H. P. T. LIND.

INTERLOCKING BLOCK.

APPLICATION FILED NOV. 12, 1915.

1,224,757.

Patented May 1, 1917.

2 SHEETS—SHEET 1.

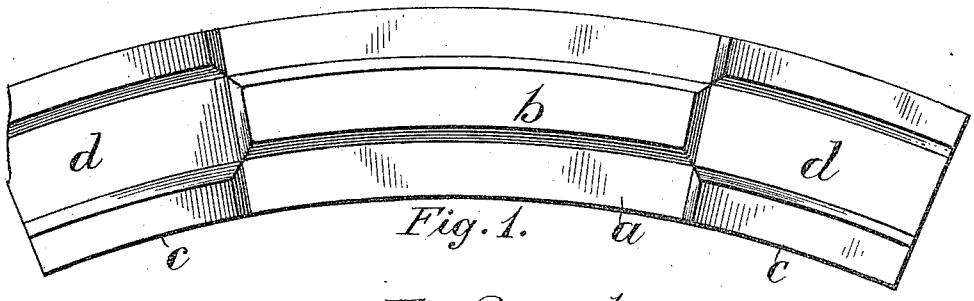
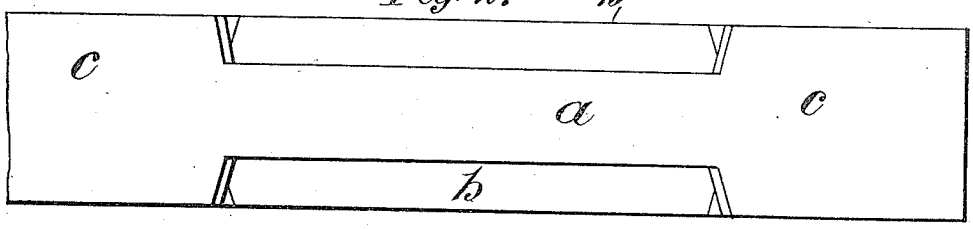


Fig. 1.

Fig. 2.



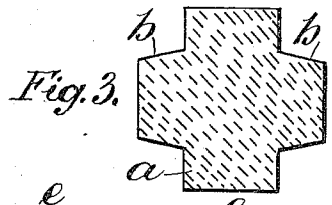


Fig. 3.

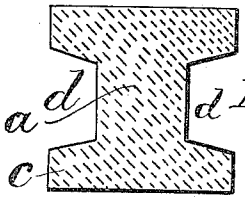


Fig. 4.

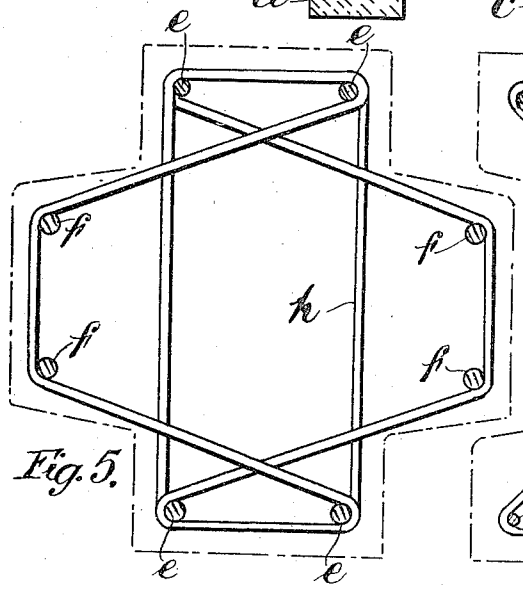


Fig. 5.

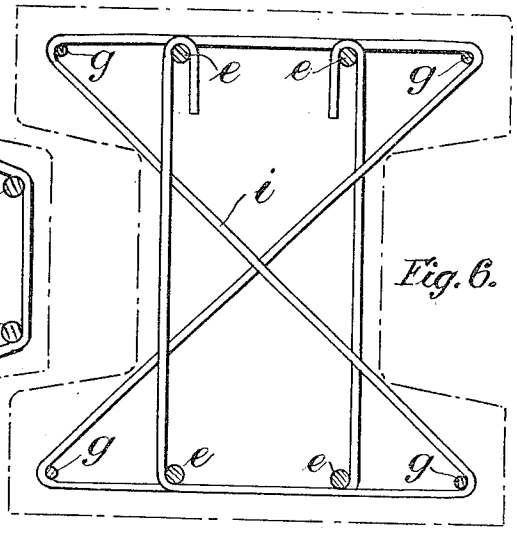


Fig. 6.

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2 SHEETS—SHEET 2.

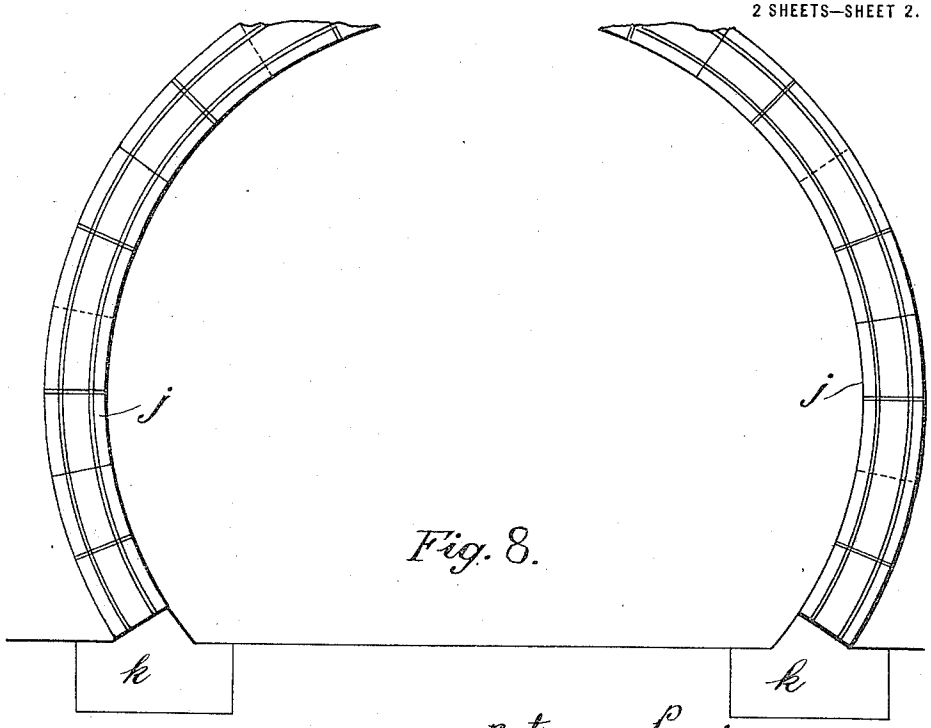


Fig. 8.

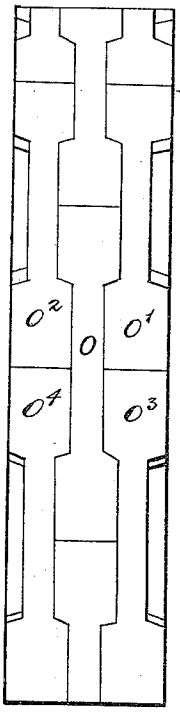


Fig. 9.



Fig. 11.

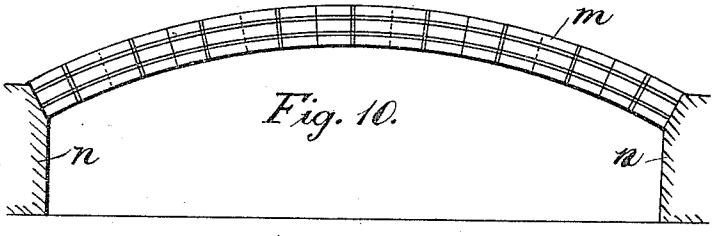


Fig. 10.

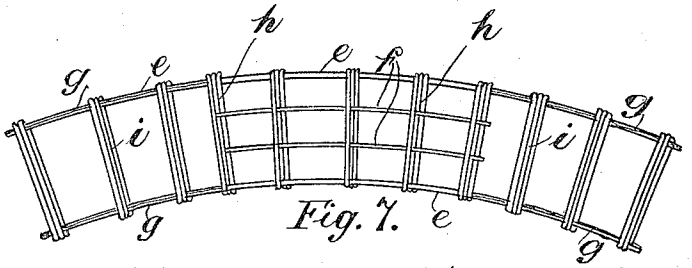


Fig. 7.

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UNITED STATES PATENT OFFICE.

HERMAN PETER THYGESEN LIND, OF KEW GARDENS, ENGLAND.

INTERLOCKING BLOCK.

1,224,757. Specification of Letters Patent. Patented May 1, 1917.

Application filed November 12, 1915. Serial No. 61,194.

To all whom it may concern:

Be it known that I, HERMAN PETER THYGESEN LIND, a subject of the King of Denmark, residing at Kew Gardens, Surrey, England, have invented certain new and useful Improvements in Interlocking Blocks, of which the following is a specification.

This invention relates to an improved constructional block and more particularly to an improved ferro-concrete interlocking block.

The block may be straight or curved to any arcuate shape without interfering with its interlocking properties.

The object of the present invention is to provide a strong block which when built into a structure will offer the maximum resistance to shearing, bending and crushing stresses.

The invention has been designed principally with a view to lining tunnels or shafts subjected to large crushing stresses, but it is evident that it is equally applicable to other constructional purposes.

According to this invention the block is composed of a body portion having projections on its sides, the center half length of the block having lateral projections which are supplemental to the lateral projections on the end quarter lengths. By "supplemental" is meant that when an end portion on one block is brought opposite to a center portion of another block the side profile of the end is such that it fits exactly into the side profile of the center. The structure is composed of blocks having the lateral profiled end portions of four blocks supplementing the lateral profiled center portion of one block, abutting end portions of two blocks being located on each side of the supplemented center portion.

Referring now to the accompanying drawings:

Figures 1 and 2 are respectively a side elevation and plan of a block in the form of a segment of a circle and particularly suitable for forming tubular linings.

Figs. 3 and 4 are cross sections taken on the central and end portions respectively.

Figs. 5 and 6 are diagrams illustrating suitable reinforcements for the central and end portions respectively.

Fig. 7 is a side view or diagram illustrating the reinforcement of the whole block.

Figs. 8 and 9 are front and side elevations illustrating a tunnel lining.

Fig. 10 illustrates an arch formed with blocks according to the invention.

Fig. 11 is a side elevation of a modified form of block.

In carrying the invention into effect according to one mode as shown in Figs. 1 to 4, each block comprises a body portion a of rectangular shape in cross section and this rectangular cross section extends from end to end of the block. In the form chosen for illustration the body is of arcuate shape. On each side of the central body a there are similar lateral projections which in the form shown are five in number on each side. The lateral projections b extend over the central part of the block for half the length and the pairs of lateral projections c extend over a quarter of the length of the block at the ends—the projections b and c being substantially co-terminous. Fig. 3 shows in section the lateral profile of the center portion, the projections b being tapered outwardly as will be readily seen. The section on Fig. 4 shows the lateral profile of the end portions where the recesses d d formed by the projections c have similar tapered faces to the faces of the projections or ribs b. The section of Fig. 3 is supplemental to the section of Fig. 4 so that when the two are approached laterally the projections b fit in and fill the recesses d.

In assembling blocks constructed in this manner the dissimilar but supplemental profiled portions of neighboring blocks interlock in the manner shown in Fig. 9. The block o has interlocking with it four blocks o', o^2 o^3, o^4, the blocks o' and o^3 being on one side and the blocks o^2 and o^4 being on the other. It will be seen that the profiled end portions of four blocks o', o^2, o^3, o^4 fit into the lateral differently profiled center portion of one block o.

The preferred form for the projections is that given in Figs. 3 and 4 where the central

projections *b* constitute with the body *a* a cross shape, while the end portions are of I shape. The interlocking projections form keys so that on assembling a structure it possesses the major portion of its ultimate strength even before any binding such as cement or mortar is applied.

This interlocking also presents another advantage, namely, that the stresses on the lining are transmitted from one section or element to the adjacent sections or elements, and as each element is preferably reinforced by steel rods *e*, in suitable positions, the tensile stresses can be adequately taken by these rods. In this way the want of continuity which would apparently result from the division of each ring of the lining into segments, is compensated for, that is to say, the stresses are transmitted continuously and circumferentially around the lining.

It is preferred to provide reinforcing rods *f* and *g* near the outer surfaces of the elements and to tie these to the main rods *e* by stout wires *h*, *i*, as shown in Figs. 5 to 7. A single wire *h* or *i* may be wound about the rods *e f* and *e g* in each position as shown.

As all the elements can be of the same shape and dimension they may be made in large number and kept in stock which is a considerable advantage, not only in initial construction work, but in repairing or extending.

When the sections are being placed in position the co-acting surfaces may if desired be coated with cement grout and the sections are then pressed firmly together by suitable means.

Figs. 8 and 9 illustrate by way of example a tunnel lining *j* springing from foundation blocks *k* let in the floor of the tunnel. Fig. 10 shows an arch *m* formed of blocks curved to a longer radius. Such a structure may be used between the buttresses *n* of a retaining wall or the abutments of a bridge.

It may be remarked that theoretically the block shown in Figs. 1 to 4 or even a block with the sections of Figs. 3 and 4 reversed or transposed is complete and perfect. In this form the lateral ribs are co-terminous that is to say, the tapered ribs *b* start from the same plane in one direction as do the tapered ribs *c* in the other. This necessitates a degree of accuracy in manufacture which is excessive especially if the cement is tamped in dry. It also renders it difficult to insure the exclusion of all air from behind a lining composed of such blocks when cement is pumped in as a backing as is usual. To avoid both these difficulties I prefer in practice to use the type of block shown in Fig. 11 where a space *r* extends for the depth of the block owing to the fact that the lateral ribs *q* do not extend all the way up to the quarter length plane. When such blocks interlock the abutting faces of two blocks meet in the plane *s* and the ribs *q* of the interlocking blocks terminate in the plane *t* which is also the plane in which the central rib *p* of the central portion terminates. This leaves at each joint of the interlocking shoulders, spaces *r* through which cement may be pumped. This cement passes through the space *r* behind the lining and the air may escape through any of the other openings *r*, pumping is continued at various openings *r* until cement has started to ooze out of all the openings at which time assurance is given that a thoroughly solid backing of cement is obtained.

I claim:—

1. A structural block for use in the formation of slab structures capable of resisting compressive, tensile, bending and shearing stresses caused by forces acting normal to the surface of the slab, said block having smooth, double symmetrical upper and lower surfaces, two plane end surfaces and two sides which have ribs and recesses forming lateral profiles which, at any point throughout the length of the block are symmetrical, said lateral profiles for the end parts being different to those of the central part of the block, the ribs on the end portions corresponding to and being supplemental to the recesses in the central portion substantially for the purpose hereinbefore set forth.

2. A structural block for use in the formation of slab structures capable of resisting compressive, tensile, bending and shearing stresses caused by forces acting normal to the surface of the slab, said block having smooth, double symmetrical upper and lower surfaces two plane end surfaces, and two sides which have tapering ribs and recesses forming lateral profiles which, at any point throughout the length of the block are symmetrical, said lateral profiles for the end parts being different to those for the central part of the block, the ribs on the end portions being of corresponding taper to and being supplemental to, the recesses in the central portion substantially for the purpose hereinbefore set forth.

3. A structural block for use in the formation of slab structures capable of resisting compressive, tensile, bending and shearing stresses caused by forces acting normal to the surface of the slab said block having smooth, double symmetrical upper and lower surfaces, two plane end surfaces and two sides having projecting tapering ribs and tapering recesses, the tapering ribs adjacent to the ends of the blocks extending each for substantially a quarter of the length of the block and those at the center

for substantially one half the length of the block, the aforesaid end ribs alternating with the said central ribs and being supplemental to the recesses in the central portion of the block substantially for the purpose hereinbefore set forth.

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

HERMAN PETER THYGESEN LIND.

Witnesses:
HELEN MATHYS,
PETER S. N. ALEXANDER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."