

No. 772,902.

PATENTED OCT. 18, 1904.

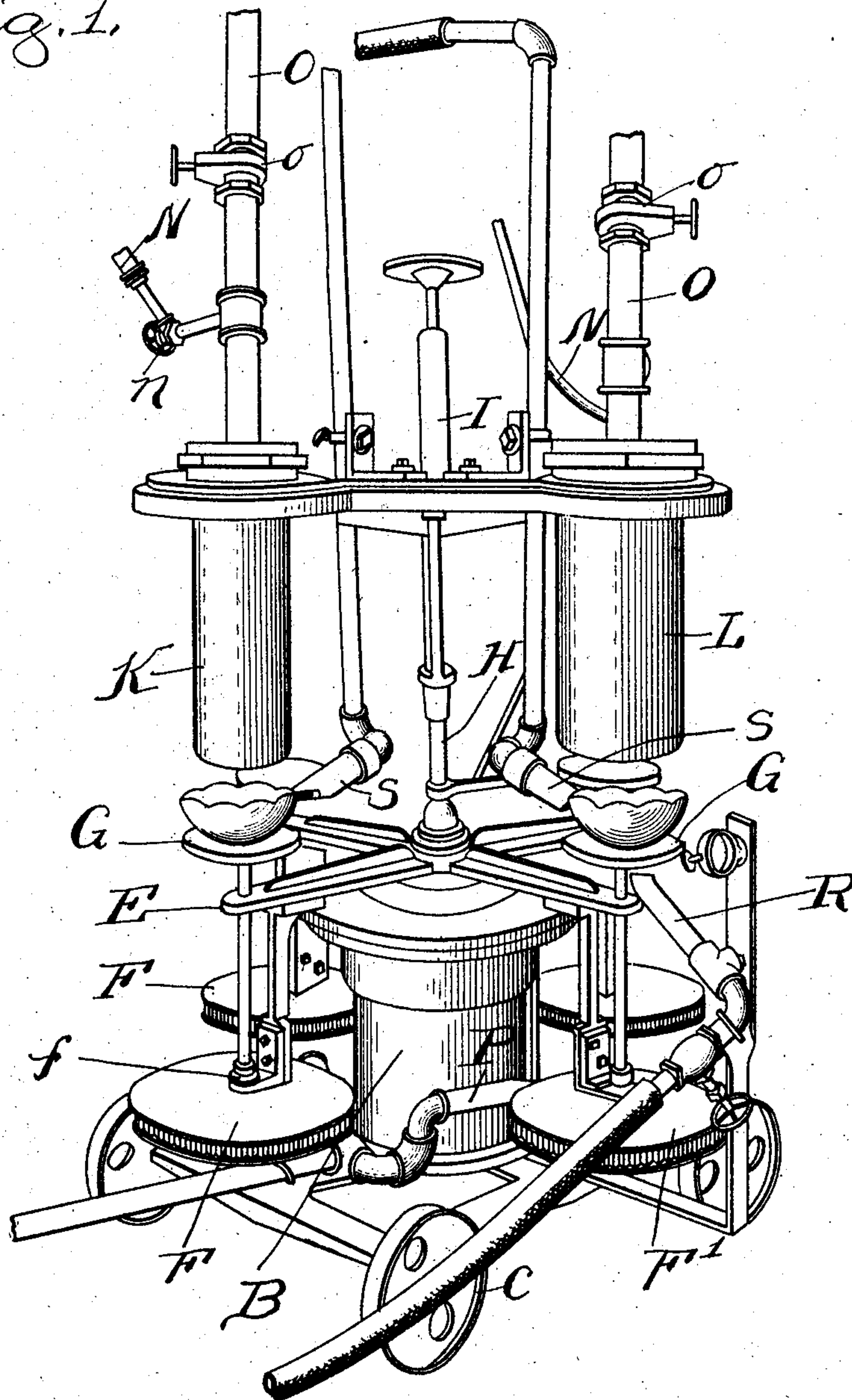
C. J. NOLAN.  
ART OF FIRE POLISHING GLASS.

APPLICATION FILED AUG. 6, 1904.

NO MODEL.

5 SHEETS—SHEET 1.

*Fig. 1.*



Witnesses:  
*J. B. Weir*  
*Chas. L. Plummer*

Inventor:  
*C. J. Nolan*  
By *Raymond & Barnett*  
*Atty.*

No. 772,902.

PATENTED OCT. 18, 1904.

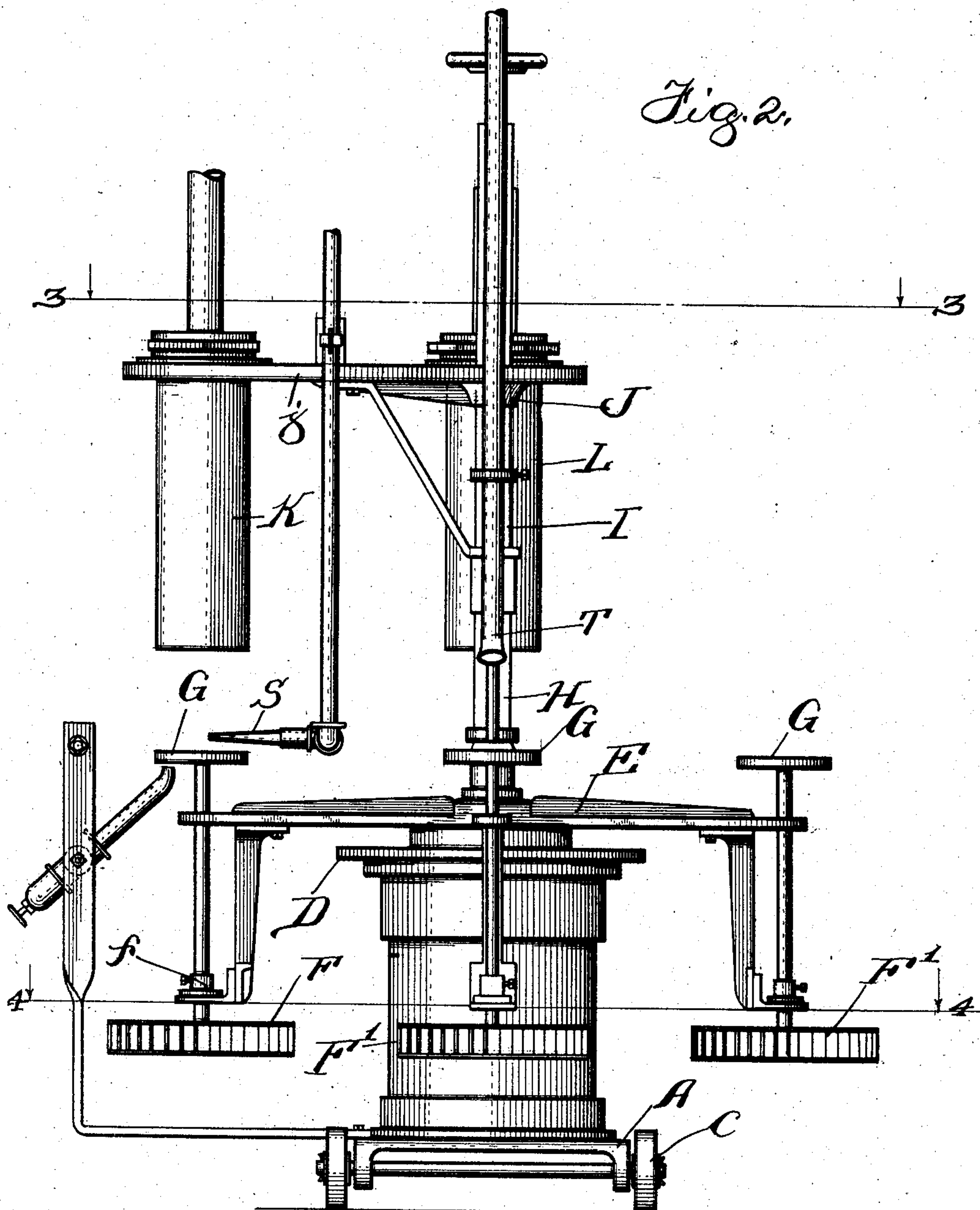
C. J. NOLAN.

ART OF FIRE POLISHING GLASS.

APPLICATION FILED AUG. 6, 1904.

NO MODEL.

5 SHEETS—SHEET 2.



Witnesses  
J. B. Wells  
Chas. I. Plautree

Inventor:  
C. J. Nolan  
By Raymond & Barnett  
Attys.

No. 772,902.

PATENTED OCT. 18, 1904.

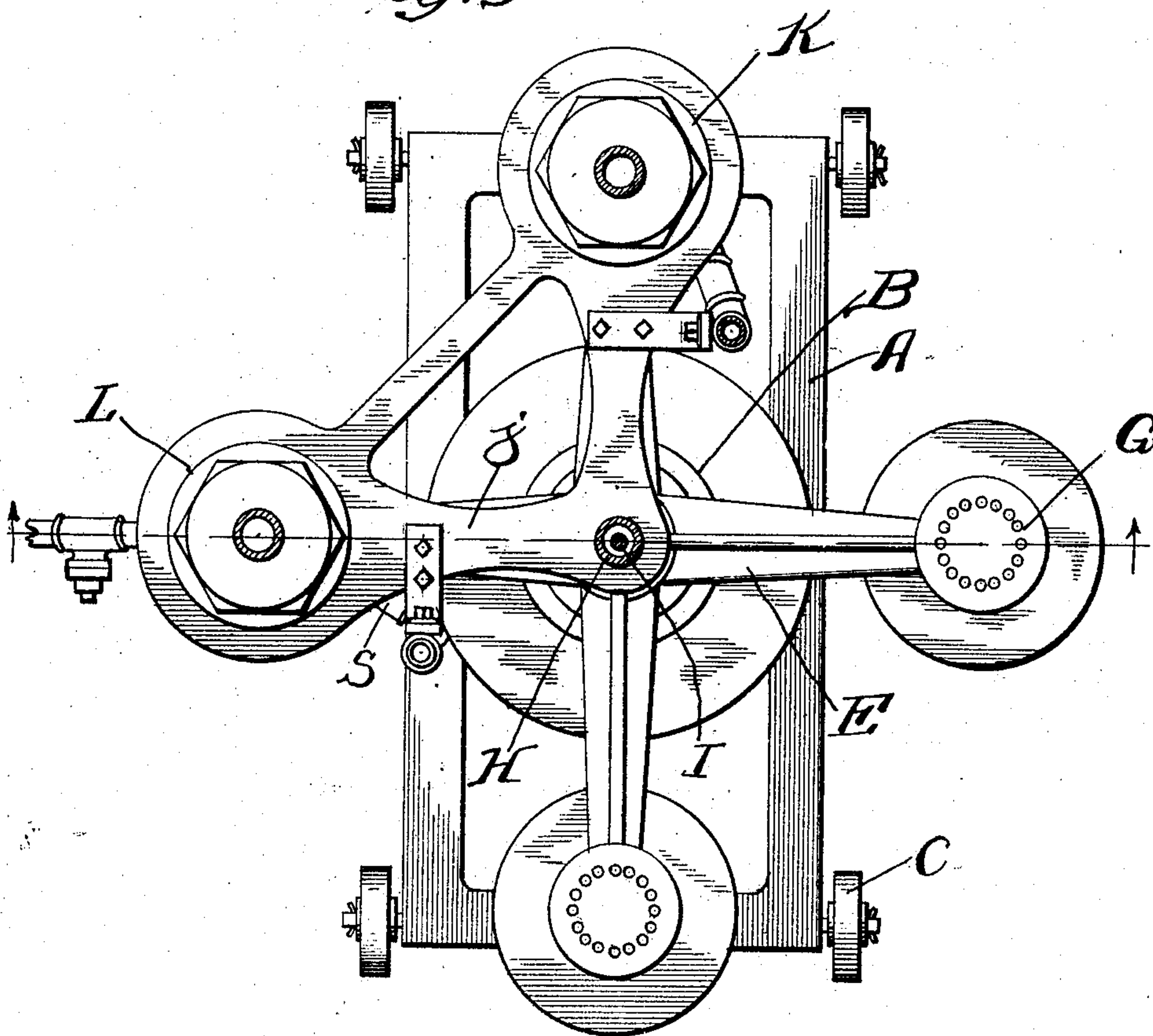
C. J. NOLAN.  
ART OF FIRE POLISHING GLASS.

APPLICATION FILED AUG. 6, 1904.

NO MODEL.

5 SHEETS—SHEET 3.

*Fig. 3*



*Witnesses:*

*J. B. Weir*

*Chas. A. Huntree*

*Inventor:*

*C. J. Nolan*  
*By Raymond H. Barnett,*  
*Attys*



No. 772,902.

PATENTED OCT. 18, 1904.

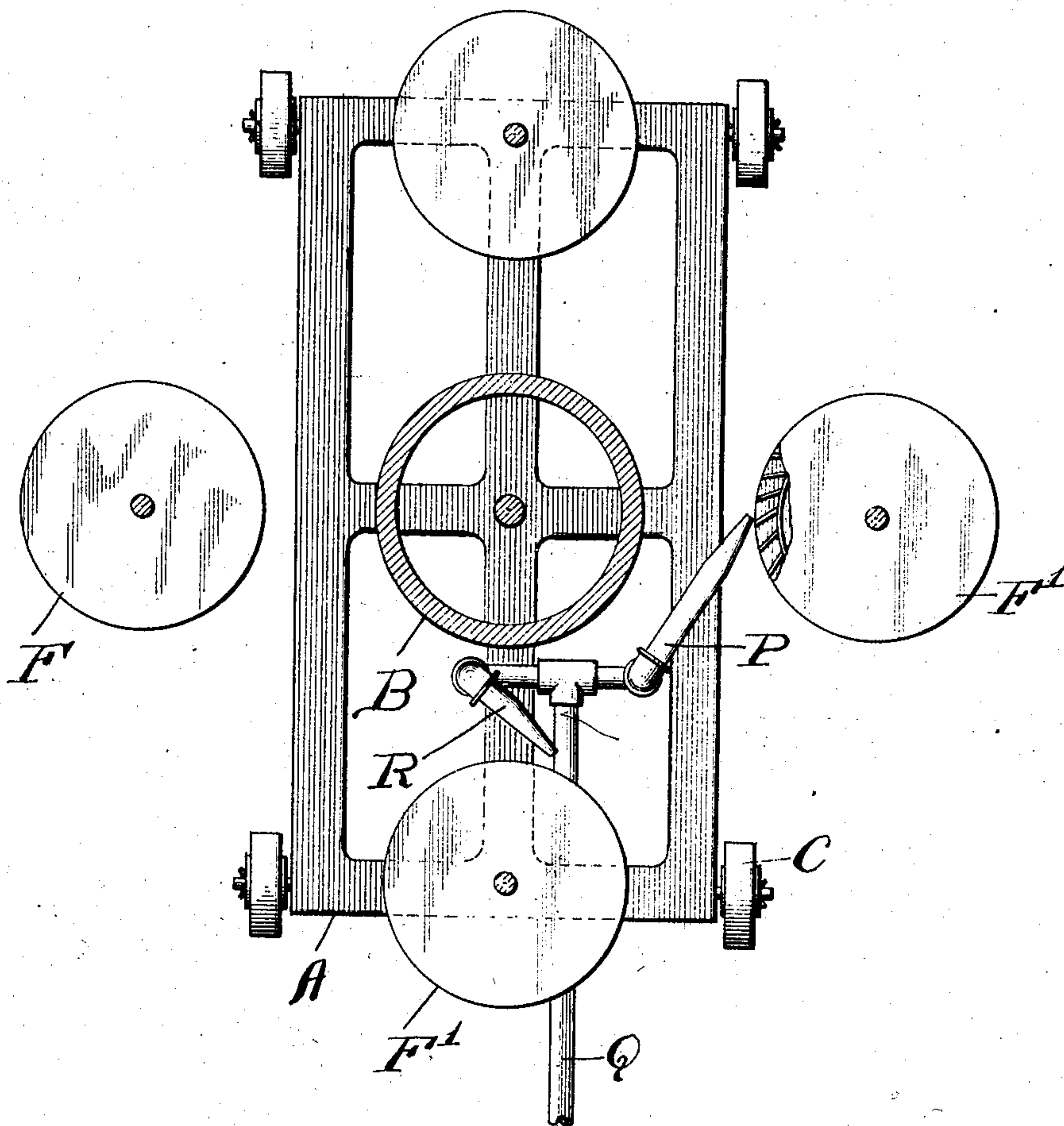
C. J. NOLAN.  
ART OF FIRE POLISHING GLASS.

APPLICATION FILED AUG. 6, 1904.

NO MODEL.

5 SHEETS—SHEET 4.

*Fig. 4.*



*Witnesses*  
*J. B. Weir*  
*Oliver H. Plummer*

*Inventor:*  
*C. J. Nolan*  
*By Raymond H. Barnett*  
*Attys*

No. 772,902.

PATENTED OCT. 18, 1904.

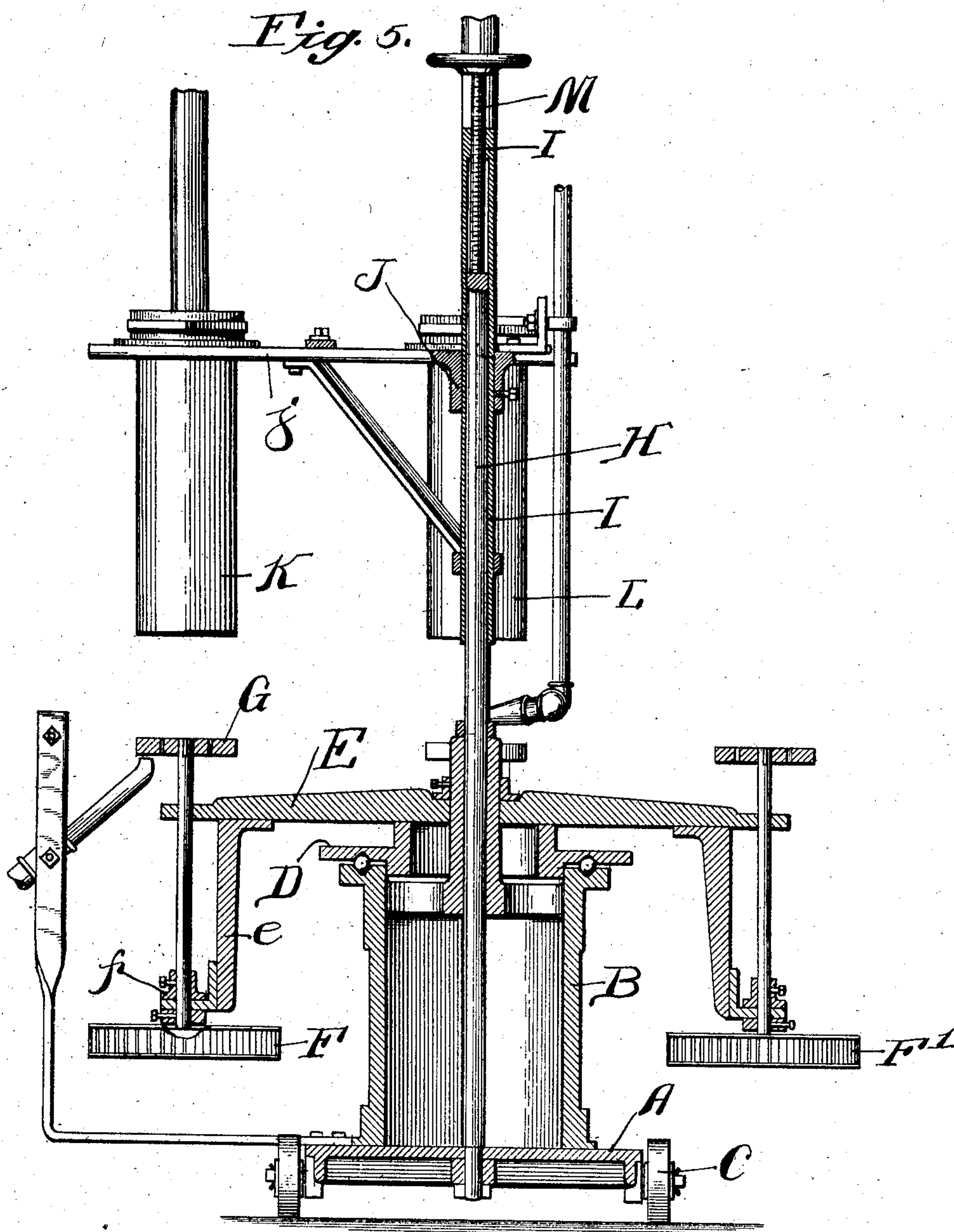
C. J. NOLAN.

# ART OF FIRE POLISHING GLASS.

APPLICATION FILED AUG. 6, 1904.

NO MODEL.

6 SHEETS—SHEET 5.



*Witnesses:*

J. B. Weir

Oliver L. Plimtree

Inventor:

Inventor:  
C. J. Nolan.  
By Raymond C. Burnett  
Attys.



# UNITED STATES PATENT OFFICE.

CORNELIUS JAMES NOLAN, OF TOLEDO, OHIO, ASSIGNOR TO THE LIBBEY GLASS COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO.

## ART OF FIRE-POLISHING GLASS.

SPECIFICATION forming part of Letters Patent No. 772,902, dated October 18, 1904.

Application filed August 6, 1904. Serial No. 219,767. (No model.)

*To all whom it may concern:*

Be it known that I, CORNELIUS JAMES NOLAN, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in the Art of Fire-Polishing Glass, of which the following is a specification.

My invention relates to improvements in the art of fire-polishing glass, and possesses some features in common with the improvements in such art which are shown in my Letters Patent No. 766,193 of August 2, 1904. Nevertheless my present invention is not limited to an improvement upon the process therein shown, but possesses some features which are entirely independent thereof.

The object of my invention is to provide an improved process for more reliably and effectively producing a perfect polish upon a glass surface by means of heat, and also to provide a process which shall hasten the operation and which shall automatically time itself. These and such other objects as may hereinafter appear are attained by my process, which may be conveniently practiced with the apparatus shown in the accompanying drawings, in which—

Figure 1 shows a perspective view; Fig. 2, an end elevation; Fig. 3, a plan view on the line 3 3 of Fig. 2; Fig. 4, a sectional plan view on the line 4 4 of Fig. 2, and Fig. 5 is a vertical sectional view on the line 5 5 of Figs. 3 and 4.

Like letters of reference indicate the same parts in the several figures of the drawings.

My process is particularly intended for use in preparing glass blanks for cutting. To this end glass blanks are pressed in molds, so that the desired pattern is deeply molded in the glass, thus avoiding, perhaps, two-thirds of the cutting, and the blank goes to the cutter with the principal lines of the pattern and often with the entire pattern molded thereon, thus avoiding the delay and skill necessary to the old practice of marking the pattern with chalk in free-hand upon the smooth surface of the blank and then roughing in the pattern along the lines so marked. In the production of cut-glass articles it is necessary,

however, that the uncut surface of the article shall have a perfect polish and be free from all marks and imperfections, such as shear-marks, mold-marks, &c. It is also important in the preparation of the pressed blank that the blank shall go to the cutter in perfect shape without any visible warping and that the pattern pressed thereon shall be unchipped nor otherwise injured.

With the process set forth in my copending application these results are attainable; but I have found that applying a polishing-flame in the first instance to the surface to be polished calls for an appreciably longer treatment than my present process, and the time during which the article shall remain under the polishing-flame under any given set of conditions as to atmospheric temperature, heat of the flame, condition of the blank, &c., is necessarily left to the judgment and skill of the operator, and while the surface which is being polished by the flame is directly under the flame it is brought to such a temperature and color that the sufficiency of the polishing cannot be reliably told by observation at the time. With my present process this skill of the operator is largely or wholly eliminated, for the first step in my process consists in subjecting the article to be polished to a comparatively cool flame, to which a comparatively small bulk of air is supplied, whereby the surface to be polished is covered with a coating or deposit of carbon or sulfur, or both. Thereupon the article so coated is subjected to the intense heat of the polishing-flame, which consumes the coating deposited upon the article by the colder flame and in so doing generates an intense heat at the immediate surface to be polished, whereby that surface is quickly melted, all superficial marks and imperfections are at once removed, and a perfect polish results. Not only does the coating referred to help to bring about this result, but it serves as an automatic gage or timer, for as soon as the coating is consumed by the polishing-flame the polishing process is completed and the article may be removed.

While subjecting the blank or other article to the successive flames the blank is supported



and cooled in any suitable manner, although I prefer keeping it cool by means of jets of air projected against the surface which is not being subjected to the polishing process, whereby that surface is kept sufficiently cool to prevent any possible warping or misshaping of the blank, while at the same time all possible danger to the pattern pressed upon that surface of the blank is avoided.

Referring now by letter to the accompanying drawings, A is a support or platform upon which is mounted a pedestal B. The platform A is preferably portable and is mounted upon wheels C.

D is a rotatable support which rests upon the top of the pedestal B and is preferably carried by antifriction-bearings and in turn carries a plurality of spider-arms E. Journalled in the outer end of each spider-arm E is a vertical shaft F. Each spider-arm E is also provided with a downwardly-extending bracket *e*, within which the shaft F is also journalled, the shaft F being supported in position by a collar *f* and being provided at its lower end with a suitable motor F' and at its upper end with a support or table G, which is preferably perforated, as shown in Fig. 4, for a purpose hereinafter specified.

H is a vertical shaft which is supported within the pedestal B and extends upwardly through the rotatable top D and carries a sleeve I, upon which is mounted a spider J, provided with arms *j*, which carry the carbonizing-burner K and the polishing-burner L, respectively.

The height of the burners may be adjusted by means of the screw-threaded shaft M, which screws into the upper end of the sleeve I and rests upon the upper end of the shaft H.

The burners K L are provided, respectively, with fuel-pipes N and air-pipes O, provided with valves *n* and *o*, respectively, whereby the relative proportions of air and fuel, such as gas, may be adjusted and varied.

While any suitable means may be provided for rotating the supports G, I have shown for that purpose the air-wheels F', which are rotated by jets of air supplied to the nozzles P through the compressed-air pipe Q, while the nozzles R and S are likewise provided with compressed air in any convenient manner.

In practicing my process the article to be polished is placed upon the top of one of the tables G, whereupon the spider-arms E are rotated until the article is brought beneath the burner K. This burner is supplied with a fuel mixture containing an excess of gas or like fuel as compared with the amount of air-supply, whereby a comparatively low heat is generated and the surface of the article acted upon by the flame from the burner K is coated in the manner previously described. Thereupon the spider-arms E are again rotated until the article is brought beneath the burner L, which is supplied with a fuel-mixture con-

taining a larger relative proportion of air, whereby an intensely-hot flame is produced, which flame consumes the coating deposited on the article by the burner K, and in so doing fuses the surface being treated and produces a perfect polish. As soon as the coating deposited by the burner K has been burned off by the flame from the burner L the arms are again rotated, carrying the article from beneath the burner L. The article is preferably subjected to a blast of cold air through the pipe S and is then removed. During this operation the tables G are rotated and the exterior of the article being treated is kept cool by blasts of cold air projected against it, preferably blasts through the nozzles R and also blasts through the nozzle S, which is projected through the perforations in the support G against the bottom of the article; but for the broad purposes of my invention—to wit, the polishing by first subjecting the article to a flame of comparatively low temperature and then to a flame of comparatively high temperature—it matters not what means are used to preserve the shape of the article during such treatment. So, also, while the article will ordinarily be subjected to this treatment immediately after having been molded to form my invention is not limited to the practice of my process at that time.

Obviously the apparatus shown is merely illustrative of a convenient form of apparatus for practicing my process, but constitutes no limitation thereon.

While I have referred to the first flame to which the article is subjected as a "carbonizing-flame," I have merely used that term as conveniently descriptive, but do not confine myself thereto in any technical sense.

Any flame which shall serve to coat the surface to be polished with a film or deposit, whether of sulfur, carbon, or other composition, is within the meaning and spirit of my invention.

It will be noted that the apparatus herein shown and described is not herein claimed, but is the subject-matter of an application filed of even date herewith, Serial No. 219,766.

I claim—

1. The process of fire-polishing glass, which comprises, first, subjecting the article to be polished to a blast containing unconsumed combustible material, and then subjecting it to a blast high in oxygen.

2. The process of fire-polishing glass, which comprises subjecting the article to be polished to a carbonizing-flame and then subjecting it to the action of burning gases rich in oxygen.

3. The process of fire-polishing glass, which comprises coating the article to be polished by means of a carbonizing-flame, and then burning off the coating so deposited upon the article.

4. The art of fire-polishing, which comprises subjecting the article to be polished to the ac-



tion of a flame containing unconsumed combustibles, whereby the article is coated substantially as described, and then subjecting the article to heated gases rich in oxygen  
5 whereby said coating is consumed.

5. The art of fire-polishing, which comprises subjecting the article to a flame, whereby a coating is formed upon the article, and immediately subjecting the article to a flame  
10 which will consume the coating, whereby said coating is consumed and the article is polished.

6. The art of fire-polishing glass, which comprises subjecting the article to a flame containing unconsumed combustible matter,  
15 whereby a coating is deposited upon the article, and immediately subjecting the article to a flame rich in oxygen, whereby said coating is consumed and the article is polished,  
20 and simultaneously subjecting the surface of the article which is not being polished to the action of a cooling medium.

7. The art of fire-polishing, which comprises providing the article to be polished with a  
25 coating, and then subjecting the article to an

intense heat in the presence of a combustion-supporting gas, whereby the coating is consumed and the coated surface is polished.

8. The art of fire-polishing glass, which comprises subjecting the article to be polished to  
30 a heated blast having an excess of combustible material whereby said article is provided with a combustible coating, and then subjecting such coated surface to a blast of heat having an excess of a combustion-supporting element,  
35 whereby said coating is consumed.

9. The art of fire-polishing glass, which comprises subjecting the article to be polished to a flame containing an excess of combustible material, whereby a combustible coating is de-  
40 posited upon said article, and then subjecting such coated surface to a flame containing an excess of a combustion-supporting element, whereby said coating is consumed, the article under treatment being simultaneously sub-  
45 jected to the influence of a cooling medium.

CORNELIUS JAMES NOLAN.

Witnesses:

F. E. WOLF,

C. C. OSWALD