E. LARDY.

LINING SHAFTS WITH CONCRETE.

APPLICATION FILED JUNE 6, 1910.

1,003,140.

Patented Sept. 12, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

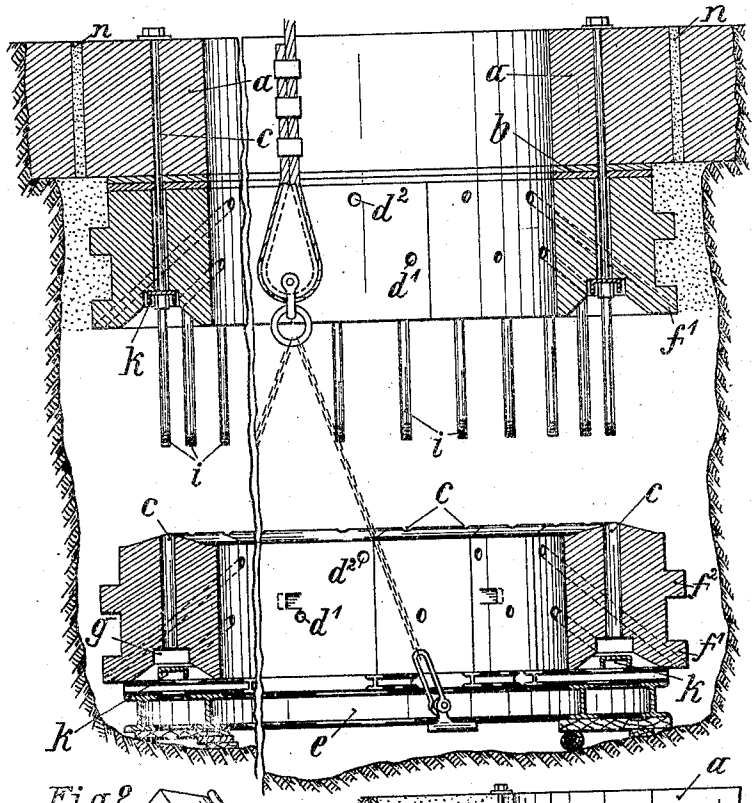

Fig. 2.

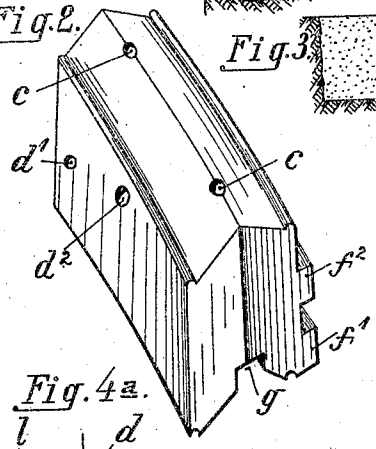

Fig. 3.

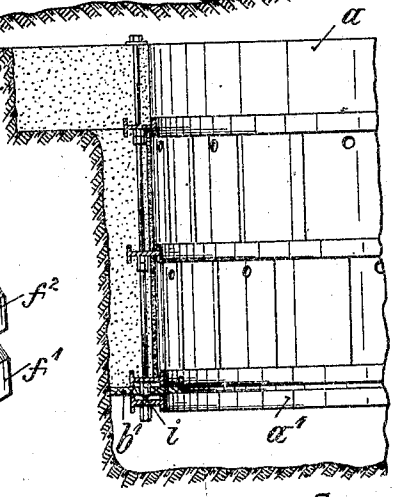

Fig. 4a.

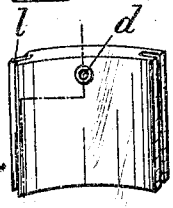

Fig. 4b.

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2 SHEETS—SHEET 2.

Fig. 5.

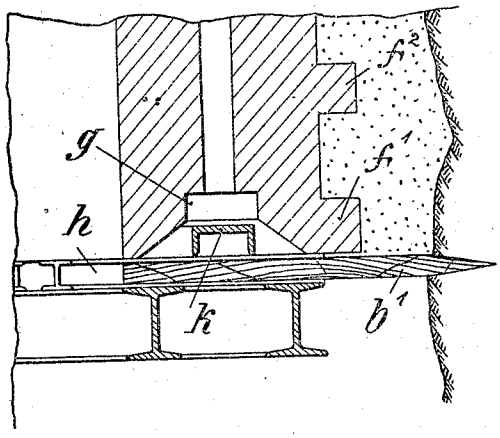
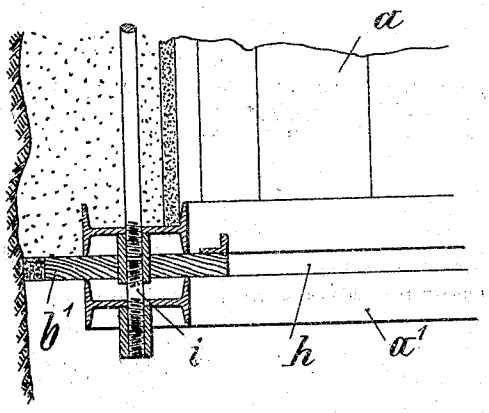


Fig. 6.



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LINING SHAFTS WITH CONCRETE.

1,003,140. Specification of Letters Patent. Patented Sept. 12, 1911.

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To all whom it may concern:

Be it known that I, EMIL LARDY, a subject of the German Emperor, residing at 28 Augustastrasse, Münster, Westphalia, in the Empire of Germany, have invented new and useful Improvements in Lining Shafts with Concrete, of which the following is a specification.

This invention relates to a method of lining shafts with concrete.

In the sinking of shafts it has hitherto been necessary in the event of their being lined to first build up a temporary shell with U-shaped iron rings and sheet-metal strips or boards. When a sufficient length has thus been freed the masonry is built up from below starting from a foundation. Where concrete or beton has been employed for the lining of shafts, this has also been applied from below upward. In the stamping operation a special sheet-iron sheath or shell is moreover required. Finally, it has also been proposed to make use of concrete blocks of special shape which are applied around the inner face of the shaft from below upward in the same manner as the masonry.

Now, my invention relates to a method of lining shafts with concrete in which the actual operation of lining takes place from above downward so that the lining can directly follow the sinking of the shaft. To this end the operation is started from a suspension support of concrete upon an accurately horizontally lying wooden ring or crown around the mouth of the shaft. To this suspension ring the complete concrete lining is hung in succeeding sections by means of bolts and screws. If sufficient space is obtainable beneath the suspension ring a platform or staging can be introduced into the shaft and the lining applied therefrom. The operation can be carried out, however, from the bottom of the shaft without such a staging. The necessity of a temporary structure is thus completely obviated by my invention.

In the accompanying drawing:—Figure 1 represents a vertical section of a shaft illustrating the method of lining by means of a staging, and with concrete blocks. Fig. 2 is a perspective view of one of the concrete blocks shown in Fig. 1. Fig. 3 is a sectional view of a portion of a shaft illustrating the method of working without a staging and with concrete slabs, and Figs. 4^a and 4^b are a perspective view and a vertical transverse section respectively of one of the slabs shown in Fig. 3. Figs. 5 and 6 illustrate the two methods of preventing the escape of liquid concrete suggested hereafter.

The platform or stage e (Fig. 1) consists of two double I or [-shaped iron rings which are connected together by four bearing shoes. The said staging is freely suspended in the shaft by one or two cables. In the drawing a represents the concrete suspension ring, which may be approximatey from one to two meters in sectional width, and of about the same height, b is the wooden crown or ring upon which the said concrete is applied, c holes for the bolts by which the concrete blocks are suspended, and n holes through which the space between the concrete lining and the surrounding wall of the shaft can be filled with cement mortar.

The concrete or beton blocks which are employed in this method of carrying out my invention are illustrated in Fig. 2. They are slightly curved longitudinally and are formed top and bottom of an angular configuration, the one to engage and fit the other. Upon the outside are ribs f^1 and f^2. They are also provided with a wide groove g on the bottom for the reception of the carrying ring, two vertical holes c and two inclined holes d^1, d^2 passing through the block. If the blocks are armored with iron or wire, the iron insertion is so shaped that it projects on the rear face. The object of the ribs and projections is to obtain a better connection of the block with the concrete filled in behind it.

Assuming now that the platform or staging e is in the horizontal position, the bolts i are first introduced, and a U-shaped iron ring k is laid upon the said staging. Above this ring a series of the concrete blocks is built up to form a ring upon short sections of I-irons so that the aforementioned holes c (Figs. 1 and 2) lie exactly beneath the bolts i. After the concrete ring has thus been built up, the platform is raised and the said ring rigidly secured to the suspension ring by means of the bolts and nuts, the space left between the outer face of the ring and the wall of the shaft being filled with liquid cement through the holes n above alluded to. In the case of the succeeding concrete sections, the filling of the space behind the same is effected through holes d^2 in the blocks of the superposed ring. In order to effect a more efficient jointing of the blocks

an elastic filling substance may be introduced into the joints between the same and in order that the liquid concrete or cement which is forced into the spaces to be filled as above described, shall not escape downward, piles or planks may be pushed up to the wall of the shaft immediately above the stage, the said piles or planks being either covered with felt at the front end (as shown in Fig. 6), or provided with an edge (as shown in Fig. 5). The surface of the platform supports the said piles which are cut somewhat conical in shape, and are provided with a groove and tongue on the longitudinal sides, so that when driven forward they close together to form a complete circular partition. A wooden saddle-piece upon the piles, and resting in the spaces g prevents the liquid filling substance from escaping from the vertical joints downward into the shaft. The setting of each individual stone ring takes place immediately after the suspension of the preceding ring. To this end the joints between the individual blocks are filled through the shorter holes or passages d^1. Then follows the filling of the intermediate spaces between the concrete lining and the shaft wall through the longer passages d^2 which terminate at the foot of the lower ribs f^1. This arrangement of passages, and of the wooden packing device has the special advantage, that in the case of the lowermost concrete ring, the unintentional penetration of concrete into the passage d^2 and the escape thereof from the vertical joints downward is prevented. The uppermost ring is, as above described, jointed through holes n in the suspension ring.

The structure can be built up of ⋈ shaped iron rings and thin concrete plates or slabs with iron insertions. The iron rings are screwed into and carry slab-like blocks by means of grooves and tongues. This arrangement is illustrated in Fig. 3. In order to prevent the filling material from falling behind the blocks, an auxiliary ring a^1 is so fastened to short bolts i, that a space h remains exactly as in the first described construction for the reception of the supports b^1 having felt heads. The concrete slabs are shown in Figs. 4^a and 4^b in perspective view and vertical section respectively. They are slightly curved and are provided on one edge with a half sunk-in iron strip l which forms the tongue for engagement with the groove of the adjacent block when the lining is being built up. The hole i serves for the introduction of the filling cement or concrete. On the rear side these holes are provided with projecting iron insertions. In this second mode of carrying out the invention use can also be made of the staging. In lieu of liquid cement mortar or concrete for filling the intermediate spaces between the lining and the shaft wall, other mortars or the like can be made use of, provided the shaft permits this to be done; the said filling can also be effected hydraulically. The method of lining shafts above described possesses, as compared with the known means of lining hitherto practiced, the advantage that the lining is rigidly built up and temporary structures, which have subsequently to be removed, are rendered unnecessary.

Claims:

1. The method of lining the walls of shafts, which consists of providing a support at the mouth of the shaft, then providing lining blocks of concrete, suspending the same from said support, and then introducing concrete between the lining and the walls of the shaft.

2. The method of lining the walls of shafts, which consists of providing a support at the mouth of the shaft which constitutes a lining for the shaft at that part, then adding thereto sectional concrete courses supported therefrom, and then introducing cement between the lining and the walls of the shaft.

3. The method of lining the walls of shafts which consists of providing a support at the mouth of the shaft which at the same time constitutes a lining for the shaft at that point, then adding thereto sectional concrete courses supported therefrom and then introducing cement between the lining and the walls of the shafts through the lining.

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Witnesses:
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