

No. 777,013.

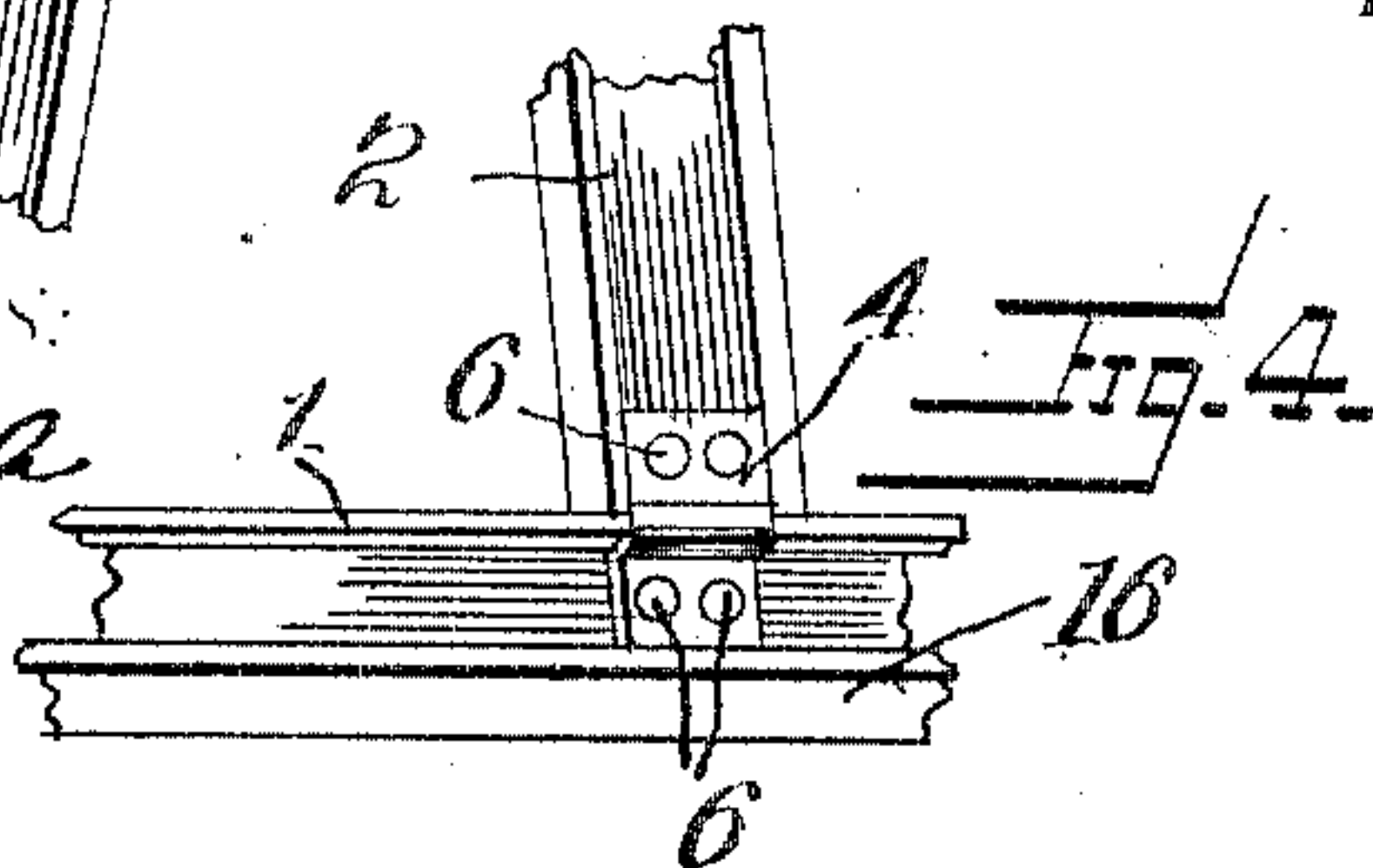
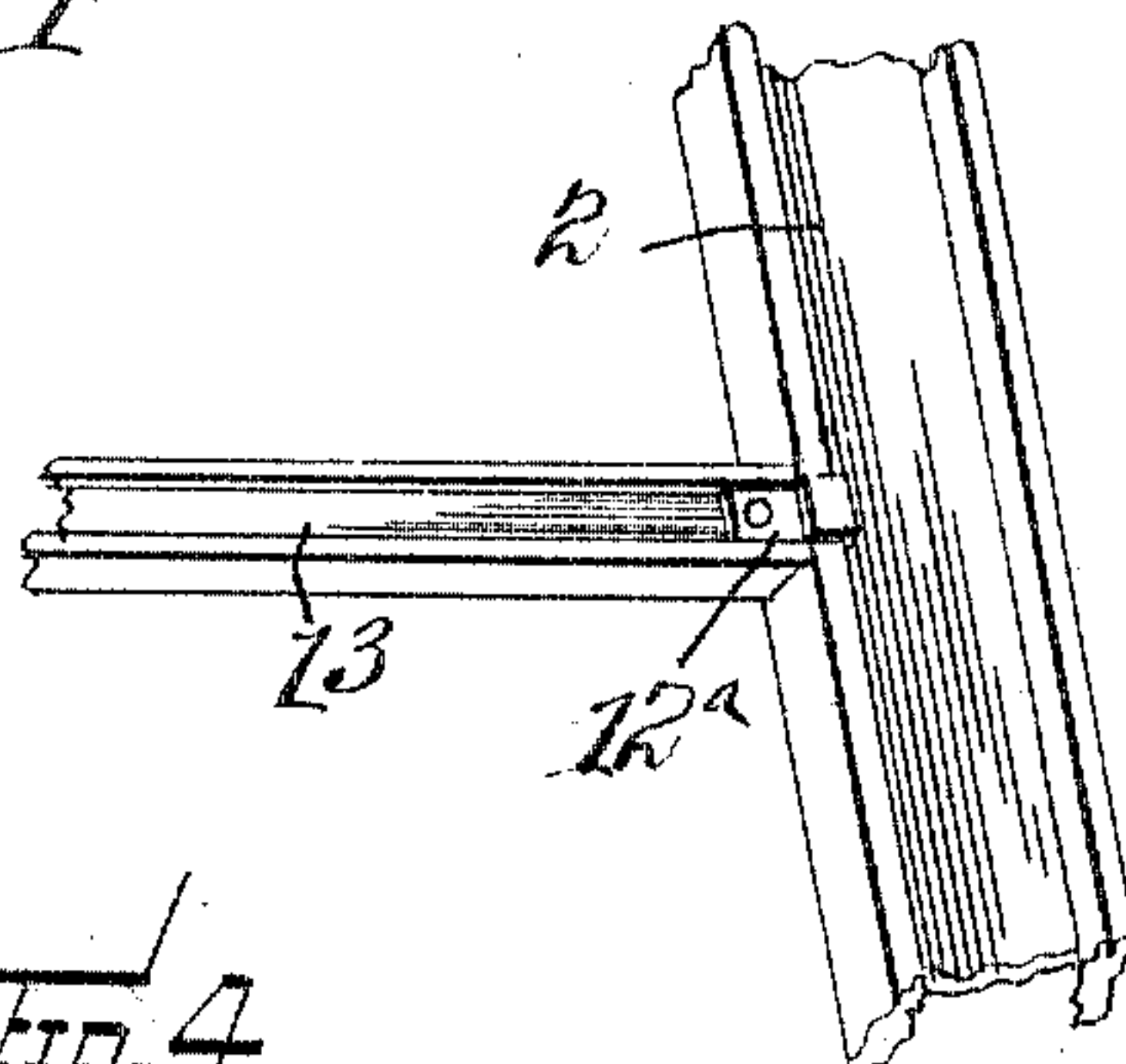
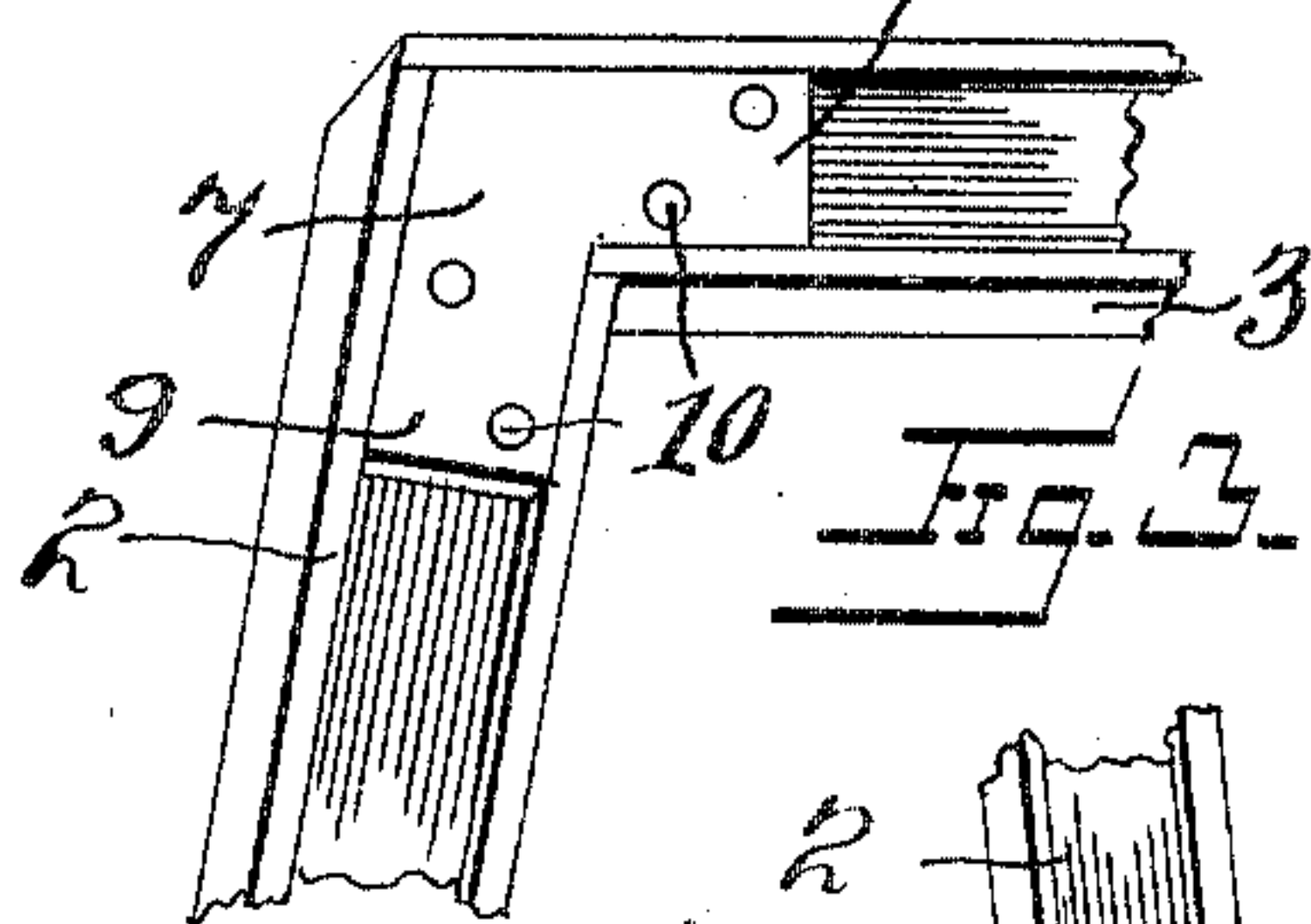
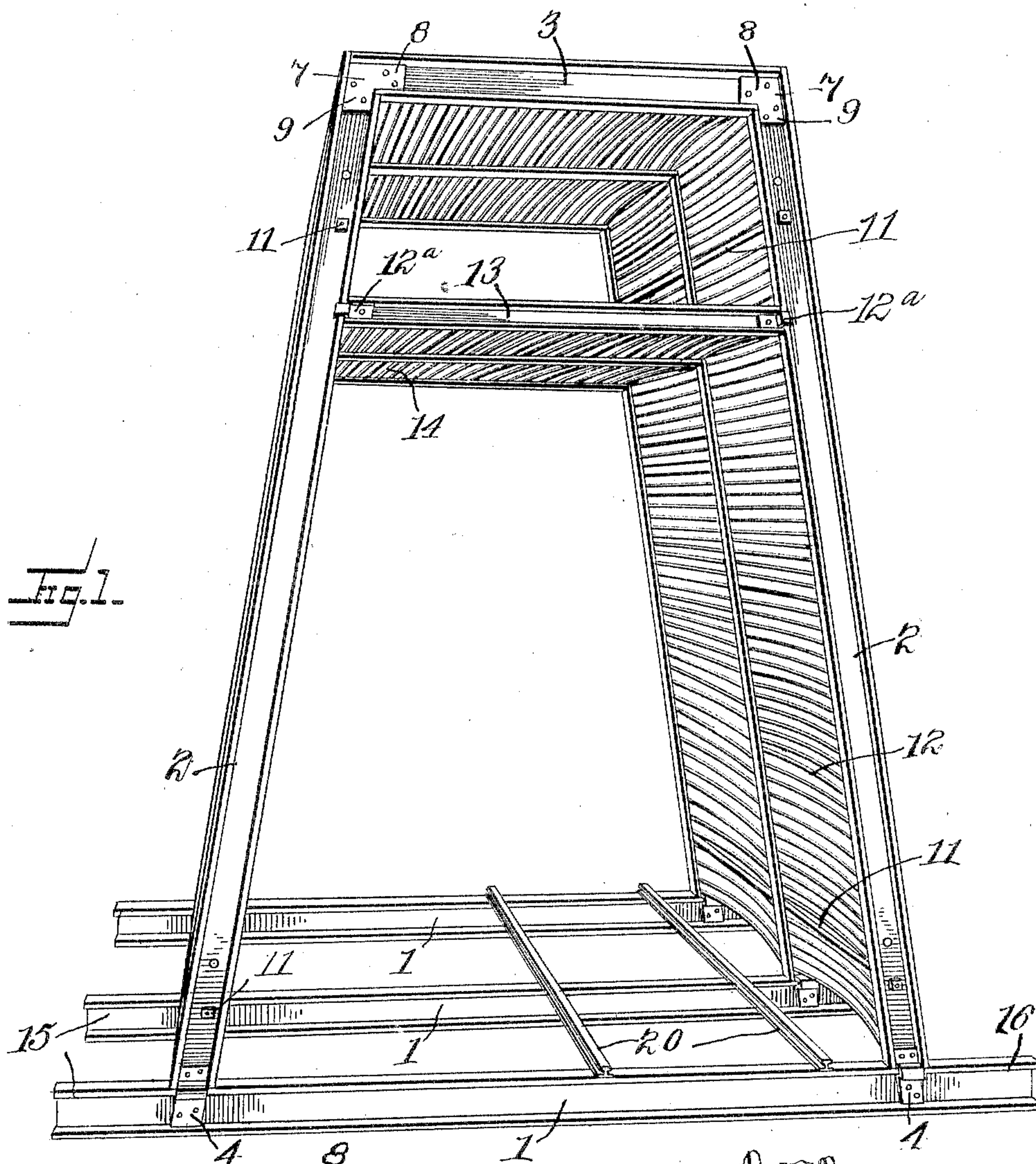
PATENTED DEC. 6, 1904.

A. FERNANDEZ.
LINING FOR SUBTERRANEAN PASSAGES.

APPLICATION FILED APR. 25, 1904.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES:

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2 SHEETS—SHEET 2.

Fig. 2.

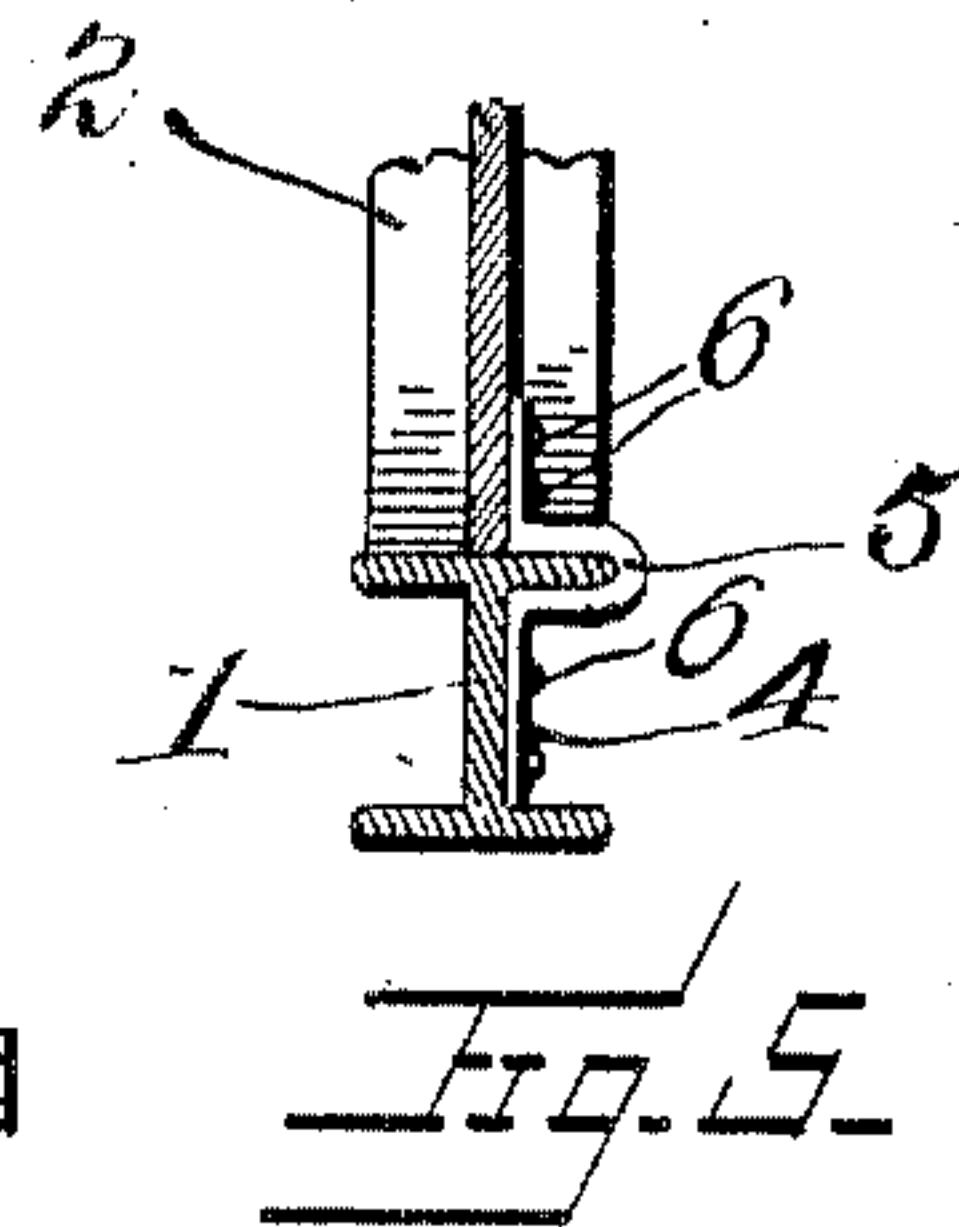
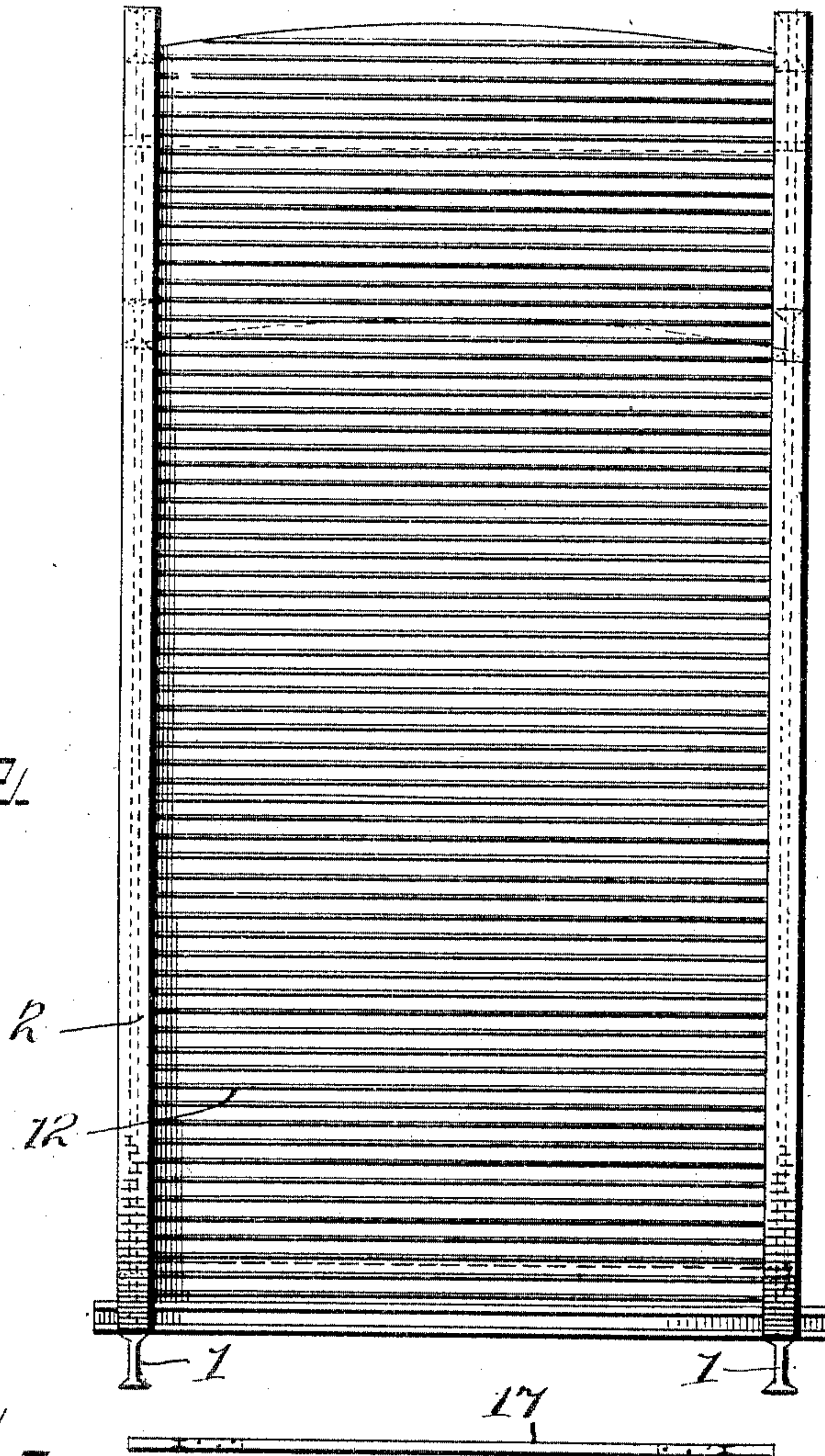


Fig. 7.

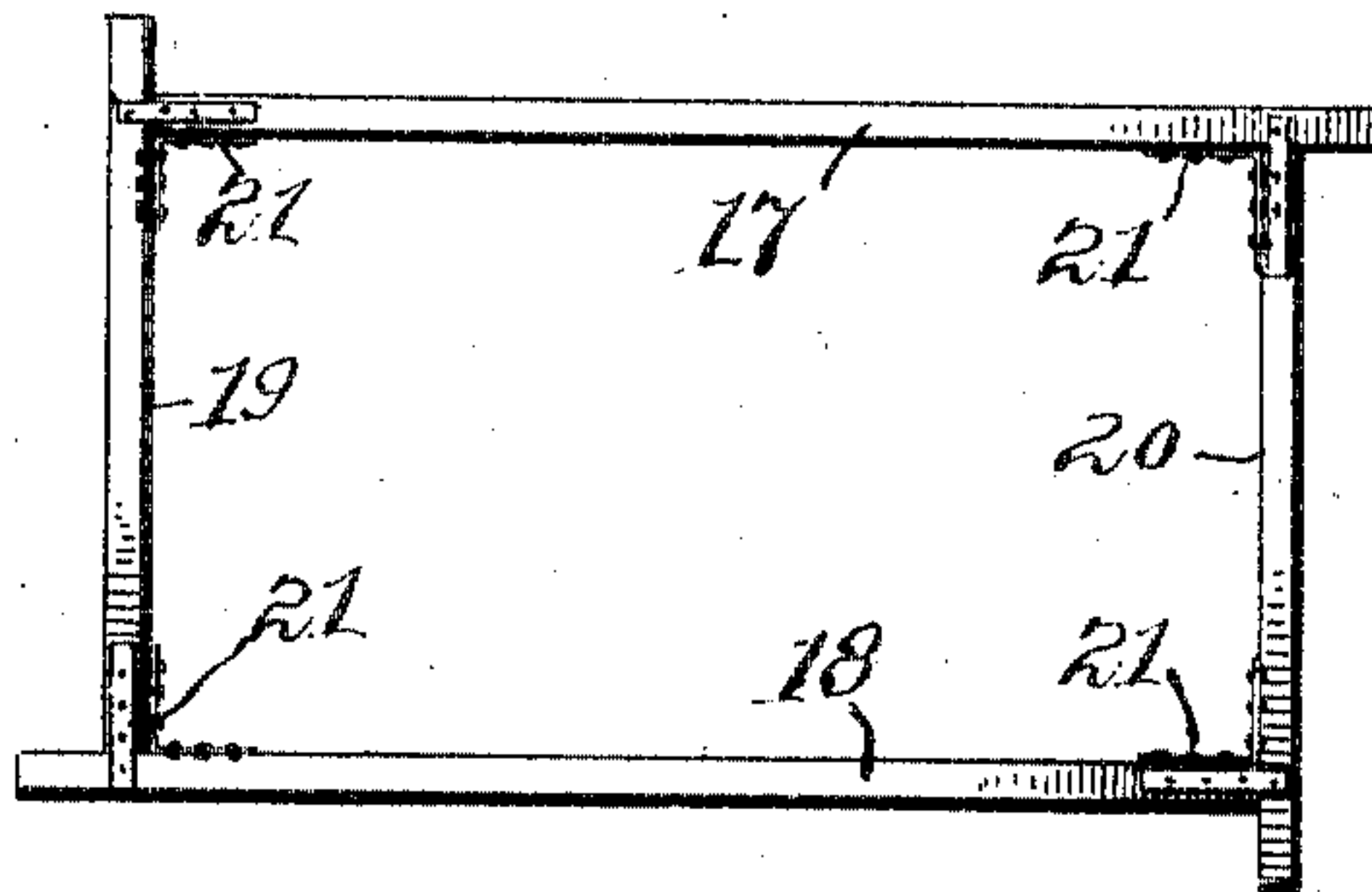


Fig. 8.

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UNITED STATES PATENT OFFICE.

ANDRES FERNANDEZ, OF PACHUCA, MEXICO.

LINING FOR SUBTERRANEAN PASSAGES.

SPECIFICATION forming part of Letters Patent No. 777,013, dated December 6, 1904.

Application filed April 25, 1904. Serial No. 204,831. (No model.)

To all whom it may concern:

Be it known that I, ANDRES FERNANDEZ, a subject of the King of Spain, and a resident of Hacienda Chica de la Purisima, Pachuca, State of Hidalgo, Mexico, have invented certain new and useful Improvements in Linings for Subterranean Passages, of which the following is a full, clear, and exact specification.

This invention relates to linings for subterranean passages, its primary object being to secure underground excavations—such as mine-drifts, railroad-tunnels, and the like—against caving.

Another object is to provide for an easy and efficient ventilation within the drift or passage lined.

A further object is to provide a lining which may be quickly set up to successfully brace or stay the surrounding walls of the passage without any liability of the lining becoming seriously affected by the deteriorating influences of the adjacent soil.

Further objects and advantages of this invention will be specifically referred to in the following description, it being understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

The invention includes the combination and arrangement of component parts and the details of construction to be hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, which illustrate one embodiment of my invention and a modification, Figure 1 shows a preferred embodiment in perspective. Fig. 2 is a side elevation of the framework of the same. Fig. 3 is a detail view of one corner connection. Fig. 4 is a detail view of the connection between the lower end of the side beams and the bottom sill. Fig. 5 is a transverse sectional view of the same. Fig. 6 is another detail view, and Figs. 7 and 8 are views of a modification.

Heretofore it has generally been the practice to utilize certain kinds of timber for securing underground excavations; but owing

to the deteriorating influence of the soil such timber is frequently attacked by dry-rot, which gradually renders it useless, and it must be renewed at considerable expense and inconvenience. Various methods of preventing dry-rot have been practiced with more or less success; but nothing has proven perfectly satisfactory. By utilizing a lining constructed in accordance with my invention the passage will remain dry and well ventilated, the necessity of relining will be practically avoided, and the liability of the walls caving will be entirely prevented.

The preferred embodiment of my invention is provided with an upper ventilating-conduit and a subjacent passage wherein work may be carried on, the entire construction being formed of suitable metallic angle-beams and attached lagging, as will be apparent as the details of the invention are referred to in the following description.

In driving a level or drift a cut is made sufficiently large for the insertion of the first sectional structure of the lining, so that it may be set up. The base-sills 1 are then laid upon the bottom of the cut to constitute a foundation upon which to build the remaining structure. These sills are preferably angle-beams, illustrated in the drawings as I-beams, so that their base-flanges will firmly rest upon the bottom of the cut or passage to be secured. In practice I prefer to lay these sills 1 transversely of the passage, and at points intermediate the ends of the sills are secured upstanding spaced side beams 2, one near each end of the respective sills 1. These side beams 2 are preferably arranged so that they will be slightly inclined toward the top of the structure, and the opposing side beams carried by each sill are connected at their upper terminals by one of the cross-beams 3.

In the practical embodiment of the invention the upstanding beams 2 and cross-beams 3 will generally be of the I-beam type, and the lower terminals of the beams 2 will rest upon the top flanges of their respective sills 1. In order that the sills and the lower ends of the vertical beams 2 may be rigidly secured, I employ the plates 4, illustrated as having

transverse intermediate grooves 5, which are engaged by and fit over the edges of the top flanges of the sills, so that the opposite end portions of the plates may lie flush with and
 5 be secured to the respective webs of the sills and side beams. These tie-plates are arranged on both sides of the webs and are secured by suitable fastening devices 6, illustrated as bolts. The cross-beams 3 are connected to
 10 the side beams by the devices 7, indicated as flat plates having substantially right-angular terminals 8 and 9 of approximately the widths of the webs of the beams, whereby the side edges of the terminals will fit against the in-
 15 ner sides of the flanges, and when fastened by fastening devices 10 they will add rigidity to the parts which they connect and strengthen the upper portion of the structure. It will be seen that the sills, inclined side beams, and
 20 cross-beams will constitute frames connected at their lower ends by the tie-rods 11, which terminally connect the end sills and any intermediate sills which may be interposed therebetween.

25 12 is a lagging, shown as a corrugated sheet, connecting the alining side beams and the alining cross-beams at the top thereof, the whole constituting an arch to effectually avoid the introduction of any earth or rock into the
 30 passage from the sides or top.

Intermediate the ends of the side beams are alining laterally-disposed struts 13, terminally fastened to the complementary side beams of each frame by tie-plates 12^a, and these
 35 struts coöperate to support sheets 14 of lagging or other suitable material, whereby a floor or partition is provided in the passage, dividing it into an upper ventilating air-conduit and a subjacent working passage. The lagging and
 40 the transverse struts materially strengthen the lining, although under certain conditions the partition may not be utilized.

The projecting ends 15 and 16 of the respective sills will be covered with rocks and
 45 earth and will advantageously prevent buckling of any intermediate part thereof due to the end thrust exerted by the side beams 2. By inclining the side beams slightly toward each other part of the side thrust thereof will
 50 be imparted to the cross-beams 3, and the weight sustained by the structure will be equally distributed.

After the lining-section as illustrated in Fig. 1 is set up earth can be filled in on either
 55 side and on the top of the lining and then tamped behind the lagging, so that the liability of the structure being strained will be avoided. After the initial section has been set up the work of driving the drift may pro-
 60 ceed by adding new lining-sections as the length of the drift or passage continues. Linings for wells and shafts may also be provided by dispensing with the sills and provid-
 65 ing rectangular frames comprising parallel side beams 17 and 18 and cross-beams 19 and

20, connected at the corners of the frames by tie-plates 21, the alternate ends of the side and cross beams extending beyond its complementary part for insertion into the walls of the well or shaft, whereby the frames will
 70 be supported.

Extending transversely of the bottom sills 1 are rails 20, the base-flanges of which are secured to the top surfaces of the upper flanges of the sill. These rails are so disposed
 75 relatively to each other as to form a track, which when intended for railway service is disposed centrally between the upright beams, but when used merely for supporting the mine the track is laid adjacent to one of the
 80 ends of the sills.

What I claim, and desire to secure by Letters Patent, is—

1. A lining for subterranean passages, having base-sills, upstanding side beams, cross-
 85 beams connecting the upper ends of the side beams, and transverse braces engaging opposing side beams intermediate their ends.

2. A lining for subterranean passages, comprising upstanding side beams, upper cross-
 90 beams connecting them, and laterally-disposed supporting-sills for the upstanding side beams and having their opposite ends projecting beyond the side beams.

3. A lining for subterranean passages comprising spaced base-sills, pairs of spaced up-
 95 standing side beams resting upon the sills, a cross-beam connecting each pair of side beams, and a corrugated lagging-sheet connecting adjacent pairs of side beams and cross-beams.
 100

4. A lining-frame for subterranean passages comprising I-beam sills, I-beam up-
 standing sides having their ends resting upon the upper flanges of the sills, I-beam cross-
 105 pieces connecting the upper ends of the sides and intermediate braces for the sides.
 110

5. A lining-frame for subterranean passages, comprising I-beam sills, I-beam up-
 standing sides having their ends resting upon the upper flanges of the sills, I-beam cross-
 115 pieces connecting the upper ends of the sides, and removable intermediate braces for the sides.

6. A lining for subterranean passages, having alining frames with oppositely-disposed
 120 flanges, and sheet lagging connecting the alining frames and secured to the flanges.

7. A lining for subterranean passages, having connected frames, and sills on which the
 125 sides of the frames rest, said sills having extended ends projecting beyond the sides of the frame.

8. A lining for subterranean passages consisting of angle-beams and comprising base-
 130 sills, upstanding side beams, cross-beams, and angle connecting-plates for the side and cross beams, the edges of the angle-plates fitting against the flanges of the respective beams.

9. A lining for subterranean passages having a removable partition dividing the space
 135

in the lining into an upper ventilating-conduit and a subjacent passage.

10. In a lining for subterranean passages, alining frames, having side beams, sheet lag-
5 ging connecting the side beams, transverse intermediate struts connecting the side beams, and partition-sheets carried by the struts.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ANDRES FERNANDEZ.

Witnesses:

CARLOS CASASUS,
JOSÉ R. AVILA.