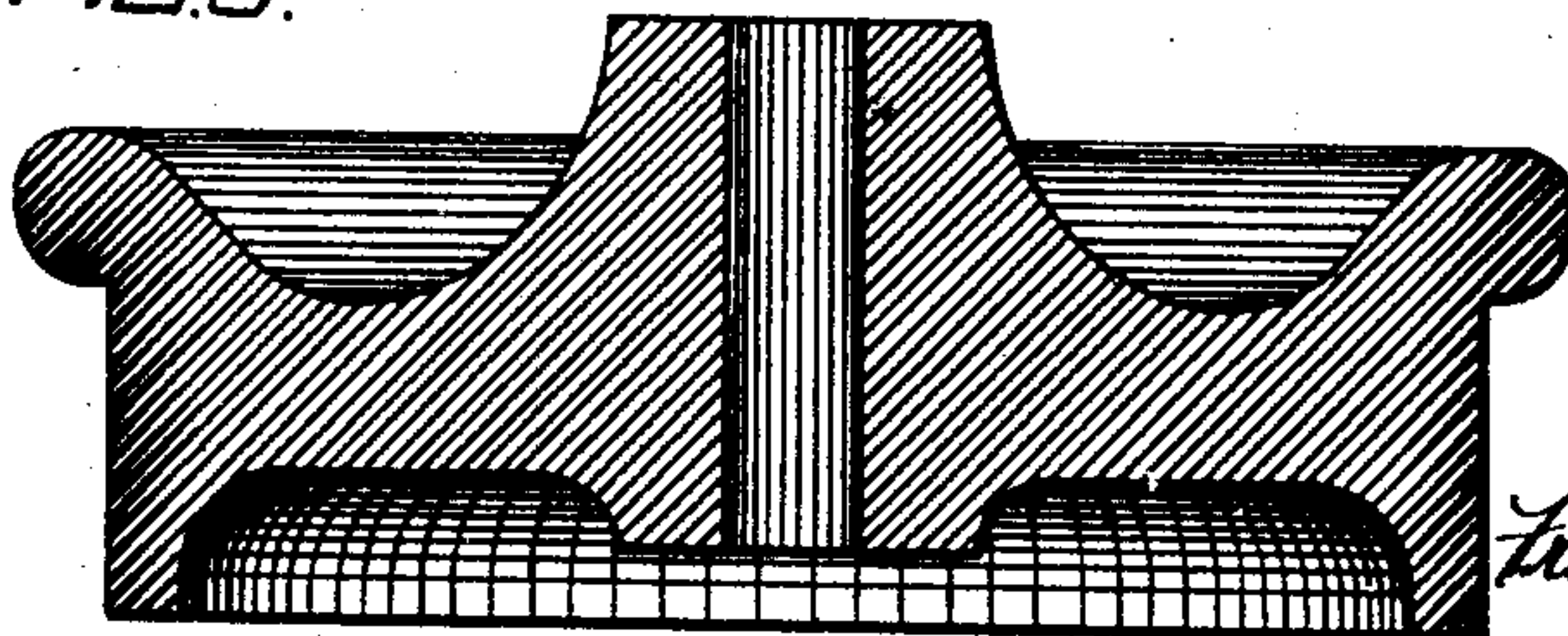


FIG. 3.



Witnesses

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# UNITED STATES PATENT OFFICE.

FREDERICK COWDEN, OF MONTREAL, CANADA, ASSIGNOR OF ONE-HALF  
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## CASTING.

SPECIFICATION forming part of Letters Patent No. 786,248, dated March 28, 1905.

Original application filed May 21, 1904, Serial No. 209,088. Divided and this application filed July 15, 1904. Serial No. 216,758.

*To all whom it may concern:*

Be it known that I, FREDERICK COWDEN, of the city of Montreal, Province of Quebec, Canada, have invented certain new and useful  
5 Improvements in Castings; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to castings with one or more portions thereof different in chemical  
10 and physical properties from the remainder, and particularly to cast-metal objects having a portion thereof subjected to greater wear than the other portions thereof—such, for instance, as the tread and flange of a car-wheel,  
15 the bearing-surface of an axle, trunnion, or brake-shoe, or friction-faces of an engine, a cog or other wheels, rails, or diamond crossings, frogs, switch-points, and the like, or any other article or device having a portion  
20 thereof subjected to greater wear than its remainder.

The treads of car-wheels and other bearing-surfaces or friction-faces have hitherto been hardened by chilling, and when articles of  
25 this nature have been made heretofore with a portion or portions thereof of a different degree of hardness from the remainder cast-iron has been used.

The main object of this invention is to substitute open-hearth acid or basic steel for the cast-iron, the obvious advantage being that a much lighter and yet stronger article is produced. The invention also has for its object to change the degree of hardness and toughness of one or more portions of a thing being  
35 cast by combining with such portion or portions a substance capable of effecting this result.

The invention may be said briefly to consist of a cast article having a portion thereof  
40 of a different degree of hardness and toughness from the remainder.

The process and apparatus referred to hereinafter and described in detail are not claimed  
45 herein, as they form the subject-matter of

separate applications filed by me May 21, 1904, under Serial No. 209,088, and July 14, 1904, under Serial No. 216,544, the present application and application No. 216,544 being divisional parts of application Serial No. 209,088. 50  
For full comprehension, however, of my invention reference must be had to the accompanying drawings, forming a part of this specification, in which similar reference characters indicate the same parts, and wherein— 55

Figure 1 is a transverse sectional view of a car-wheel constructed according to my invention. Fig. 2 is an axial sectional view of a car-wheel mold used for the production of  
60 car-wheels constructed according to my invention, and Fig. 3 is a view of the drag portion of the mold with the cope portion removed.

In order that my invention may be thoroughly understood, I have illustrated the  
65 means whereby my improved casting is produced, and I will now describe the said means and the process which results in my improved casting.

I will now describe a mold whereby a car-wheel can be cast in order to demonstrate the invention, although it is to be understood that I do not confine myself to such embodiment, but select the same only as an instance. 70

The mold is in the main of usual construction and consists of a cope *b* and drag *c*, shaped  
75 interiorly to impart the required form, the drag having one of its walls *d* adapted to act as a chill and the cope having a pouring-gate or sprue-hole *h*. According to my invention 80  
the chill is formed with a series of apertures or recesses *e*. After the mold has been formed I locate a destructible tray *f* (in this instance of annular form and consisting, preferably, of paper or other inflammable material) in the  
85 drag and support the same above the floor, preferably upon a series of pins *g*, preferably fusible at a comparatively low temperature. This tray is preferably cut to a size adapted to hold heaped thereon the required quantity, 90



and no more, of manganese to be combined with the substance in the apertures or in the chill, thereby acting as a gage.

The method of using my improved mold is as follows: I first fill the apertures or recesses *e* with a mixture consisting of sand one (1) part and pulverized coke two (2) parts, dampened with molasses-water, the latter being in the proportion of molasses one (1) part and water five (5) parts. The chill is then washed with a liquid consisting of manganese one (1) part, coke two (2) parts, and molasses-water, the latter consisting of molasses one (1) part and water five (5) parts. While the chill is drying, the dry powdered manganese in quantity sufficient with that in the liquid mixture with which the chill has been washed to impart the desired degree of hardness to the article being cast is introduced into the mold, this being done in the following manner: The destructible tray is placed upon the pins *g*, and as much dry pulverized manganese as it will hold is heaped thereon, the tray being gaged to hold sufficient manganese to make up with that in the liquid mixture with which the chill is washed, approximately from one per cent. to two per cent., according to the degree of hardness desired. After the chill is dry the mold is closed and the molten metal, preferably open-hearth acid or basic steel, is poured into the same through the ingate or sprue-hole *h*, the remainder of the process being the same as usual in casting car-wheels, excepting that if the pins *g* should not happen to be fused they can be broken or filed off.

The action which takes place while the molten metal is being poured and while it is flowing from the ingate to the chill is that when it comes in contact with the tray the latter will be gradually destroyed and the elements thereof will combine with the elements of the metal, thus allowing the manganese heaped thereon to be fused and absorbed by the flowing molten metal, which will gradually take up all the manganese upon the tray. Owing to the natural rolling forward of such molten metal as it flows, the manganese is supported above the bottom of the mold in order to cause the manganese to be distributed throughout and absorbed by that portion only of the molten metal which will lie in contact with and be adjacent to the chill when the cast is made. This manner of supplying the dry pulverized manganese to the molten metal secures a uniform distribution thereof throughout the portion of the molten metal by which it is required to be taken up. The resultant chemical action is that the molten metal, with the additional manganese absorbed thereby, absorbs the carbon in the substance with which the apertures or recesses in the chill are charged, thereby making the portion of the casting

thus treated different in chemical and physical properties owing to its being recarbonized from the charges of carboniferous substance carried by the chill and made to constitute an alloy rich in manganese, and consequently hard and durable.

The casting produced according to the foregoing consists of a body portion, the hub and web comprising any desired percentage of carbon—say, for instance, 0.25 per cent. to 0.35 per cent., approximately—while the tread and rim comprise carbon from 0.75 per cent. to one per cent., approximately, and manganese from one per cent. to two per cent., approximately.

Articles cast according to the foregoing may be considerably less in weight, comparatively speaking, and will be able to withstand greater strain than like articles as heretofore cast, and in the case of car-wheels while the center or body portion thereof will be of softer steel of any requisite degree of strength or hardness, such as having, for instance, from 0.25 per cent. to 0.35 per cent. carbon, such wheel will have a harder wearing surface or tread of from 0.75 per cent. to one per cent. carbon and from one per cent. to two per cent. manganese combined with the 0.25 per cent. to 0.35 per cent., the latter being the carbon strength of the mass from which the wheel is cast.

The effect of the manganese upon the molten steel is to render the portion thereof with which it combines tougher than the remainder.

What I claim is as follows:

1. A cast manganiferous-steel article a portion whereof contains a higher percentage of carbon than the remainder such portion also containing a higher percentage of manganese than the remainder.

2. A cast-steel article a portion whereof contains carbon from 0.75 per cent. to one per cent. approximately and the remainder a lower percentage, and such portion also containing manganese from one per cent. to two per cent. approximately.

3. A cast manganiferous-steel article, a portion whereof contains carbon from 0.75 per cent. to one per cent. approximately and manganese from one per cent. to two per cent. approximately and the remainder of the article containing carbon from 0.25 per cent. to 0.35 per cent. approximately.

4. A cast manganiferous-steel car-wheel the tread whereof contains a higher percentage of carbon than the remainder such tread also containing a higher percentage of manganese than the remainder.

5. A cast-steel car-wheel the tread whereof contains carbon from 0.75 per cent. to one per cent. approximately and the web and hub a lower percentage, and such tread also containing manganese from one per cent. to two

per cent. approximately and the web and hub containing a lower percentage.

5 6. A cast manganiferous-steel car-wheel the tread whereof contains carbon from 0.75 per cent. to one per cent. approximately and manganese from one per cent. to two per cent. approximately and the web and hub of the wheel containing carbon from 0.25 per cent. to 0.35 per cent. approximately and a lower

percentage of manganese than contained in 10 the tread and web.

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

FREDERICK COWDEN.

Witnesses:

C. GORMAN,

WILLIAM P. McFEAT.