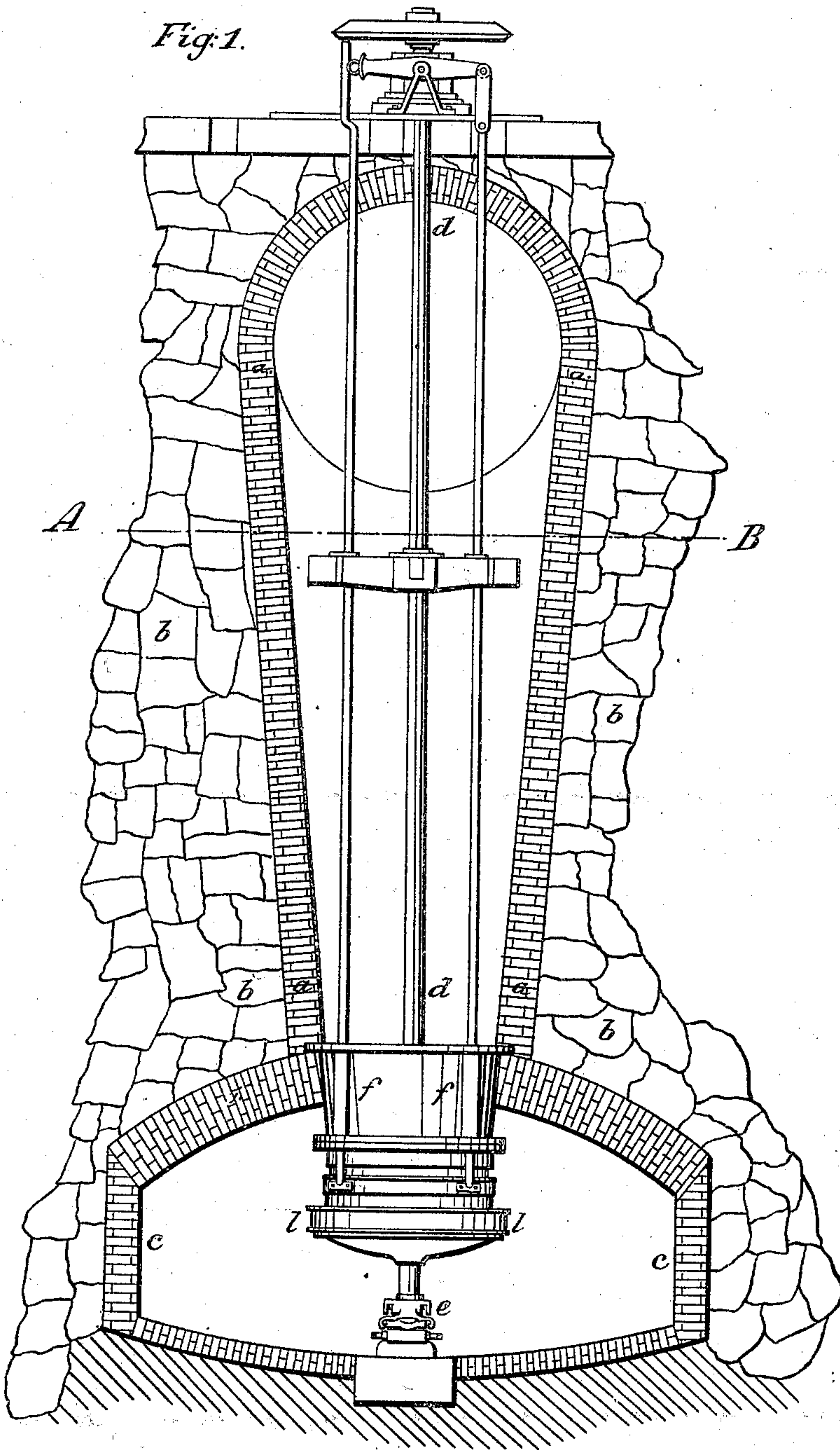


*C. H. Bigelow,*  
*Turbine.*

*Nº 10,981.*

*Patented May 30. 1854.*

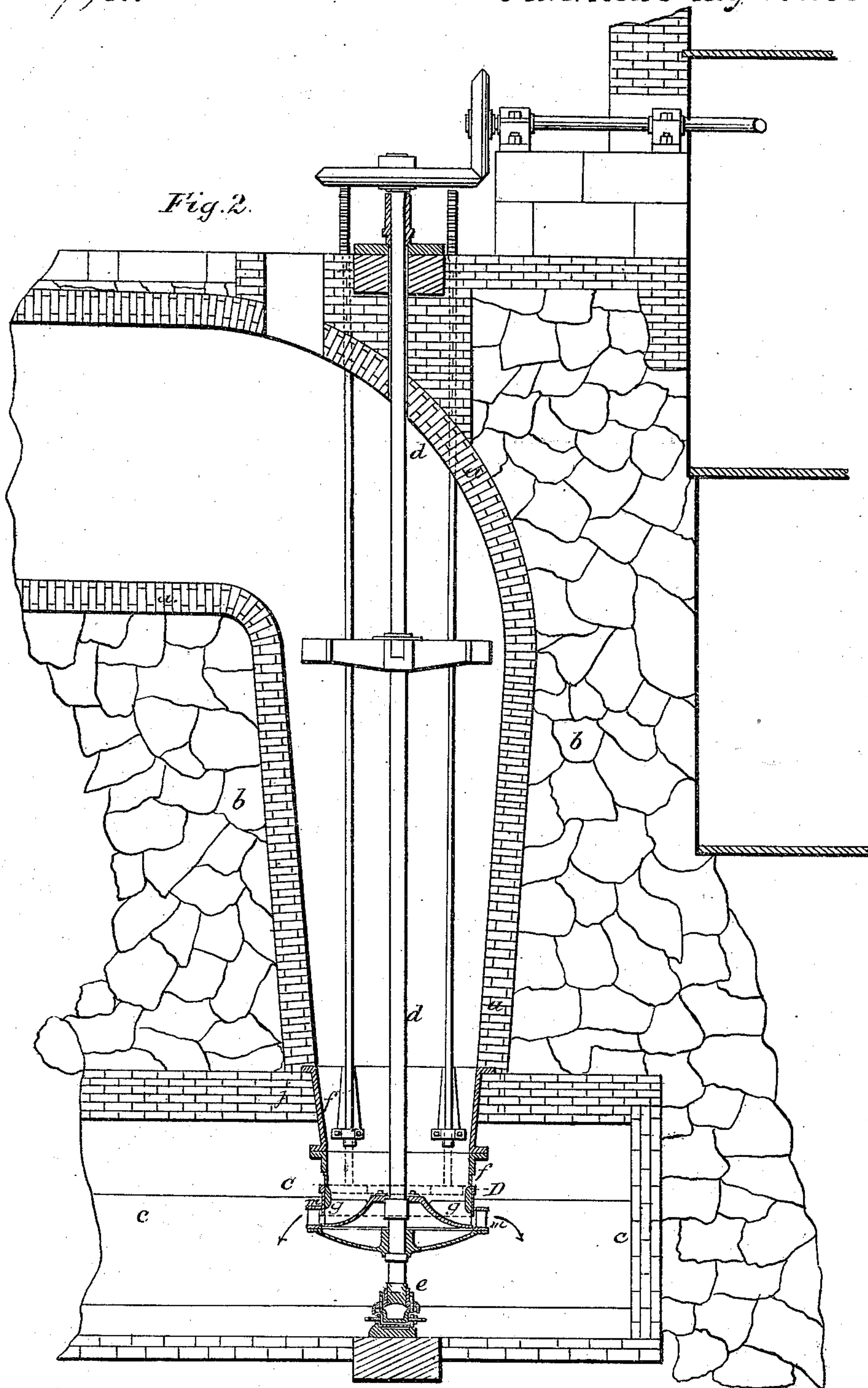
*Fig. 1.*



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*Nº 10,981.*

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Fig. 3.

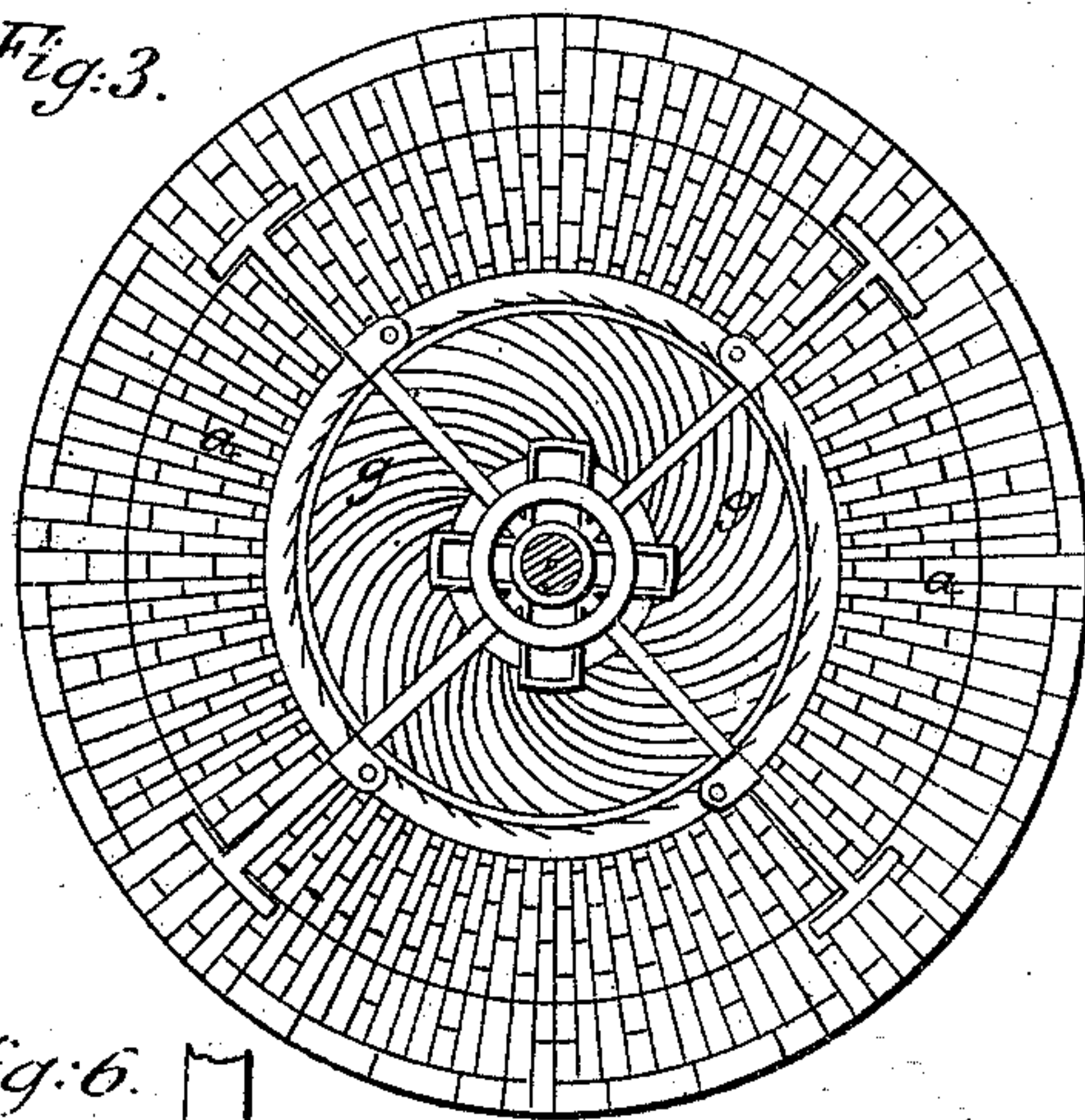


Fig. 6.



Fig. 5.

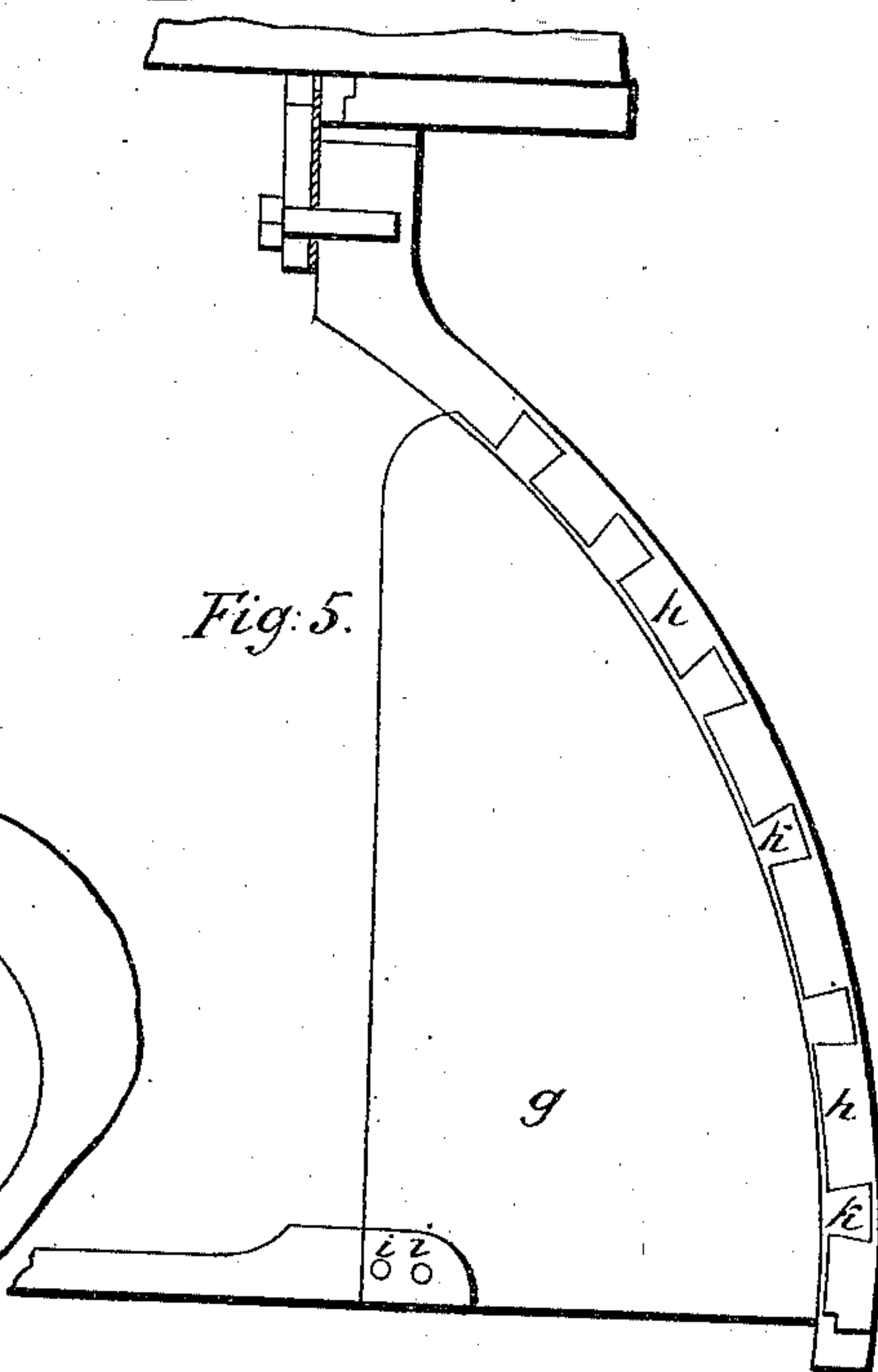
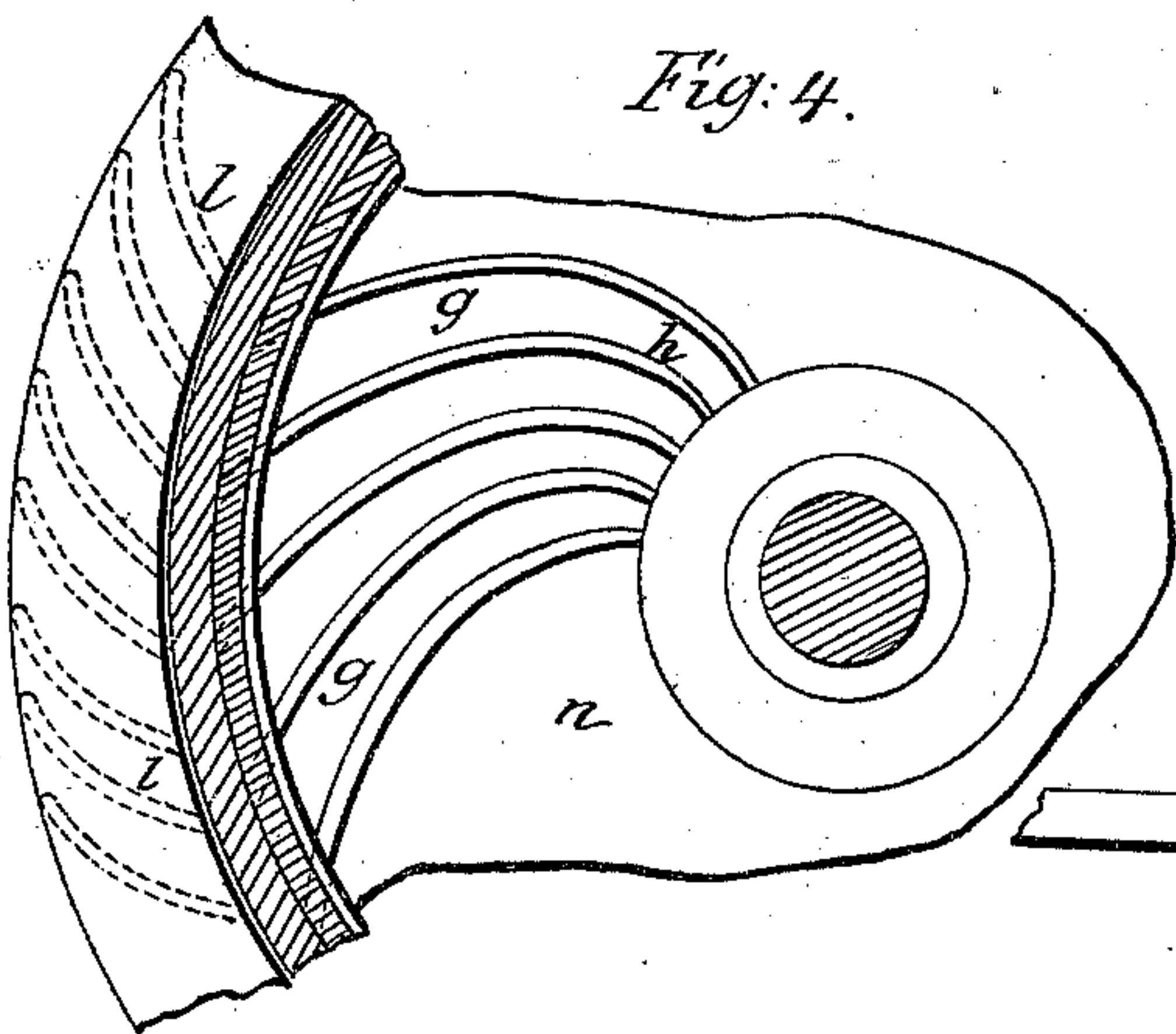


Fig. 4.





# UNITED STATES PATENT OFFICE.

CHARLES H. BIGELOW, OF LAWRENCE, MASSACHUSETTS.

## IMPROVED MODE OF MANUFACTURING TURBINE WHEELS.

Specification forming part of Letters Patent No. **10,981**, dated May 30, 1854.

*To all whom it may concern:*

Be it known that I, CHARLES H. BIGELOW, of Lawrence, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Turbine Wheels; and I declare that the following description, taken in connection with the accompanying drawings, hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvements, by which my invention may be distinguished from others of a similar class, together with such parts as I claim and desire to have secured to me by Letters Patent.

The figures of the accompanying plate of drawings represent my improvements. Figure 1 is a general section of masonry across the arch of the wheel-pit, showing the turbine wheel in elevation. Fig. 2 is a general section of masonry along the arch of wheel-pit and through the turbine wheel. Fig. 3 is a transverse horizontal section taken in the plane of the line A B, Fig. 1. Fig. 4 is a partial section, on an enlarged scale, taken in the plane of the line C D, Fig. 2. Figs. 5 and 6 are detail views which will be hereinafter referred to.

A large portion of the expense of building and erecting turbines is incurred in the construction of the wooden or iron flumes which serve as a conduit for the water, these flumes being necessarily large and heavy and requiring strong framing or braces to support them. My first improvement consists in an arrangement by which the expense attendant upon the construction of the flume is greatly diminished. This is effected by using as a substitute for the long iron tube commonly employed a conduit of masonry, the lower part only of the flume being formed of iron, which part is embedded in the masonry and sustained by an arch over the wheel-pit, and also serves to sustain the guide-curves and the whole weight of water impinging upon the disk of the same. I have also made an essential improvement in the manner of inserting the wrought-iron buckets of the wheel into the rims of the same, the usual method of mortising grooves in the rims and then bolting or riveting the tenons of the buckets or floats into them being a very troublesome and expensive one.

By my improvement the wrought-iron buckets of the wheel are cast in connection with the rims, the plates of wrought-iron of which the buckets are composed being first formed into about the proper curve, and having tongues or dovetails formed on them, around which the melted metal used in casting the rims is flowed, so that when it cools the buckets are rigidly set and held in the rims of the wheel. By this process the expense attendant upon mortising curved grooves in the rims and then fastening the buckets to them is avoided, while the buckets and the rims of the wheel are much more rigidly attached to each other and consequently less liable to be displaced or drawn apart. In the same manner I attach the guide-curves or diaphragms of the turbine to their disk by casting them in connection with the same, thus avoiding the expense of mortising the said disk and fastening the guide-curves to it, as in the mode heretofore practiced. I have also made an essential improvement by which the guide-curves are made to sustain the weight of their disk and of the water resting upon it by casting the said guide-curves in connection with the lower part of the iron flume, either in the manner before mentioned of dovetailing the curved plates of which the guides are composed and flowing the metal around them, or by forming holes in the said plates, so that the melted metal used in casting the flume shall flow into them and rivet them together.

*a a a a* in the drawings represent the conduit, which I use in lieu of the iron or wooden flume heretofore employed. This conduit is formed of brick and shaped as shown in Figs. 1 and 2, the exterior stone masonry *b b*, &c., serving to strengthen and sustain the whole.

*c c* is the wheel-pit, also formed of brick, as shown in Fig. 1.

*d d* is the main shaft or spindle, to which the wheel is attached, extending up through the brick flume and having its journal or step at *e* at the bottom of the wheel-pit.

*f f* is the lower part of the flume and is the only portion of the same which is made of iron. It is inserted by means of proper flanges in the lower brick-work of the conduit *a a*, and has its whole weight sustained by the brick arch *j j* over the wheel-pit. To the bottom of this portion *f f* the guide-curves *g g*, &c., of the turbine are attached, being cast



in connection with the same by forming holes *i i* (shown in Fig. 5) in the plates of the wrought-iron guide-curves, into which holes the melted metal used in casting the lower part of the flume *ff* is made to flow, so that when the metal cools the part *ff* and the guide-curves will be firmly riveted together. The guides *g g*, instead of being attached to their disk *h h* by mortising the said disk, as before explained, have tongues or dovetails *k k* formed on their lower edge. Around these dovetails the metal used in casting the disk *h h* is poured, so that the metal of the disk when it cools will embrace the dovetails and thus firmly attach the guide-curves and their disk *h h* together. From this description it will be seen that as the guide-curves *g g* are cast in connection with the lower part *ff* of the flume, which is sustained by the arched masonry, and also in connection with their disk *h h*, the said guide-curves will sustain the weight of their disk and also of the water impinging upon it, and that the parts thus cast in connection can be finished off as one piece and will be much more strongly attached to each other than by any of the modes heretofore practiced.

The buckets *l l*, &c., instead of being mortised into the rims *m m*, are cast into the said rims, being formed with dovetails *n n*, Fig. 6, around which the rims are cast, so that the upper and lower rims and the buckets of the wheel will be rigidly attached to each other.

The iron flume *ff* is of a conical shape, as shown in the drawings, being in shape a continuation of the brick flume, and the brick arch *jj* is formed around it, so that the iron

flume forms the "key" or support of the arch and is sustained by the said arch. This arch formed over the wheel-pit supersedes the necessity of any bracing or frame-work to sustain the flume and all the appendages of the turbine, as the said arch with its key or flume forms the base of the whole superstructure.

Having thus described my improvements, what I claim as my invention, and desire to have secured to me by Letters Patent, is—

1. My improvements in the manufacture of turbines, the same consisting in attaching the buckets of turbine wheels to their rims or disks by forming tongues or dovetails on their upper and lower edges, and then flowing the melted metal used in casting the said rims about them, so that the rims when cool shall rigidly hold and embrace the buckets, substantially as above set forth.

2. Attaching the guide-curves or diaphragms of the turbine to their disk by casting them in a similar manner in connection with their disk.

3. Using the guide-curves of the turbine to sustain the weight of the disk and of the water impinging upon the same by casting the lower part of the iron flume around dovetails formed on the said guide-curves, so as to mortise them together, or by casting the lower part of the iron flume into holes formed in the said guide-curves, so as to rivet them together, as above described.

CHAS. H. BIGELOW.

Witnesses:

EZRA LINCOLN,  
JOSEPH GAVETT.