

No. 762,622.

PATENTED JUNE 14, 1904.

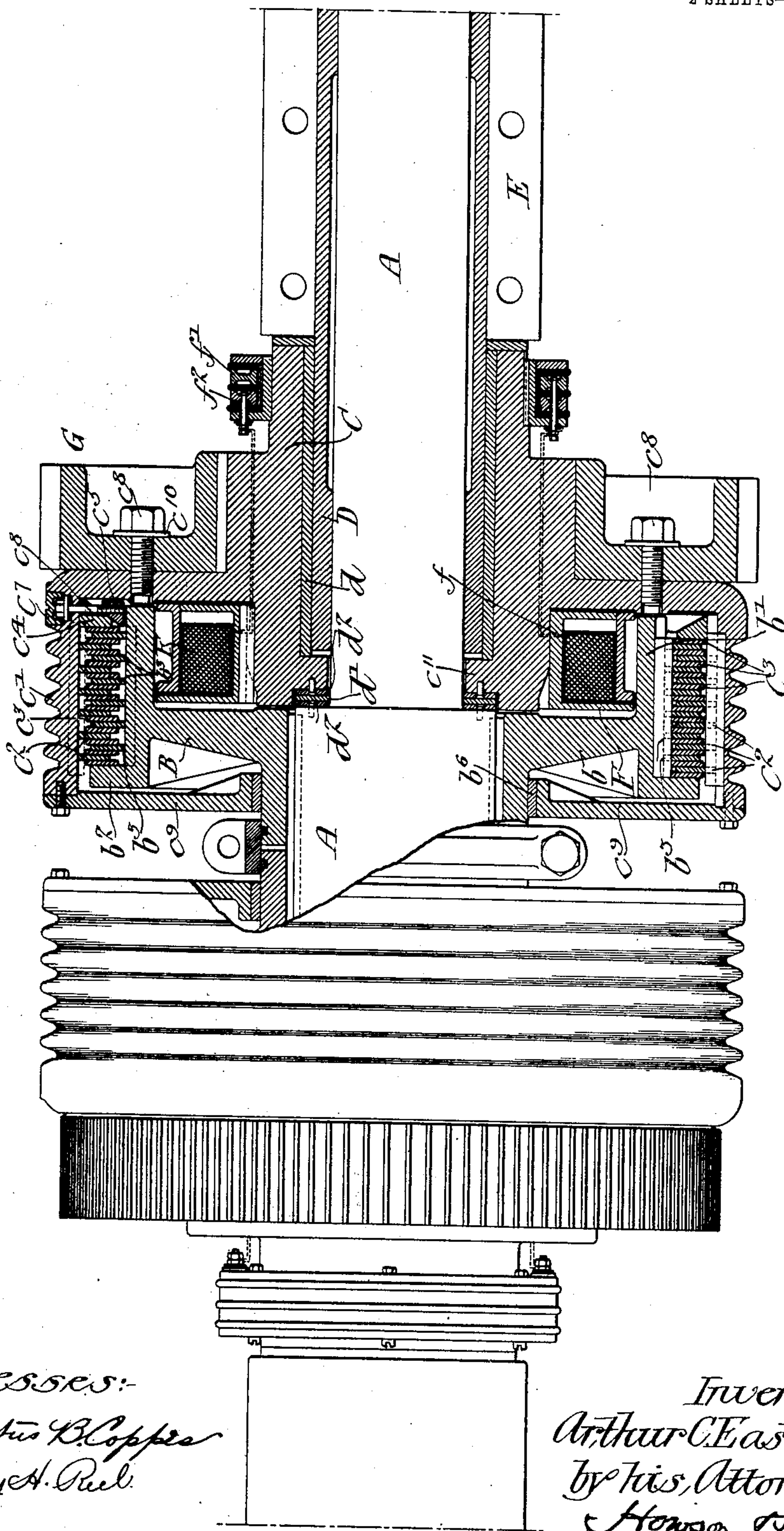
A. C. EASTWOOD.
MAGNETIC CLUTCH.

APPLICATION FILED MAR. 5, 1904.

NO MODEL.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Augustus B. Cope
Wesley A. Paul

Inventor:
Arthur C. Eastwood,
by his Attorneys,
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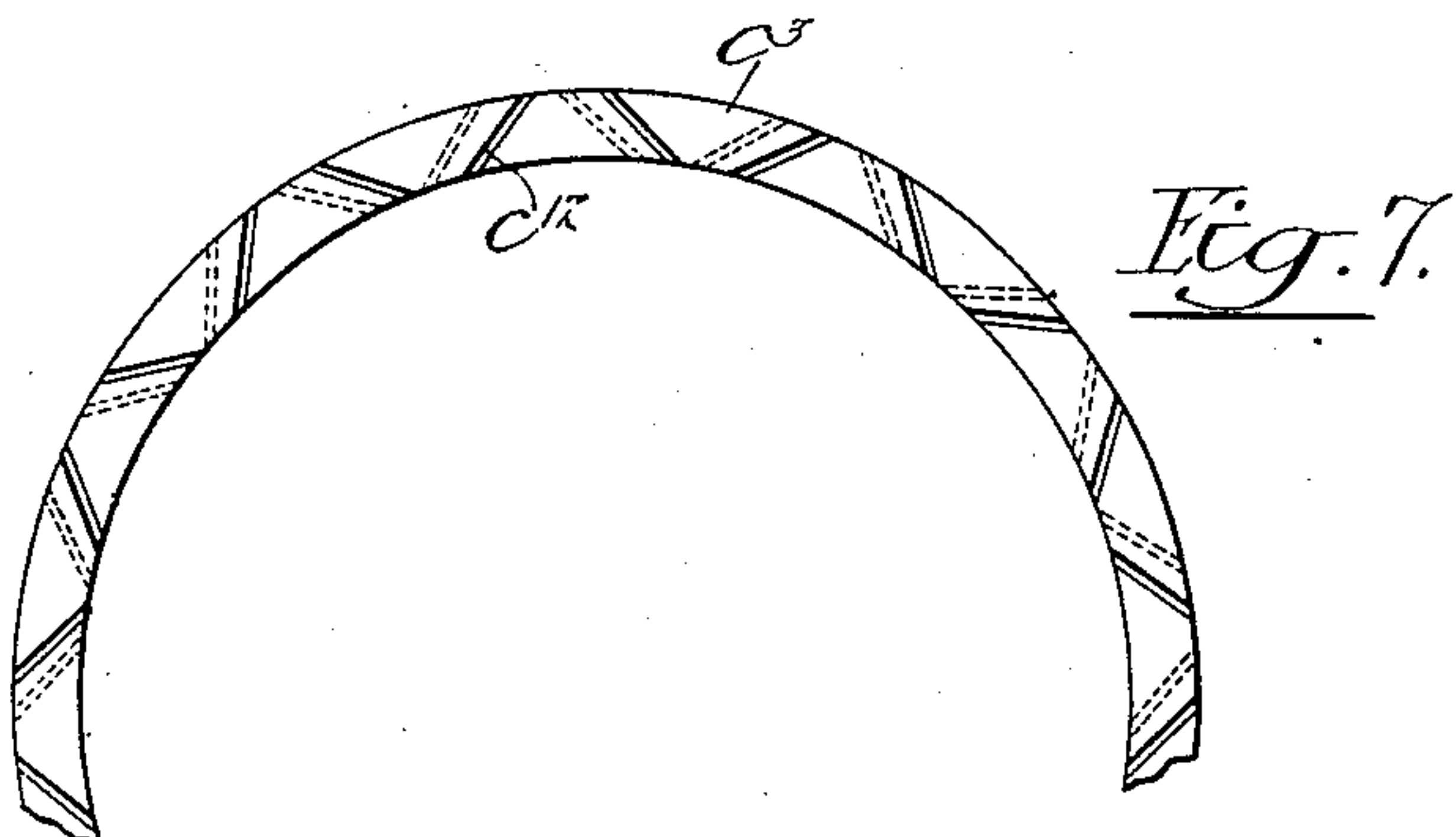
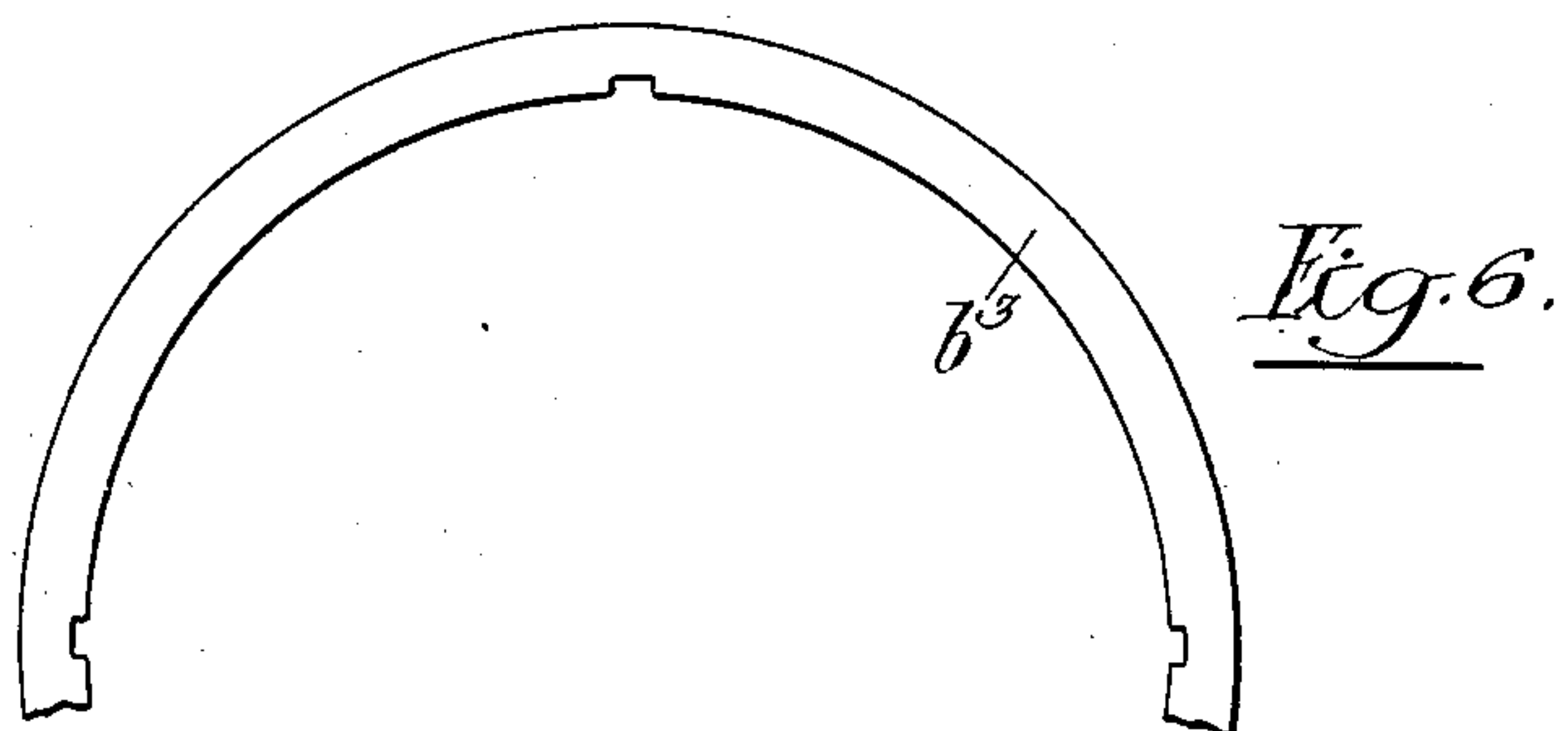
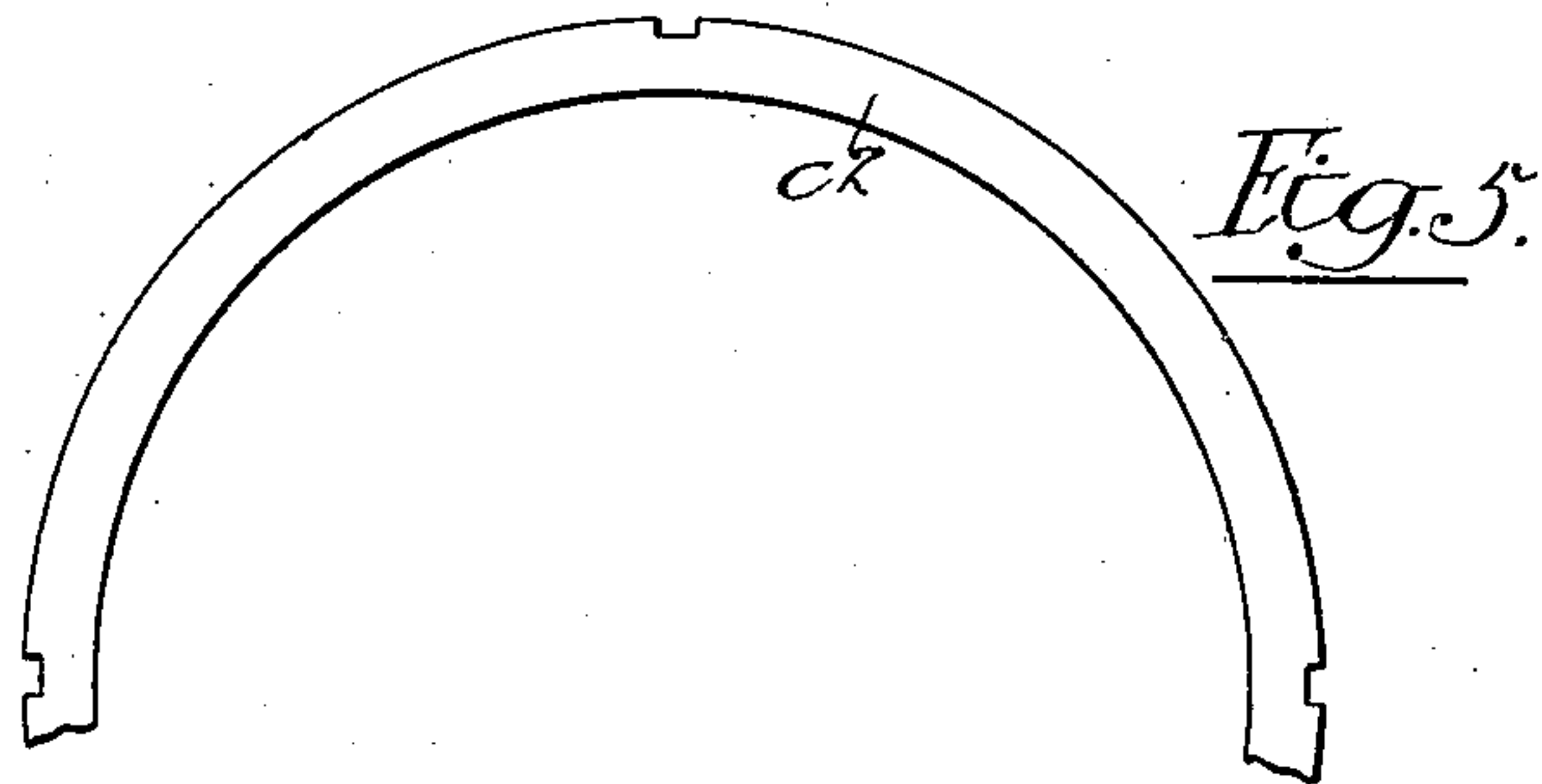


Fig. 5.

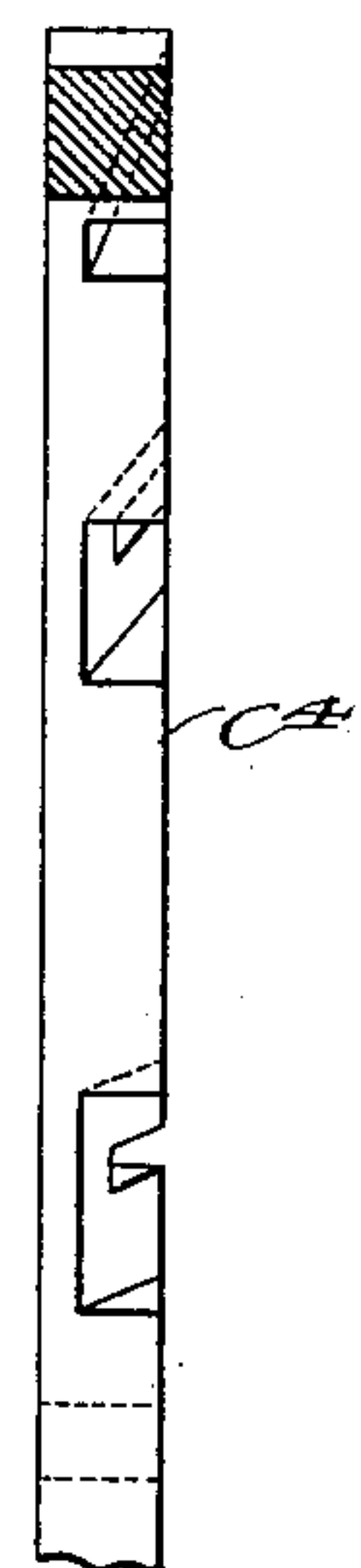


Fig. 2.

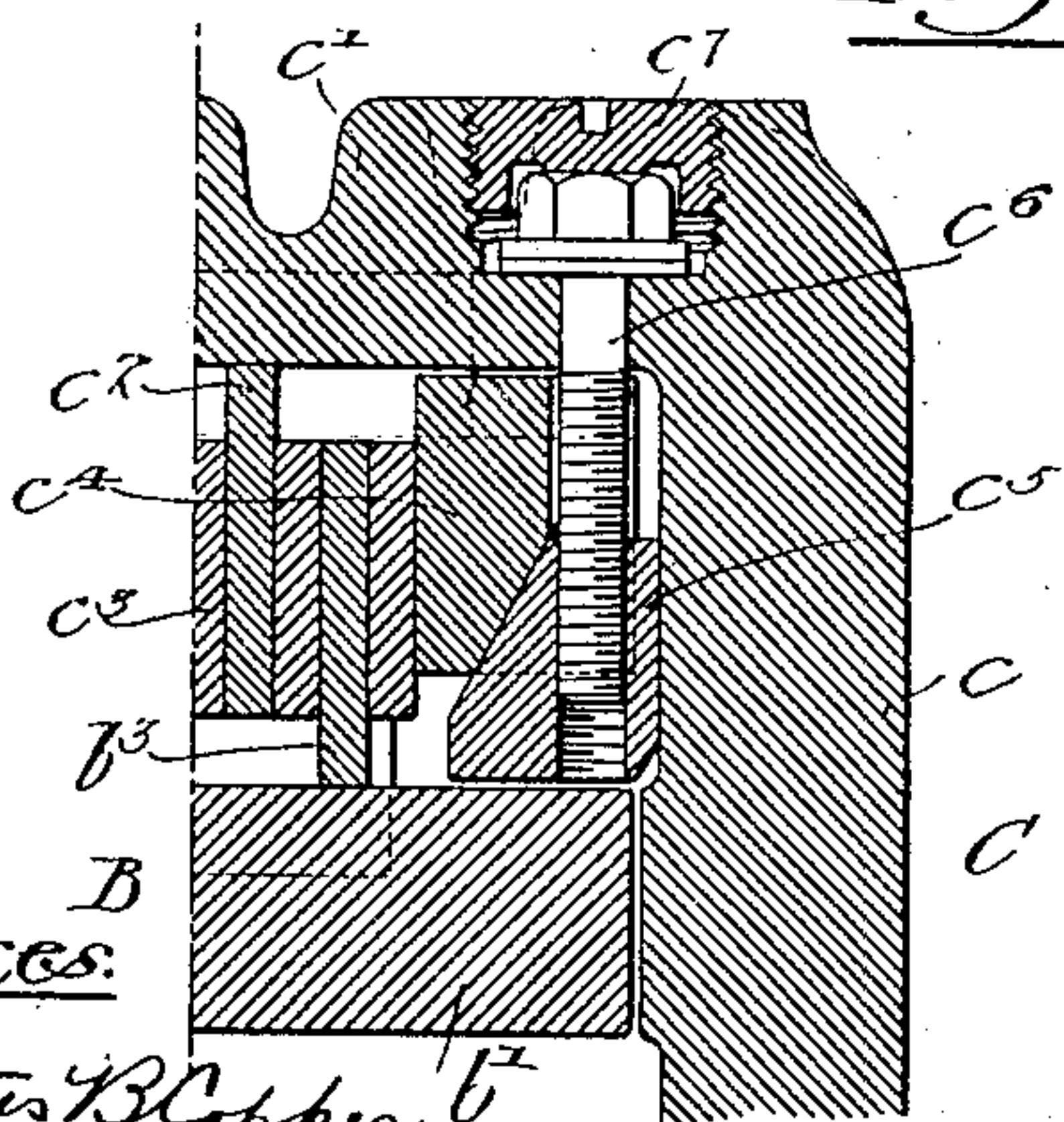
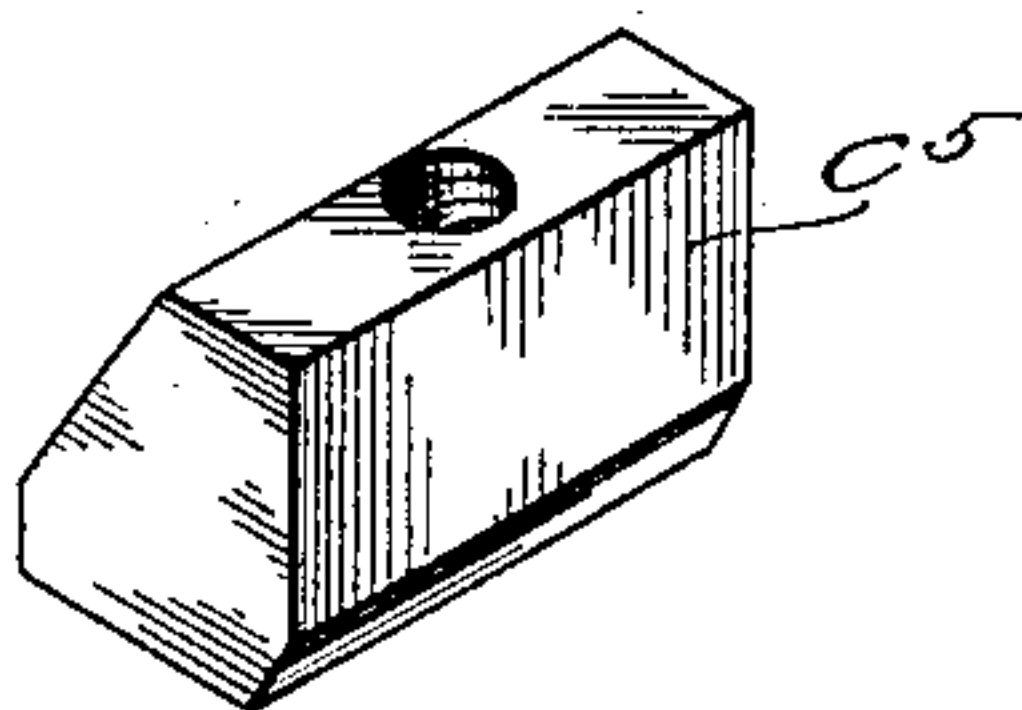


Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

MAGNETIC CLUTCH.

SPECIFICATION forming part of Letters Patent No. 762,622, dated June 14, 1904.

Application filed March 5, 1904. Serial No. 196,730. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, and a resident of Cleveland, Ohio, have invented certain Improvements in Magnetic Clutches, of which the following is a specification.

The object of my invention is to provide a magnetic clutch which shall be of relatively high capacity for a given size and provided with means for rapidly dissipating heat due to the friction between its coacting surfaces.

Another object of the invention is to so dispose the parts of the device that a portion of the shaft upon which the clutch members are supported shall be included in the magnetic circuit of the clutch.

It is further desired to provide means whereby the wear between the members of the clutch may be easily taken up and the distance between the parts of the device adjusted. I also desire that the clutch shall be of an efficient and substantial construction, having its parts so arranged that they may be made and assembled with ease and convenience.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view, partly in section, showing the detailed construction of my improved clutch. Fig. 2 is a sectional elevation of a portion of the clutch, showing in detail the construction of the ring adjusting device. Fig. 3 is a side elevation, partly in section, of a portion of one of the adjusting-rings. Fig. 4 is a perspective view of one of the adjusting-blocks, and Figs. 5, 6, and 7 are side elevations showing the detail construction of the rings belonging to each of the three series of friction-rings.

In the above drawings I have shown two clutch units, each provided with a gear-wheel and each having one member keyed to a single supporting-shaft, which shaft has also keyed to it any desired form of gear or other wheel (not shown) through which power is transmitted to mechanism to be driven. The gear-wheels of the two clutches are driven in opposite directions from any desired source or

sources of power in a manner well known to the art.

A is the main supporting-shaft of the clutch, and this has keyed to it the member B, which consists of a wheel having a web b and a rim b' , on one edge of which is an outwardly-projecting flange b^2 . Movably keyed to the outside surface of the rim b' are a series of flat rings b^3 , and it is to be noted that said rim overhangs its web b on one side for a purpose set forth hereinafter.

The second member C of the clutch is carried upon a portion of the shaft A of a diameter somewhat smaller than that to which the member B is keyed, there being upon said portion a sleeve D, preferably of brass, extending into and fixed in the bearing E, in which one end of the shaft A is supported. This member C has interposed between it and the sleeve D a revoluble sleeve d , usually of cast-iron, and there is between the shoulder formed by the larger portion of the shaft A and the portion of the member C a loose ring d' , each of said two parts having fixed to it a ring d^2 , bearing upon said ring d' .

A magnetizing-coil F is carried in a metallic liquid-tight casing f , keyed or otherwise rigidly fixed to a portion of the member C, projecting under the overhung portion of the rim b' of the clutch member B, so that said coil is within the inclosure or casing formed by the two clutch members.

The clutch member C has keyed to it a gear-wheel G and is formed with a web-like portion c , from whose outer edge projects a corrugated flange or rim c' , this latter extending over the rim and flanged portion of the clutch member B. The inside surface of this portion c' has movably keyed to it a series of flat rings c^2 , and there are grooved rings c^3 between each of said rings and the rings b^3 , said rings c^3 being unattached to either of the clutch members, and consequently free to revolve. The rings b^3 and c^2 are preferably of cast iron or steel, while the freely-movable rings c^3 are of brass and provided with inclined grooves c^{12} , preferably on both faces. At that side of the series of rings most distant from the flange b^2

is a ring c^4 , made with a number of inclined slots, as shown in Fig. 3, and there are a series of wedge-shaped blocks c^5 fitting in said slots between the ring c^4 and the portion c of the member C.

A series of bolts, of which one of which is shown at c^6 , extends through the portion c' of the clutch-member C and passing loosely through the ring c^4 are threaded into the various blocks c^5 . The heads of these bolts are preferably countersunk, and the recesses thus formed are closed by cap-nuts c^7 .

Projecting through the gear G and through a threaded opening in the web portion c of the clutch member C are a series of bolts c^8 , whose ends are adjacent to the edge of the rim b' of the member B, but are normally kept out of engagement with said edge by means of washers c^{10} . These bolts are all of the same length, so that when the washers are removed they may all be made to project beyond the face of the web portions c for a predetermined distance.

A flat ring c^9 is bolted to the outer edge of the flanged portion c' of the member C and extends inwardly from said edge to the hub of the member B, there being a bushing b^6 interposed between said plate or ring c^9 and said member.

The web and rim of the member B and the web c , hub, and corrugated rim c' of the member C form with said plate c^9 a chamber within which under operating conditions a body of oil or other liquid is retained, the magnetizing-coil F being within this chamber, but protected from the liquid by means of its inclosing casing f .

Upon a suitably-extended portion of the member C are supported two metallic rings f^2 and f' , respectively connected to the ends of the magnetizing-coil F.

From an inspection of the drawings it will be seen that the portion of the hub of the member C extending adjacent to the hub of the member B is of relatively small area of cross-section as compared to the portions of the magnetic circuit surrounding the coil F and that there is an annular portion c^{11} of said hub of member C which projects inwardly to within a short distance of the shaft A. By this arrangement of parts I am enabled to include a portion of said shaft in the regular magnetic circuit of the clutch, thus not only utilizing a body of magnetic material hitherto not thus employed, and consequently reducing the metal of the clutch proper, but also preventing magnetic leakage and stray fields in the vicinity of the shaft.

Under operating conditions the coil F is energized by current supplied through the rings f' and f^2 , thereby causing the member B to be bodily moved longitudinally of the shaft A toward the member C, with the result that the three series of rings c^2 , c^3 , and

b^3 are clamped between the flange b^2 and the ring c^4 , (and consequently the part c ,) so that power is transmitted through the member C to the rim c' , and hence to the rim b' and the body of the member B. The various rings, as well as the magnet F, being constantly bathed in the oil or other liquid with the chamber formed by the clutch members impart to the rim c' the heat generated by the friction between said rings and also the heat arising from said coil, and this heat is rapidly dissipated from the relatively extended surface of said rim. This is a most advantageous action, since when the clutch is employed as part of the apparatus connecting a device whose direction of motion is frequently reversed with a source of power there is considerable heat generated by the frictionally-engaging surfaces of the clutch at each stroke of the machine, and this would certainly be sufficient to cause injury when said machine was operated at full speed unless means was provided for rapidly and conveniently dissipating it. Under operating conditions there is more or less motion of the independent rings c^3 , and the grooves in their faces materially assist in circulating the otherwise relatively quiet body of liquid in the casing, tending to make it alternately bathe the peripheral flange of the clutch-casing and the friction-rings, and so dissipate the heat generated.

When it is desired to adjust the spaces between the various portions of the two clutch members, the washers c^{10} are removed from under the heads of the bolts c^8 , which are screwed inwardly until their ends all project for the same distance beyond the face of the web c . The coil F is then energized, so as to draw the edge of the rim b' against said bolts, after which the bolts c^6 are turned in a direction such that the blocks c^5 are moved outwardly, so as to cause the ring c^4 to clamp the three series of rings c^2 , c^3 , and b^3 tightly between itself and the flange b^2 . The cap-nuts c^7 are then put in place over the heads of the bolts c^6 , and the washers c^{10} are replaced under the heads of the bolts c^8 , which are thereby retained out of contact with the edge of the rim b' .

It is to be noted that certain features of my improved mechanism—notably the liquid-containing casing surrounding the engaging portions of the clutch, the liquid-circulating rings, and the ring adjusting means—are not limited in their use to magnetic clutches, since it is obvious that they are in no way dependent for their action on the particular mechanism employed to operatively couple the two clutch members.

I claim as my invention—

1. A clutch having members constructed to be frictionally coupled and forming a casing inclosing their engaging surfaces, liquid in the casing and a coil carried by one of said

members for causing them to be operatively coupled, substantially as described.

2. The combination in a clutch of two members, each having a flanged portion and together forming a liquid-tight casing, a series of rings connected to each member, with a coil carried by one of the members for causing the rings to be clamped between the flanged portions of said members, substantially as described.

3. The combination in a clutch of two members, each having connected to it a series of rings, a third series of rings independent of both clutch members, with a magnetizing-winding for causing said rings to be clamped together and means for taking up wear of the rings, substantially as described.

4. The combination in a clutch of two members, each having connected to it a series of rings, with a magnetizing-winding for causing said rings to be clamped together and means for taking up wear of the rings, said means including a ring having portions inclined to its plane and blocks coacting with said portions, substantially as described.

5. The combination in a clutch of members having projecting portions and each provided with a series of rings, a magnet for causing the rings to be clamped between the projecting portions, and means for adjusting the distance between said portions, substantially as described.

6. A clutch including two members, a plurality of series of rings between portions of the same, a coil for causing said members to be operatively coupled, with pieces having coacting surfaces inclined to the plane of the clutch interposed between the members and means for moving said pieces radially of the clutch, substantially as described.

7. The combination in a clutch of two members provided with bearing-surfaces, a magnet for drawing the members together and a ring independent of both members and interposed between the said bearing-surfaces, substantially as described.

8. The combination in a clutch of two members, each having connected to it a series of rings, a third series of rings having its units interposed respectively between the rings of the two other series and means for causing said rings to be clamped together, substantially as described.

9. The combination in a clutch of two members having their parts arranged to form a liquid-tight casing, three series of rings within the casing, of which two series are connected respectively to the two clutch members, liquid in the casing and a magnetizing-winding for causing said rings to be clamped together, substantially as described.

10. The combination in a clutch of a supporting-shaft, two clutch members, a magnetizing-coil for operatively coupling said mem-

bers, said shaft and portions of said clutch members being of magnetic material so disposed that the shaft is included in the magnetic circuit of the clutch, substantially as described.

11. The combination in a clutch of two members having bearing-surfaces, a ring between said surfaces free to move independently of the same, with means for clamping said parts together, substantially as described.

12. The combination in a clutch of a supporting-shaft, two clutch members and a magnetizing-coil for operatively coupling said members, said shaft and portions of the members being of magnetic material, the portions of said members included in the magnetic circuit of the clutch being of minimum cross-section between the coil and the shaft, substantially as described.

13. The combination in a clutch, of a supporting-shaft and two clutch members, with an annular magnetizing-coil around said shaft, there being portions of said clutch members of magnetic material so disposed around said coil that the shaft is included in the magnetic circuit of the clutch, substantially as described.

14. The combination in a clutch of two members of which one is provided with an annular magnetizing-coil, a shaft extending through said coil, both members having portions extending radially beyond the coil, and said second member also having a portion extending beyond the coil and inclosing the same, the metal of said members and of the shaft being disposed so that a portion of the shaft is included in the magnetic circuit of the clutch, substantially as described.

15. The combination in a clutch of two members having portions engaging one another so as to form a liquid-tight casing, a magnetizing-coil and two series of rings within said casing, said series of rings being respectively connected to the two clutch members, with liquid in the casing, substantially as described.

16. The combination in a clutch of a shaft, two members having portions engaging each other in such manner as to form a liquid-tight casing, one of said members being free to move longitudinally of the shaft, with liquid in the casing and means for operatively coupling the two members, substantially as described.

17. The combination in a clutch of two members, of which one is provided with a corrugated surface, a series of rings fixed to each member and a magnet-coil carried by one of the members for causing said rings to be clamped together, substantially as described.

18. The combination in a clutch of two members, each provided with an overhung rim portion and one fitting within the other, an end plate on one of the members forming a liquid-tight joint with the other member, liquid in

the casing, rings on the members, with a winding for causing said rings to be clamped together, substantially as described.

19. The combination in a clutch of two members together forming a liquid-tight casing and having engaging surfaces within said casing, with a magnet and a body of liquid also in the casing, said magnet having a liquid-tight inclosing container, substantially as described.

20. The combination in a clutch of two members forming a casing, liquid within the chamber, and a coil within said casing for causing said members to be drawn together, substantially as described.

21. The combination in a clutch of two members forming a chamber, liquid within the chamber, a liquid-tight casing within said chamber and a coil within said casing for causing said members to be operatively coupled, substantially as described.

22. The combination in a clutch of two members forming a chamber, liquid within the chamber, and a magnet also within the casing, with means for dissipating heat from said liquid, substantially as described.

23. The combination in a clutch of two members having bearing-surfaces and formed as a liquid-tight casing around said surfaces, a ring

interposed between the bearing-surfaces, and liquid in the casing, said ring having means for causing circulation of said liquid, with means for clamping the members together, substantially as described.

24. A clutch having members constructed to be frictionally coupled, a casing inclosing the engaging surfaces of said members, a grooved ring interposed between the said engaging surfaces and movable independently thereof, liquid in the casing and means for operatively coupling the clutch members, substantially as described.

25. The combination in a clutch of two members each having connected to it a series of rings, a third series of rings having its units interposed respectively between the rings of the two other series, said last series of rings having grooves in their faces, and means for operatively coupling the two members, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. EASTWOOD.

Witnesses:

WILLIAM E. BRADLEY,
JOS. H. KLEIN.