

(No Model.)

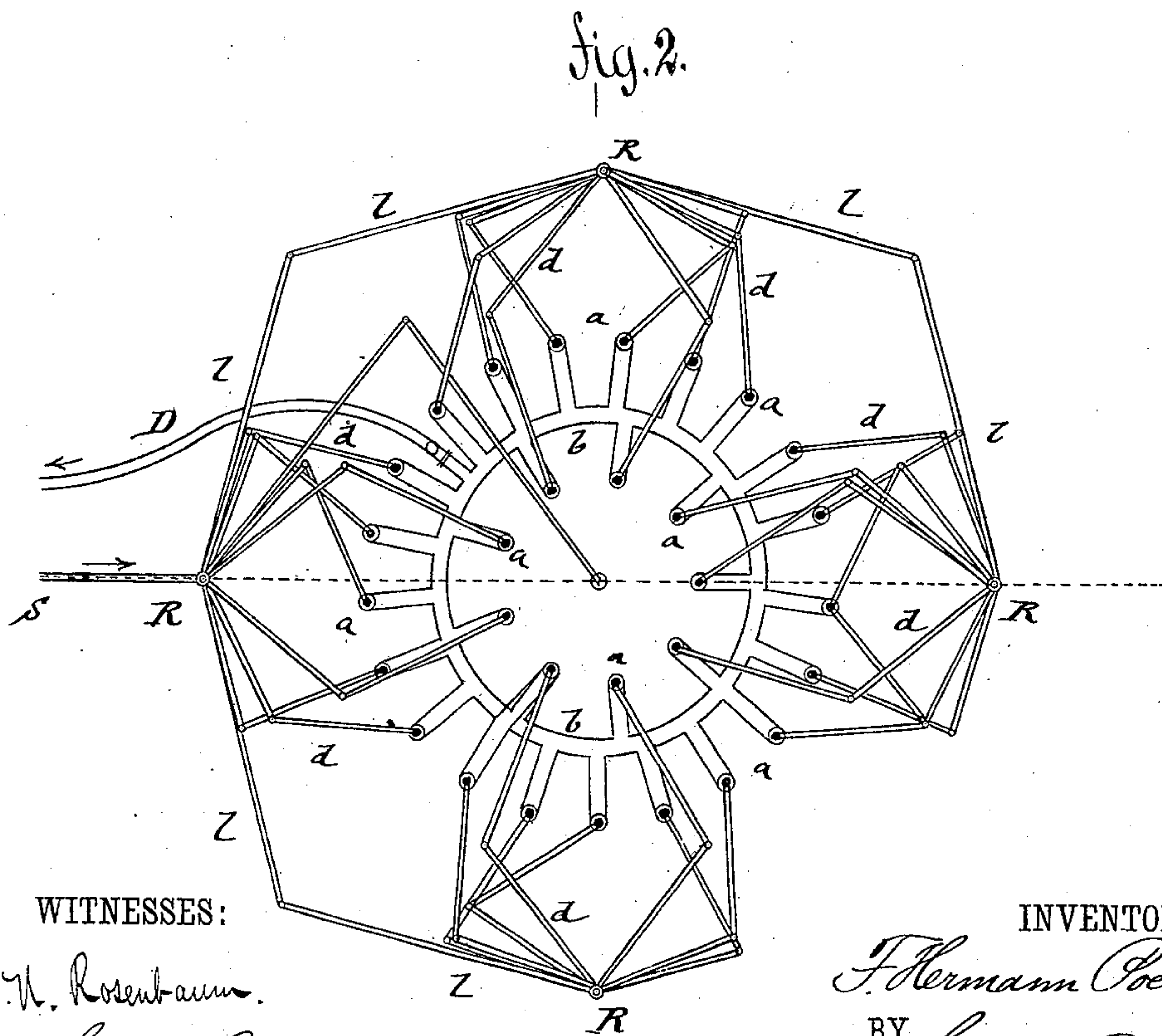
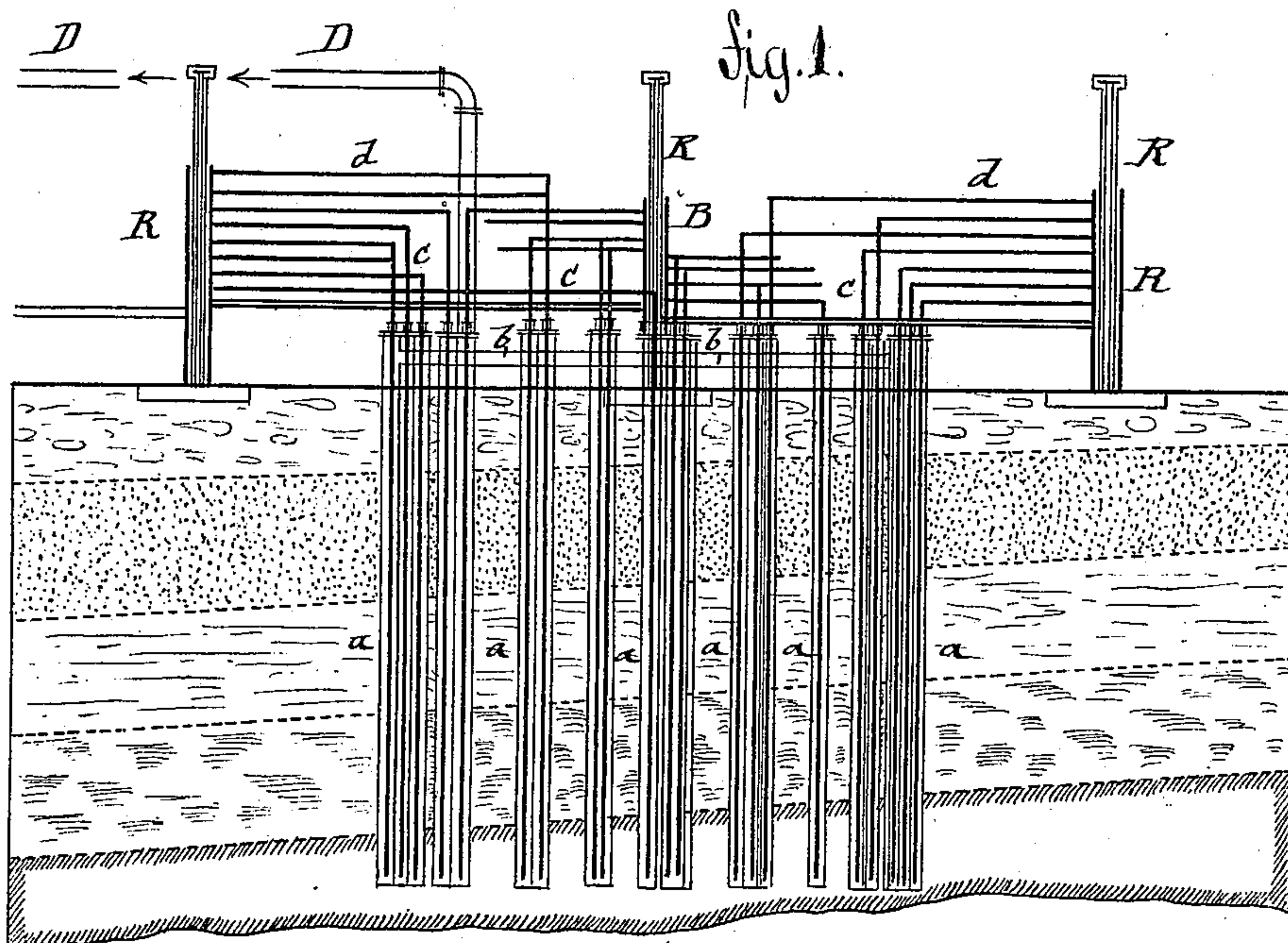
2 Sheets—Sheet 1.

F. H. POETSCH.

METHOD OF AND APPARATUS FOR SINKING SHAFTS THROUGH QUICKSAND.

No. 300,891.

Patented June 24, 1884.



WITNESSES:

*J. H. Rosenbaum.*  
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INVENTOR

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(No Model.)

2 Sheets—Sheet 2.

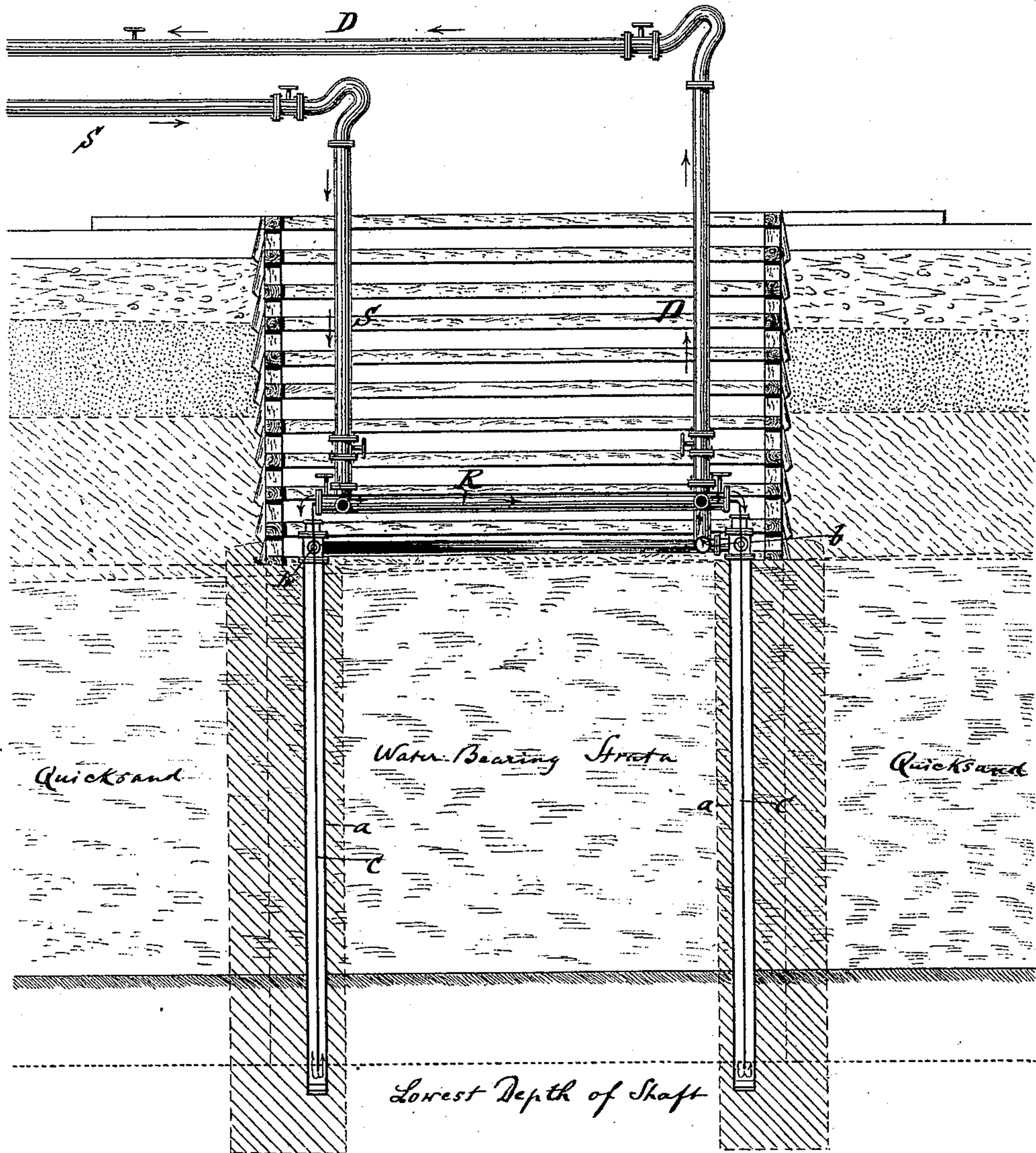
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Fig. 3.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

F. HERMANN POETSCH, OF ASCHERSLEBEN, PRUSSIA, GERMANY.

METHOD OF AND APPARATUS FOR SINKING SHAFTS THROUGH QUICKSAND.

SPECIFICATION forming part of Letters Patent No. 300,891, dated June 24, 1884.

Application filed February 15, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, F. HERMANN POETSCH, of the city of Aschersleben, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in the Method of and Apparatus for Sinking Shafts Through Quicksand, of which the following is a specification.

My invention relates to a novel method of sinking shafts through quicksand and other water-carrying strata; and it consists of a method of freezing said quicksand by artificial means, and then proceeding with the mining operation within or through the frozen ground, as in ordinary solid ground.

It consists, secondly, of a series of exterior tubes closed at the bottom, and of a series of interior tubes open at the bottom, and means by which a refrigerating medium is supplied to the interior tubes and conducted off from the exterior tubes, said tubes being sunk through the water-carrying strata, which are frozen solid by the refrigerating action of the tubes.

In the accompanying drawings, Figure 1 represents a side elevation of the apparatus for freezing the water-carrying strata. Fig. 2 is a plan of the same, and Fig. 3 is a vertical transverse section of a shaft with the freezing-pipes on a larger scale.

Similar letters of reference indicate corresponding parts.

Fig. 1 shows in section a series of strata through which a shaft is to be sunk, including a layer of quicksand. A series of pipes, *a*, which are closed at the bottom and placed at proper distances from each other, are sunk through the water-bearing strata and connected at the top with one or more receiving-pipes, *b*. Pipes *c* are inserted from the top into the pipes *a* and extended to near the bottom of the same, their ends being open. These pipes *c*, as shown in Figs. 1 and 2, are connected with vertical manifolds *R* by pipes *d*. The manifolds *R* are connected by pipes *l*, and have a common supply-pipe, *S*. *D* is a return-pipe connected to the receiving-pipe *b*. The supply-pipe *S* is connected to a refrigerating-machine of any approved construction, by which the cold liquid or gas is supplied and conducted to the manifolds *R*, and thence through

the pipes *d* and *c* into the pipes *a*, which pass through the strata to be frozen, the liquid or gas being returned through the pipes *b* and *D* to the refrigerating-machine. By these means a continuous circulation of a freezing medium is established through the pipes sunk through the water-bearing strata, which strata are thereby frozen to a sufficient thickness to form a solid wall, so that mining operations may be carried on at the interior of the wall. The number and arrangement of the freezing-pipes *a*, and the consequent thickness to which the ground will be frozen, depend on local circumstances, and more especially on the lateral pressure of the ground. The circulation of the freezing medium has to be maintained until the operations are completed. As a circulating and freezing medium, cold air or chilled solution of chloride of calcium, or liquid ammonia, which through its evaporation within the pipes *a* abstracts heat, or any other suitable heat-abstracting medium may be used, the circulation being established in the usual manner.

Fig. 3 shows a section through a series of strata, through the upper part of which a shaft is sunk and timbered to near the top of the water-bearing quicksand. It also shows the freezing-tubes *a* sunk through the quicksand with the internal tubes, *c*. The tubes *a* receive the freezing medium through pipes *c* from a circular manifold, *R*, and a supply-pipe, *S*. The pipes *a* are connected by an annular pipe, *b*, the freezing medium passing from it to the return-pipe *D*. The drawings show the solid frozen body of water-bearing strata, which remains solid until the shaft is lined entirely and finished in masonry or other permanent material.

It is evident that this system of freezing may be applied to any cross-section and slope of a shaft to boring, and, in fact, to all mining operations carried on in water-bearing strata. The freezing medium and arrangement of the apparatus also may be varied according to circumstances.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The method of sinking shafts through water-bearing strata, which consists in freezing a portion of said shafts by artificial means



and then proceeding with the mining operations through said frozen portion in the usual manner, substantially as set forth.

2. An apparatus for freezing water-bearing strata, consisting of a series of exterior pipes closed at the bottom and sunk through said strata, a series of interior pipes open at the bottom, means for supplying a freezing medium to the interior pipes, and means for returning it from the exterior pipes to the source of supply, substantially as and for the purpose specified.

3. The combination of a circuit of vertical refrigerating-pipes adapted to be sunk through water-bearing strata and arranged to surround the sides of a prospective shaft to be sunk therethrough, and means for circulating a freezing medium through said pipes, substantially as described.

4. The combination of a circuit of vertical exterior pipes closed at their lower ends, and adapted to be sunk through water-bearing strata, and arranged to surround the sides of a prospective shaft to be sunk therethrough, a series of vertical pipes open at their lower

ends within said exterior pipes, means for supplying a freezing medium to the interior pipes, and means for returning said medium from the exterior pipes, substantially as described.

5. The combination of a circuit of vertical exterior pipes closed at their lower ends, and adapted to be sunk through water-bearing strata, and arranged to surround the sides of a prospective shaft to be sunk therethrough, a series of vertical pipes open at their lower ends within said exterior pipes, manifolds connected to said interior pipes, means for supplying a refrigerating medium to said manifolds, and means for returning said medium from said exterior pipes, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

F. HERMANN POETSCH.

Witnesses:

H. WILOP,  
B. ROE.