A method and apparatus for leveling a building foundation including excavating a cavity below the portion of the foundation to be raised at regular intervals and using an oversized screw anchor driven under the foundation at approximately 15 degrees relative to the foundation edge at each of the excavated cavities, the anchor having relatively large helical screw flighting or auger plate to insure support at relatively shallow depths. Each excavated cavity is provided with a bed of dry cement mix. The method includes the steps of installing an anchor jack-plate upon said bed of dry cement the jack plate having a collar and gusset attached thereto slideable upon the screw anchor shaft, providing a pair of hydraulic jacks atop the anchor plate, taking a portion of the foundation load on each jack, thereby directing the load at each jack in axial alignment with the helical screw anchor flighting or auger plate, setting the cement by wetting and welding the collar of the anchor jack-plate to the screw anchor shaft only when the foundation is considered level, installing a screw jack at each lifting point and removing the hydraulic jacks and pumping cement into any voids detected below the foundation footing.
METHOD AND APPARATUS FOR LIFTING, LEVELING, AND UNDERPINNING A BUILDING FOUNDATION

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates generally to a method and apparatus for lifting, leveling, and underpinning a building foundation where such foundation has fallen out of plumb as a result of soil movement below the foundation and more particularly to foundation leveling apparatus that utilizes screw anchors as an integral part of a support column.

[0003] 2. General Background

[0004] The prior art teaches various methods for raising, leveling, and underpinning foundations that have dropped or cracked as a result of movement of the supporting soil on which the foundation was laid. These concepts include the process of excavating a portion of the soil from below the foundation and constructing some form of underpinning in the form of columns which serve as a new footing for the foundation at strategic points and using these columns as a base for supporting screw jacks to bring the building foundation back into a level plane. Others teach the use of screw anchors as support columns for the screw jacks. In most cases the foundation is first raised to a near level condition by some type of cantilever jacking apparatus in form of an "L"-shaped shoe inserted under the edge of the foundation. In some cases the jack shoe is supported from one or more screw anchors. In other cases the shoe is simply left in position as a permanent support when the foundation reaches a level plane, while others provide a cement pier of some sort for support of a permanent screw jack. In either case the screw jack may be adjusted at a later date if necessary to compensate for soil settling.

[0005] Several problems occur when these procedures are implemented. In some case the screw anchor is not driven to a sufficient depth to insure stability or the angle of penetration is improper. Therefore, when the jack is loaded, the anchor bends or excessive stress is placed on the foundation due to improper point loading. Where cement piers are used they are often not level, thereby causing the jacks to stress the foundation by improper point loading. Providing sufficient support at proper intervals and leveling uniformly is essential to prevent foundation stress and further cracking. Therefore, a more reliable and inexpensive method is desirable to reduce the cost of materials and man-hours per lift point while insuring uniform loading at each lift point.

3. SUMMARY OF THE INVENTION

[0006] The present invention teaches a method and apparatus for leveling a building foundation. The method including excavating a cavity below the portion of the foundation to be raised at regular intervals and using and an over-sized screw anchor driven under the foundation at approximately 15 degrees relative to the foundation edge at each of the excavated cavities, the anchor having relatively large helical screw driving or auger plate to insure support at relatively shallow depths, providing a bed of dry cement mix at each of the excavated cavities, installing an anchor jack-plate having a collar and gusset attached thereto slideable upon the screw anchor shaft, providing a pair of hydraulic jacks atop the anchor plate, taking a portion of the foundation load on each jack, thereby directing the load at each jack in axial alignment with the helical screw anchor flanging or auger plate, setting the cement by wetting and welding the collar of the anchor jack-plate to the screw anchor shaft only when the foundation is considered level, installing a screw jack at each lifting point and removing the hydraulic jacks and pumping cement into any voids detected below the foundation footing.

4. BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For a further understanding of the nature and objects of the present invention, reference should be made to the following detailed description taken in conjunction with the accompanying drawings, in which, like parts are given like reference numerals, and wherein:

[0008] FIG. 1 is an isometric illustration view of the preferred embodiment as implemented;

[0009] FIG. 2 is an isometric exploded view of the preferred embodiment and its implementation;

[0010] FIG. 3 is an isometric sectional view of the preferred embodiment and its implementation with hydraulic jacks;

[0011] FIG. 4 is an isometric sectional view of the preferred embodiment and its implementation with a screw jack;

[0012] FIG. 5 is a cross section view taken along sight lines 5-5 as seen in FIG. 1;

[0013] FIG. 6 is a cross section view taken along sight lines 6-6 as seen in FIG. 1;

5. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] As illustrated in FIG. 1, foundation leveling is usually required as a result of movement in the soil providing support for the foundation. Such movement often results in cracks 14 in the floor slabs 12, etc. In such cases it has been found that floating piers 16 stabilized by a screw anchor 18 located at strategic points around the foundation 12 are very effective and inexpensive in raising and leveling a foundation if applied in a unique manner using a unique jack plate assembly 20 as seen in FIG. 2. The leveling apparatus includes the screw anchor assembly 18, which is comprised of the screw blade portion 22 and the shaft portion 24 which may be extended by coupling additional shaft lengths as necessary to allow the anchor to reach a stable earth formation. Making the screw auger blades or driving 22 oversized, relative to general practice, typically in the range of 18 to 24 inches in diameter, stability may be achieved at a much shallower depth. The apparatus further includes the jack plate assembly, which is slideable upon the anchor shaft 24 or its coupled extension shafts 26. Shafts 24 or 26 may be solid rods or heavy wall tubular. Jack plate assembly 20 is comprised of a base plate 28 attached to a tubular collar 30, slideable upon the shafts 24, 26, and supported by a gusset 32. The collar 30 and the gusset 32 are attached perpendicularly to the jack plate 28 at an approximate angle of 15 degrees. A second jack plate 34 is provided but not attached to help strengthen the base jack plate 28.
As seen in FIG. 2, excavations 36 are made below the foundation 12 at a number of locations around the foundation as necessary to effectively lift the foundation as illustrated in FIG. 1. The anchor assembly 18 is screw driven in the earth at an angle of approximately 15 degrees relative to the outer edge of the foundation 12 in such a manner that the screw anchor's auger blade or helical flighting 22 is located substantially under the foundation. As seen in FIG. 3, the excavation may then be partially filled with dry cement mix 38, thereby forming a bed to support the jack plate assembly 20. A pair of heavy-duty hydraulic jacks may then be placed on the jack plate assembly, which is still slidable upon the shafts 24 or 26. As the foundation load is applied to the jack plate by the jacks 40, the jack plate assembly 20 is guided and prevented from tipping by the shafts 24, 26 as it sinks and compacts the cement mix 38.

The gusset plate 32 further prevents rotation of the jack plate assembly 20 relative to the cement mix 38. When maximum compression is reached, the foundation 12 is forced upwards to the desired elevation. When the hydraulic jacks 40 have elevated the foundation to the desired height, a screw jack serving as an underpinning element may be inserted between the hydraulic jacks and rotated to sustain the full load of the hydraulic jacks, at which time the hydraulic jacks 40 may be removed as shown in FIG. 4. As seen in FIG. 5, the central axis of the screw jack 42 is aligned with the vertical central axis of the screw anchor assembly 18. In FIG. 6 we see that, when placed properly, the central vertical axis of the screw jack also passes through the central axis of the screw anchor assembly 18 at or about the blades or flighting of the screw anchor, which is the point of maximum support. The anchor shaft 24 or 26 can now be welded to the collar 30 at point 50, thereby transferring a portion of the axial load of the foundation to the screw anchor 18. Any remaining portion of the anchor shaft 24, 26 extending above the collar 30 may be removed, if desired, to prevent any obstruction above ground level. Water may be added to the cement mix 38 to stabilize the mix and thus form the floating piers 16 seen in FIG. 1. Fill material, such as earth or cement, may also be added to the excavations and below the foundation 12 at any accessible areas around the foundation as needed to further stabilize the foundation.

Because many varying and different embodiments may be made within the scope of the inventive concept herein taught, and because many modifications may be made in the embodiments herein detailed in accordance with the descriptive requirement of the law, it is to be understood that the details herein are to be interpreted as illustrative and not in any limiting sense.

What is claimed is:

1. A foundation underpinning apparatus comprising:
   a) a screw anchor assembly having an extendable shaft portion and an auger blade portion; and
   b) a first base plate assembly comprising:
      i) a base plate;
      ii) a tubular collar slidable upon said shaft portion attached perpendicular to one edge of said first base plate; and
      iii) a gusset plate attached perpendicular to said first base plate and said tubular collar.

2. The foundation underpinning apparatus according to claim 1 wherein said collar is attached to said base plate and said gusset at an approximate angle of 15 degrees.

3. The foundation underpinning apparatus according to claim 1 wherein said auger blade portion is between 18- and 24 inches in diameter.

4. The foundation underpinning apparatus according to claim 1 wherein said apparatus further comprises a second base plate placed parallel and in contact with said first base plate.

5. A method for lifting and underpinning a building foundation comprising the steps of:
   a) excavating at least one cavity below the perimeter of a building foundation;
   b) inserting a screw anchor having an extendable shaft portion and an auger portion at an angle of approximately 15 degrees relative to the outer vertical edge of the building foundation to a sufficient depth to insures stability and extending said anchor as necessary to reach the surface of the foundation;
   c) filling at least a portion of said cavity with dry cement mix forming a bed therein;
   d) providing and installing a first base plate assembly comprising a base plate, a tubular collar, slidable upon said shaft portion, attached perpendicular to one edge of said first base plate; and a gusset plate attached perpendicular to said first base plate and said tubular collar at vertical angle of approximately 15 degrees and in such a manner that said gusset plate is pressed into said cement mix and said base plate rests on the surface of said bed;
   e) providing a second base plate parallel to and in contact with said first base plate;
   f) installing at least one hydraulic jack vertically between said second base plate and said foundation;
   g) actuating said hydraulic jack; thereby lifting said foundation to near level plane;
   h) providing and installing a screw jack adjacent said hydraulic jack and adjusting said screw jack to take the full load of said hydraulic jack and removing said hydraulic jack;
   i) wetting said cement mix sufficiently to form a cement pier; and
   j) welding said collar to said screw anchor and removing any excess portion of said shaft.

6. The method according to claim 5 further comprising the step of placing said screw jack in a manner whereby the vertical axis of said screw jack is aligned with the vertical central axis of the shaft of said screw anchor and the vertical axis of said screw jack crosses the vertical axis of said shaft at the approximate location of said auger portion.

7. The method according to claim 5 wherein the load of said foundation is divided between said cement pier and said screw anchor.

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