No. 825,903. PATENTED JULY 17, 1906.

L. G. HALLBERG.

FOUNDATION.

APPLICATION FILED APR. 24, 1903.

FIG. 1.

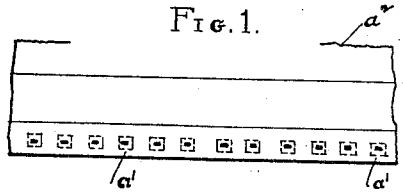


FIG. 2.

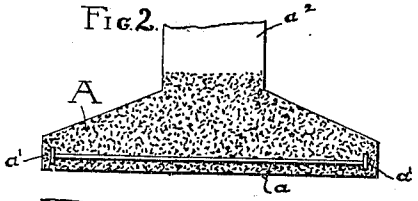


FIG. 3.

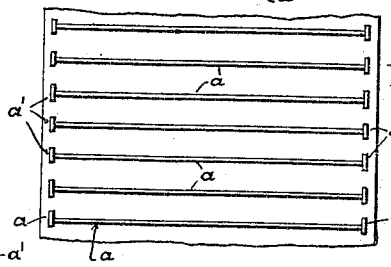


FIG. 8.

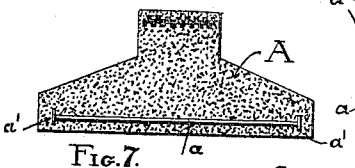


FIG. 6.

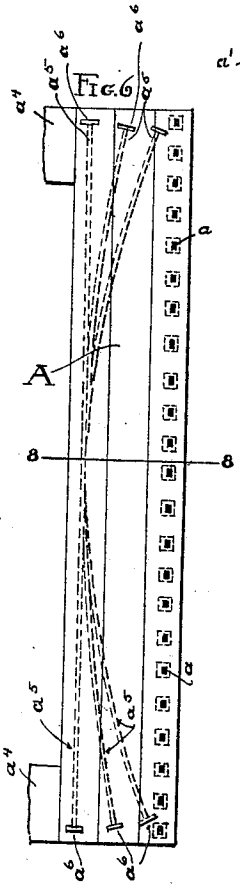


FIG. 7.

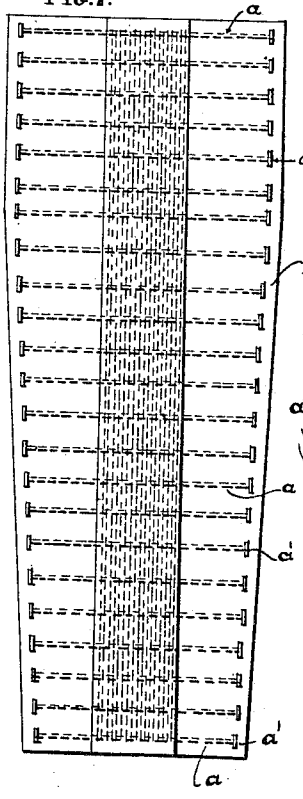


FIG. 4.

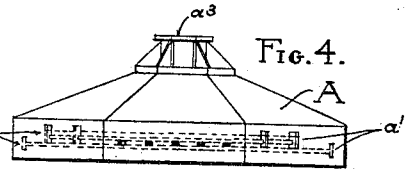
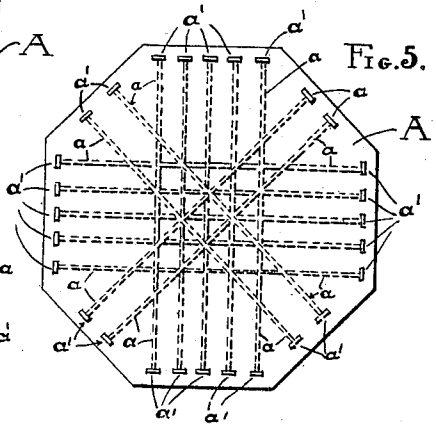


FIG. 5.



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FOUNDATION.

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To all whom it may concern:

Be it known that I, LAWRENCE GUSTAV HALLBERG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Foundations, of which the following is a specification.

My invention relates to foundation structures, and has for its object to provide a novel and efficient foundation to serve as footings or bases adapted to support columns and walls of buildings.

In constructing foundations for use on compressible soil it is necessary to spread the load of the walls and columns over a more or less extended area or surface, and for this purpose foundations are employed which usually consist of layers of metal rails or beams embedded in masses of concrete and which are generally termed "floating" foundations by reason of the fact that they are placed or extended over more or less compressible soil. This construction has proved to be very expensive, for the reason that the rails or beams merely provide a resistance to transverse strains, and therefore a large amount of metal is required. Moreover, the amount of metal employed correspondingly diminishes and divides the mass of concrete and diminishes its resistance. Also in floating foundations the line or point of weight or load is within the area of the foundation, so that the upward pressure of the earth has a tendency to break or shear the foundation approximately at about the line of connection of the load and foundation. There is a constant leverage upon the foundation at or near the line of load, which tends to break or fracture it.

According to my present invention the rails and beams above described are replaced by a system of anchor-rods which extend outward from or beyond the point or line of load and are firmly anchored in the concrete of the foundation. By this construction I utilize the tensile strength of the rods as a substitute for the resistance to transverse strain of the rails and beams previously employed, the tension in the rods being opposed to the compression in the concrete. By this means an increased load-carrying capacity may be obtained by employing a greatly-reduced amount of metal.

My invention consists in the organizations and arrangements of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, which form a part of this specification and illustrate the application of my invention to the support of walls and columns, Figure 1 is a side view of part of a foundation structure constructed in accordance with my invention and representing a section of a footing for a wall. Fig. 2 is a transverse sectional view through the structure of Fig. 1. Fig. 3 is a top plan view of the structure shown in Fig. 1 when the rods are set and before they are covered with concrete. Fig. 4 is a side elevation of a pier adapted to support a column and constructed in accordance with the present invention. Fig. 5 is a bottom plan view of the construction of Fig. 4. Fig. 6 is a side view of a part of a foundation structure for two columns or walls. Fig. 7 is a top plan view of the footing shown in Fig. 6, showing the arrangement of anchor-rods in dotted lines; and Fig. 8 is a sectional view on the line 8 8 of Fig. 6.

In the accompanying drawings the reference-letter A denotes as a whole a foundation structure suitable for use as a floating footing or base and composed of a mass of concrete in which anchor-rods *a* are embedded. The rods are securely anchored in the concrete by providing them with any suitable means to prevent them from slipping in the concrete or to prevent any relative movement between the rods and the concrete. For this purpose I prefer to provide them with heads *a'*. The foundation thus constructed is adapted for use in sustaining walls or piers or other loads, and in the drawings I have shown the application thereof as a base or footing for various purposes.

Referring more particularly to the form shown in Figs. 1, 2, and 3, the weight, such as the wall of a suitable building, is indicated by the reference-letter a^2 and rests upon or is supported by the base or footing A, provided with anchor-rods *a*. The pressure of the wall is exerted in its line within the area of the footing or base A, and the earth upon which the base rests exerts an upward pressure on all parts of the under face of the base, so that there is a tendency to break the base by this leverage, which tendency generally shows itself at about the line of connection of the wall and base or footing. The base or footing is therefore provided with a series of anchor-rods *a*, arranged in a row or layer extending longitudinally of the footing and with the individual rods transverse or at right angles to the line of the wall. It is obvious that any tendency of the foundation to shear

or crack by the compression of the load or weight will exert a strain in the direction of the length of the rods to stretch the latter. By this means the tensile strength of the rods is employed against the compression in the concrete caused by the load. As the rods are firmly anchored in the concrete they are secured against lengthwise displacement, and no change can take place in the base or footing beyond the wall or load unless the rods stretch or the concrete above them is crushed. The tensile strength of the metal of the rods is thereby substituted for the resistance to transverse strain or bending momentum of the beams and rails previously employed, and the tendency of the base or footing to break or shear by reason of the leverage between the earth and load is obviated. The same system is employed in pier constructions, as shown more particularly in Figs. 4 and 5, where the footing or base is in the form of a pier provided with the rods similarly anchored in the concrete and running in two or more directions. In these figures the support for the column is indicated by the reference-letter a^3, which rests in the line of the center of the pier or base and practically above the crossing-points of the several layers of rods a. In this construction I prefer to employ two main series or layers of rods, one superposed upon the other, with more or less intermediate cement, and extending at substantially right angles to each other, with two other layers or series of similar rods arranged to substantially bisect the angles between the first two or main layers to take care of the triangles of concrete between the main layers, as clearly shown in Fig. 5. All of the rods of the different layers are provided with suitable heads a', whereby they are securely anchored within the concrete. This arrangement of rods prevents the fracture of the base or pier and holds it securely together, the effects being produced in substantially the same manner as in the construction described in connection with Figs. 1 to 3.

In some cases it is desired to support separated loads, as two walls, upon the outer lines or ends of the same footing or base, as shown at a^4 a^4 in Fig. 6. Under ordinary conditions these end loads would fracture the concrete and the ends would settle down and cause the intermediate material to bulge or buckle up. By employing my invention I am able to obviate all such defects in this type of foundation, as will be apparent from the organization shown in Figs. 6, 7, and 8. In this form the cross-rods a are similar in construction and arrangement to those illustrated in the other figures and act in the same manner and perform the same functions. In this construction the base or footing is provided with auxiliary longitudinal rods a^5, which extend along the length of the base or footing and are provided with suitable heads a^6 to securely and firmly anchor them in the concrete thereof, so they will act as cantalivers. Some of the longitudinal rods a^5 are bent, preferably in inverted catenary curves, as shown in Fig. 6. This arrangement of devices prevents the concrete from buckling up in the middle and from cracking under the strain of the weights or loads at the ends, as indicated at a^4, because if any buckling occurs it must be by stretching the rods, and as the rods are firmly anchored in the footing or base and cannot stretch it follows that they prevent this tendency to buckle and crack. The cantaliver construction is employed when it is required to carry the load at the outer line of one or both ends of the footing or base, in which case the end loads would tend to fracture the concrete and by the settling of the under portions would cause the center or intermediate portions of the footing or base to bulge upwardly. By embedding anchor-rods in inverted catenary curves the loads at the ends cannot change the footing or base unless the rods are stretched or the mass of concrete below them is crushed. The catenary curves of the bars prevent the shearing of the concrete both transversely and longitudinally.

Having described my invention, I claim—

A foundation comprising a base of cementitious material, headed anchor-rods embedded therein and disposed substantially transversely to the longitudinal line thereof, and a series of longitudinal headed anchor-rods embedded in the said material and forming a cantaliver.

In testimony whereof I affix my signature in presence of two witnesses.

LAWRENCE G. HALLBERG.

Witnesses:

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J. MCROBERTS.