

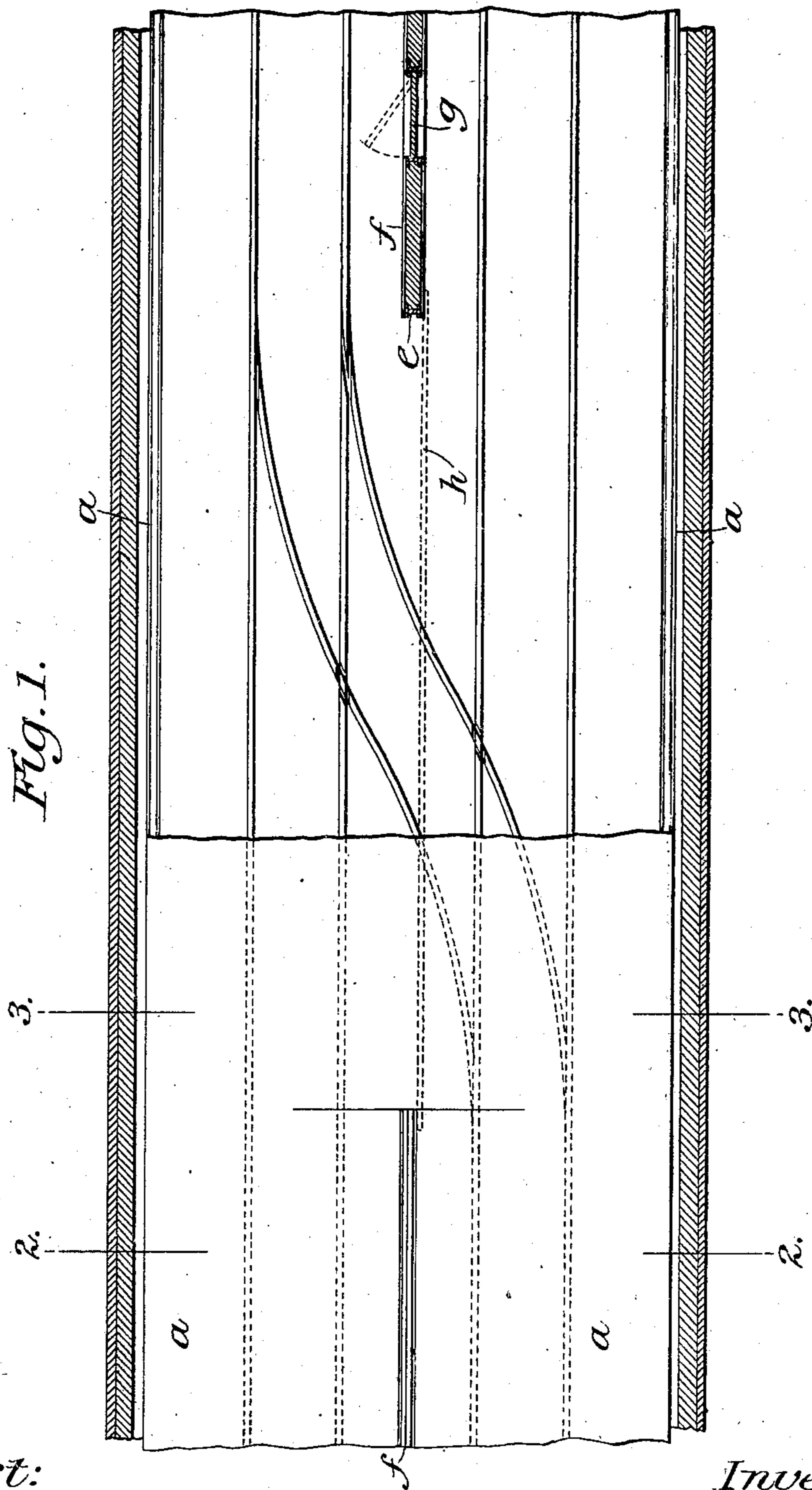
No. 742,220.

PATENTED OCT. 27, 1903.

J. F. O'ROURKE.
TUNNEL CONSTRUCTION.
APPLICATION FILED NOV. 17, 1902.

NO MODEL.

2 SHEETS--SHEET 1.



Attest:
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L. E. Varney.

Inventor:
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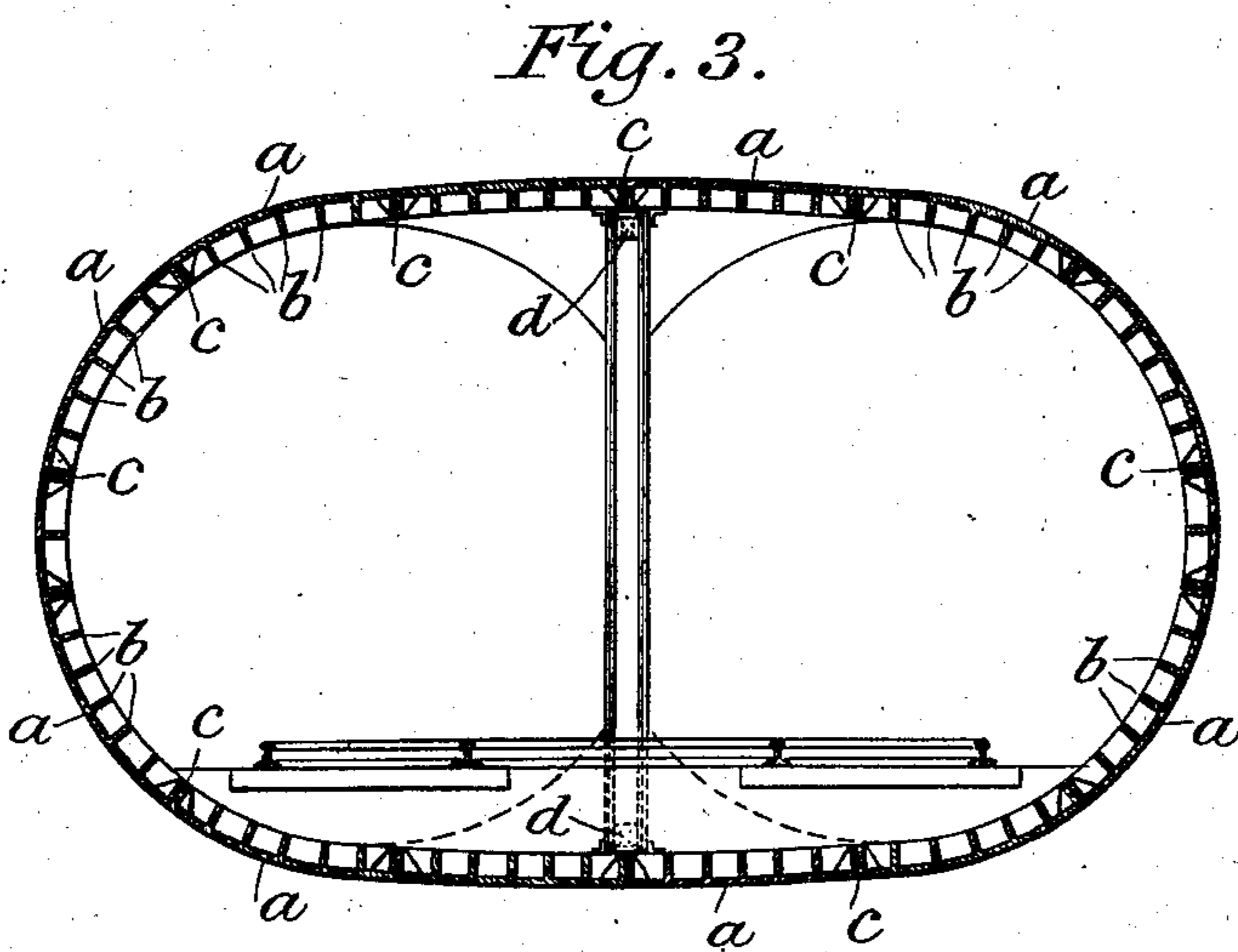
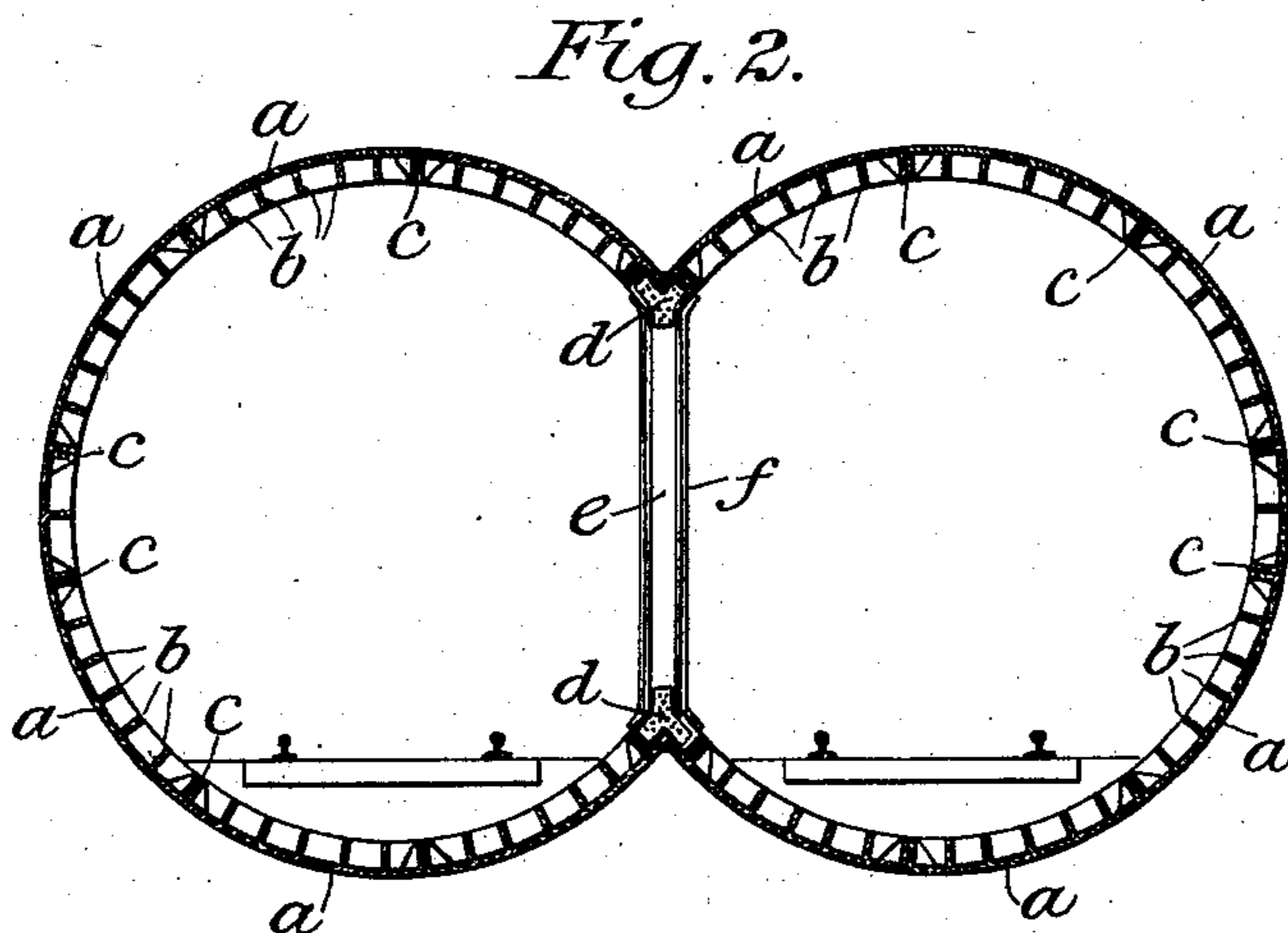
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UNITED STATES PATENT OFFICE.

JOHN F. O'ROURKE, OF NEW YORK, N. Y.

TUNNEL CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 742,220, dated October 27, 1903.

Application filed November 17, 1902. Serial No. 131,658. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. O'ROURKE, a citizen of the United States, residing in the borough of Manhattan, in the city of New York, in the State of New York, have invented certain new and useful Improvements in Tunnel Construction, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

In the construction of tunnels for railway purposes it is often necessary to provide for two tracks side by side. When these tunnels are constructed through material incapable of self-support, the process known as the "shield method" is adopted, by means of which the material is supported temporarily as the excavation is pushed forward, permanent support being afforded by cast-iron work or other form of lining. In some cases where the use of a metallic lining is dictated and where provision must also be made for two tracks both tracks have been spanned by a single arch or inclosed within a single metallic tube. The use of the single arch or tube for two tracks involves a great depth of tunnel, so that the tracks are often too low to permit of convenient connection with the approaches, besides increasing the engineering difficulties and the cost of construction. The use of two single tunnels separate from each other while avoiding the objection of great depth is open to objections no less forceful, particularly by reason of the inaccessibility of any part of either tunnel except from the ends.

It is the object of this invention to provide for a construction of tunnel-lining by which all of the advantages of the smaller diameter for single-track tunnels are obtained, while the advantages of the double-track tunnel, including intercommunication at will between the tunnels for persons and materials or for the passage of a train from one tunnel into the other at any desired point, are retained.

It is a settled principle in tunnel ventilation that the arrangement of two tracks in one tunnel does not permit good results in ventilation, and it is a self-evident fact that in such an arrangement a derailment or conflagration would involve both tracks and

that a conflagration would be attended with grave danger to persons from the fumes and gases if no independent tunnel is immediately available. These considerations for refuge make the construction of the tunnel according to this invention an almost unavoidable necessity. Furthermore, in a tunnel constructed in accordance with the invention the resistance to radial thrust from without can be made as ample as in ordinary construction, even if provision is made for more than two intercommunicating tunnels. The metal lining is proportioned and strained precisely as though the circles of the several tunnels were completed in each case through the employment of suitable supports between the arches and the inverts located between the tracks. Moreover, while the tunnels can be shut off from each other at all times under ordinary conditions of use by means of easily-operated doors and gates provision is made for immediate passage of either persons, materials, or trains from one tunnel to another when necessity or occasion requires.

In general, therefore, this invention aims to provide a tunnel construction which is more practicable, which can be built more readily, which can better accommodate itself to conditions involving limitation of height and space, and which better overcomes recognized difficulties than any tunnel construction heretofore known.

The invention will be more particularly described hereinafter with reference to the accompanying drawings, in which—

Figure 1 is a plan view in outline, partly broken away, showing the double tunnel at a crossover with the adjacent portions of the tunnel. Fig. 2 is a section on the plane indicated by the line 2 2 of Fig. 1. Fig. 3 is a section on the plane indicated by the line 3 3 of Fig. 1.

The invention is illustrated herein as embodied in a tunnel structure comprising a cast-iron lining the successive sections of which are assembled and placed in rear of the advancing shield. As represented in the drawings, each of such sections in each tunnel is composed of a series of segmental castings *a a*, each provided in the usual manner with strengthening-webs *b* and flanges *c*, by which the segments may be secured to one

another. Along the adjacent sides of the two tunnels two or more of such segments are omitted, so that the arcs of the walls or linings of the two sections shall overlap, as
 5 clearly indicated in Fig. 2. At the point of meeting of the segments of the two tunnels the arches and inverts take their bearing upon suitable plates or castings *d*, preferably in the form of skewbacks, by which the
 10 meeting sections can be securely fastened together. Between the meeting lines of the two tunnel-sections—that is, between the opposing arches and inverts—and midway between the center lines of the two tunnels are
 15 erected suitable supports *e*, which may be pillars, plates, walls, diaphragms, or anything of suitable character to resist the thrust from without, by which the pressures above and below are transmitted to the opposing
 20 arches or inverts and the strength of the double structure becomes substantially and for all practical purposes as great as the strength of a single cylindrical structure of equal track capacity. If pillars are em-
 25 ployed, walls *f*, of any suitable material, may be built in between them to separate the tunnels, and at frequent intervals therein doors *g* may be provided, such doors being arranged to be opened readily from either side in case
 30 of necessity.

At a track-crossover, as indicated in Figs. 1 and 3, where it is necessary to retain practically the full head room of the tunnel from one to the other, the cross-section of the tun-
 35 nel is modified, so that the top and bottom shall extend from one vertical diameter to the other in an easy curve, the necessary omission of certain of the pillars at the crossover being compensated for by increased
 40 strength of the tunnel-sections. At such crossovers suitable sliding doors or partitions *h* may be provided to separate the tunnels during ordinary use. It will be understood that the details of construction may be
 45 varied as desired without departing from the spirit of the invention and that although two tunnels are shown as incorporated into one structure a greater number might be so incorporated, if desired.

50 I claim as my invention—

1. A subterranean driven-tunnel structure,

comprising a plurality of substantially cylindrical lining-sections incorporated into one structure and so arranged that the arcs of
 contiguous sections overlap, each section be- 55
 ing composed of a series of segments, the segments along the adjacent sides of contiguous sections being omitted, skewbacks upon which the opposing arches and inverts have
 their bearing and supports between said 60
 skewbacks to resist the radial thrust, openings through said supports being provided for intercommunication between the sections; substantially as described.

2. A subterranean driven-tunnel structure, 65
 comprising a plurality of substantially cylindrical lining-sections incorporated into one structure and so arranged that the arcs of
 contiguous sections overlap, each section be-
 ing composed of a series of segments, the seg- 70
 ments along the adjacent sides of contiguous sections being omitted, a wall erected between the opposed arches and inverts to resist radial thrust and to separate the tunnels,
 said wall being provided with openings for 75
 intercommunication between the sections and movable doors for said openings; substantially as described.

3. A subterranean driven-tunnel structure, 80
 comprising a plurality of substantially cylindrical lining-sections incorporated into one structure and so arranged that the arcs of
 contiguous sections overlap, each section be-
 ing composed of a series of segments, the seg- 85
 ments along the adjacent sides of contiguous sections being omitted, supports between the opposing arches and inverts to resist the radial thrust, the segments along adjacent
 sides of the contiguous sections for a portion
 of their length being omitted for substan- 90
 tially one-half the arcs of the sections, the tops and bottoms of the contiguous sections along such portions of their length being so
 connected as to provide a crossover of the
 full height of the sections; substantially as 95
 described.

This specification signed and witnessed this 14th day of November, 1902.

JOHN F. O'ROURKE:

In presence of—

ANTHONY N. JESBERA,
 M. A. BRAYLEY.