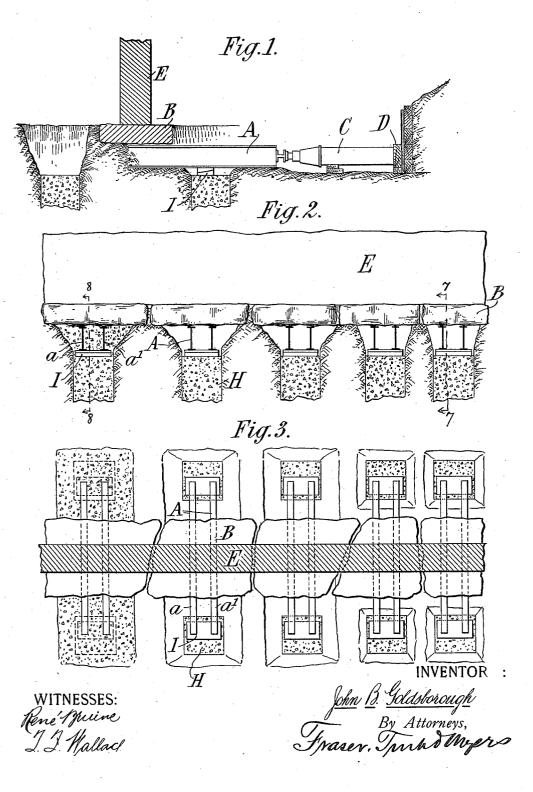
## J. B. GOLDSBOROUGH. METHOD OF UNDERPINNING BUILDINGS. APPLICATION FILED JUNE 17, 1913.

1,093,262.

Patented Apr. 14, 1914. 2 SHEETS-SHEET 1.



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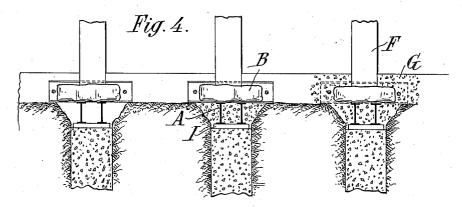
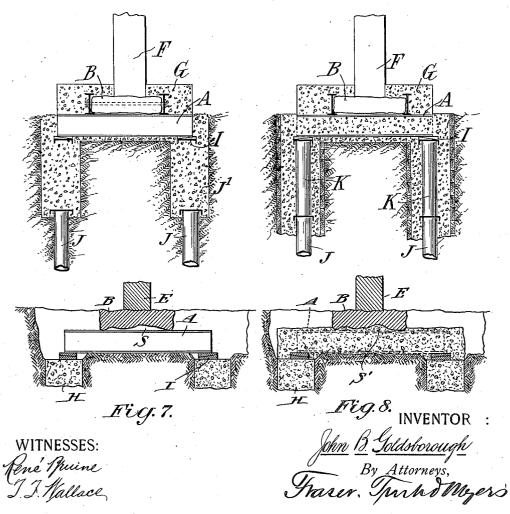




Fig. 6.



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# UNITED STATES PATENT OFFICE.

JOHN B. GOLDSBOROUGH, OF CROTON, NEW YORK.

### METHOD OF UNDERPINNING BUILDINGS.

Specification of Letters Patent. Patented Apr. 14, 1914. Application filed June 17, 1913. Serial No. 774,258.

### To all whom it may concern:

1,093,262.

Be it known that I, JOHN B. GOLDSBOR-OUGH, a citizen of the United States, residing in Croton, in the county of Westchester 5 and State of New York, have invented certain new and useful Improvements in Methods of Underpinning Buildings, of which the

following is a specification. My invention relates to the underpinning

10 of buildings and similar heavy structures, and has for its object to provide means whereby a new and permanent foundation or underpinning may be provided for such building or other structure at any desired

15 depth lower than the original foundation without undermining the original foundation or interfering with the supporting power of the earth upon which the same rests.

A further and important object of my in-20 vention is to provide such building or other structure with an underpinning or new foundation without the employment of temporary supports for the structure being underpinned or of shores, braces, needle beams, 25 etc., the employment of which obstructs the

work in hand and interferes with the occupancy of the adjoining building.

It frequently becomes necessary, for various reasons, to provide a building with a 30 new and deeper foundation. The founda-

tions of the majority of buildings, particularly in cities, are usually located at from 12 to 15 feet below the curb and a slight distance below the basement floor. Such foun-

- 35 dations are ample when undisturbed but when, as is often the case, adjacent building operations require an excavation to a greater depth than the said foundation, or when the bearing power of the soil has become dis40 turbed by the draining of the water there-
- 40 turbed by the draining of the water therefrom through excavations nearby, or when the weight on the building is greatly increased, it becomes necessary to provide a building with foundations of increased sup-
- 45 porting power, and usually in case of deeper excavations alongside, such foundations are extended to a greater depth and until they reach a sub-strata of sufficient bearing power to support the increased weight. Such un-
- 50 derpinning operations, particularly in cases where buildings have been supported upon piers or columns, have usually required that the earth underlying the original founda-

tions should be removed; and such foundations themselves have usually likewise been 55 removed to provide sufficient headroom for construction of a new foundation. Such operations have involved the temporary support of the structure being underpinned. This is recognized as a difficult and danger- 60 ous undertaking and it is a decided advantage to be able to dispense with it. There is also a great advantage in providing a new foundation without removing the earth from under the original foundation or interfering 65 with the supporting power thereof.

My invention may be employed in underpinning a continuous wall having the ordinary type of foundation usually provided for such walls or in underpinning a wall 70 which is supported upon isolated piers or columns having independent footings. In the latter case I preferably bond the said footings together and provide a new and extended footing in accordance with the 75 method invented by me and more particularly described and claimed in my Patent Reissue No. 13,610 dated August 26, 1913.

The particular invention forming the subject-matter of this application is an im- 80 provement upon the method disclosed in my application for patent, Serial No. 717,303, filed August 27, 1912. According to the said application beams are located transversely of the wall closely adjacent to the base por- 85 tion thereof and these beams are then connected to suitable supporting columns. The said transverse beams are the means whereby the weight of the building wall is transferred to the underpinning columns and it is 90 a matter of importance that the said beams should bear evenly upon the base portion of this wall as the strains are very heavy and if concentrated upon a few points of the wall 95 are liable to crush the wall.

My present invention has for its object to provide means whereby a uniform and continuous contact between the transverse beams and the base portions of the wall may be assured.

The accompanying drawing illustrates a desirable embodiment of my invention. Here Figure 1 illustrates the manner of forcing the transverse beams to place beneath the wall; Fig. 2 illustrates a continuous wall in the underpinning of which my

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invention is employed, different phases of the work being shown at different points; Fig. 3 is a plan view of Fig. 2; Fig. 4 is an elevation of a wall supported upon piers 5 and underpinned according to my invention; and Figs. 5 and 6 are typical cross sec-tions of Fig. 4, illustrating different modes of forming columns. Fig. 7 is a typical cross section for instance on the line 7-7 Fig. 2, 10 illustrating the uneven contour of the bottom of the footing. Fig. 8 is a typical similar cross section taken for instance on the line 8-8 Fig. 2, illustrating the applica-tion of applicant's invention.

According to my invention a supporting member A is forced through the earth trans-15 versely of the wall and immediately below the base portion thereof and is then cleaned out so as to remove the earth therefrom. 20 At the same time the earth is removed up to the bottom or base of the wall. The base of the wall is preferably cleaned of adhering dirt, etc., and in the space within the beam A and up to the bottom of the founda-25 tion or base part of the wall liquid grout, concrete or the like is inserted in such manner as that it shall flow into and completely fill the space and thereby establish and form a durable connection between the said beam 30 A and the bottom of the wall, whereby the weight of the wall is uniformly and evenly borne in part by the said beam A. The said beam A may well be inserted in place, as in-dicated in Fig. 1, wherein space having been 35 provided, by excavation if necessary, at one side of the wall the beam is located in position at one side of and lower than the foundation or base portion B of the wall and is then pushed to place by a hydraulic

40 or other jack C which reacts against an abutment D so as to force the beam trans-versely of the wall. The said supporting member A is preferably in the form of a hollow beam having an open top, and for 45 this purpose I have heretofore preferred to employ I-beams  $a a^1$ , of which a pair is preferably employed, and more than two if desired, to each supporting member. The number of I-beams employed for each sup-50 porting member will depend upon the ulti-mate strength required in the said member. I prefer I-beams because their flanges provide a desirable means whereby the weight is transferred from the wall to the support-55 ing member or beam A. Other flanged beams might serve such as channel or angle beams. The said supporting member A is open at the top for the reason that it occasionally is found that the base portions or 60 foundations B of building walls are very rough and irregular. They may be of rough and irregularly laid concrete or rubble, boulders, cut-stone, or what-not. Little

or no attention is usually paid to having

fore, it will be perceived that if the supporting member A were inserted beneath the foundation or base portion B of the wall and made contact therewith at only possibly one point, that when the said support- 70 ing member A were fulfilling its function of transferring the weight of the wall to the underpinning there would be grave danger of rupturing the wall or bending the supporting member. This danger is obviated by 75 my present invention.

In Fig. 7 there is illustrated a typical cross section of a foundation of a building or other structure wherein an I-beam A has been driven transversely beneath the foot- 80 ing for the purpose of transferring the weight to underpinning columns H. Here it is seen that the uneven contour at the bottom of the footing B results in the existence of spaces S between the top of the 85 I-beam A and the said footing B.  $\mathbf{This}$ causes a concentration of the weight on one or two points of the footing which is extremely undesirable. It may be that such weight is concentrated at one point of the 90 footing if the footing engages the I-beam at only one point, as would be the case if a footing at one point only projected consid-erably below the common plane.

In Fig. 8 I have illustrated the manner in 95 which my invention overcomes the evil results of such conditions. Here the I-beam A is shown in dotted lines and grout or concrete S<sup>1</sup> is inserted between the top flange of the I-beam and the bottom of the footing B, 100 thereby causing a uniform and continuous connection between the I-beam and the footing at all points.

My invention is equally applicable to the underpinning of a continuous wall, as illus- 105 trated in Figs. 1, 2 and 3, where the wall E has foundations B which it will be seen are irregular at the bottom. The said invention may likewise be employed in underpinning a wall as illustrated in Figs. 4, 5 and 6, 110 wherein the building wall, which has been omitted for economy of space, is supported upon isolated piers F, each of which has its independent foundation or footing B. In said figures these footings have been bonded 115 together, according to the invention of my Patent Re-issue No. 13,610, to provide a unitary and extended footing G. The in-vention is only illustrated in connection therewith to show that it is capable of greatly 120 extending the usefulness of the said inven-tion and that it is particularly applicable thereto, and as illustrating one manner in which it may be used to underpin a wall supported on piers. 125

My invention is intended to transfer the weight of the wall to underpinning columns and accordingly I have illustrated several ways in which said columns may be constructed. Such columns may take the form 130

65 them of even contour at the bottom. There-

of concrete piers H constructed in pits, as illustrated in Figs. 2 and 3. In this case I prefer to locate the said pits a suitable distance away from the footings B and the 5 supporting member A may be made longer

- so as to rest upon the said columns. Shims and wedges or other suitable means may be employed to transfer the weight to the columns H. In case sectional cylinders are 10 employed to form the underpinning columns,
- they will preferably be driven into the earth directly beneath the footings so that they may be forced down by the use of the weight of the structure being underpinned exerted
- 15 through some instrumentality, as through a hydraulic or other jack, for this purpose. This may well be done in accordance with the method of the Breuchaud Patent No. 563,130, dated June 30, 1896. Such columns
- 20 are illustrated in Figs. 5 and 6. In Fig. 5 the underpinning columns J, J are sectional cylinders which have been forced into the earth by means of a jack reacting against the footing G and employing the weight
- 25 of the wall as resistance to force the cylinders J, J into the earth. In said figure the pits in which the columns J have been forced into the earth are illustrated as filled with concrete J' which forms a pressure resisting 30 connection between the cylinders and the
- supporting member A and shims I are driven between the transverse supporting member A and the concrete connection J to cause the weight of the wall to be borne
- 35 by the column. If desired the underpinning cylinders may have upper sections K, as in Fig. 6, which extend substantially up to the supporting member A and are directly connected thereto by shims.
- I have found it desirable in some cases to 40 inclose the supporting member A in con-crete or the like, and accordingly I have illustrated in the several figures the removal of the soil on each side of the said support-
- 45 ing member. This enables me to fill the space thus formed with grout or the like at the same time that the beam A is filled and thereby I am enabled to surround the said beam A with the protecting grout which desirably increases the area of the support-
- 50 ing member. This may safely be done, because I preferably form the columns, whether the same consist of the columns H or of the underpinning cylinders J before driving the
- 55 supporting beams A and therefore, in case columns H have been located, the supporting beams A may after they have been driven be connected to the said columns so as to be supported thereby before the earth
- 60 outside of said beams is excavated and thereby additional support will be provided and enable the excavation to be safely made. In case the underpinning cylinders are employed the same will be preferably connected

is employed, so as to temporarily support the same before the supporting members are driven or the additional excavation on each side thereof is made.

I do not regard my invention as neces-70 sarily limited to the kind of wall being underpinned or to the kind of columns employed in connection therewith or the number of beams employed in each supporting member, as said wall may be of any kind 75 and the underpinning columns may, if, employed, be of any desired construction and may in some instances be entirely omitted and the number of beams may be varied for different cases according to circumstances. 80 These and other modifications may be made within the limits of the appended claims.

What I claim is:

1. The method of underpinning buildings or other structures, which consists in forcing 85 a supporting member having side walls and open at the top through the earth transversely of, and closely adjacent to, the base portion of said building or other structure, in cleaning out the earth from said support- 90 ing member and up to the underside of said base portion, and filling the spaces between the top of said supporting member and the underside of said base portion and the space between the side walls of said supporting 95 member with grout or the like.

2. The method of underpinning buildings or other structures, which consists in locating an underpinning column in the earth adjacent the structure to be underpinned, in 100 forcing a supporting member having side walls and open at the top through the earth transversely of the foundation of said building or other structure and closely adjacent the base portion thereof, in cleaning out the 105 earth from said supporting member and up to the base of the said foundation, and filling the spaces between the top of said supporting member and the underside of said base portion and the space between the side walls 110 of said supporting member with grout or the like, and in interposing a pressure resisting connection between the said column and said supporting member.

3. The method of underpinning buildings 115 or other structures, which consists in locating an underpinning column in the earth adjacent the structure to be underpinned, in then temporarily supporting said structure upon said column, in forcing a supporting 120 member having side walls and open at the top through the earth transversely of the foundation of said building or other structure, and closely adjacent the base portion thereof, in cleaning out the earth from said 125 supporting member and up to the base of the said foundation, and filling the spaces between the top of said supporting member and the underside of said base portion and 65 up to the footing G, if this style of footing | the space between the side walls of said sup- 130

porting member with grout or the like, and in interposing a pressure resisting connection between the said column and said supporting member.

4. The method of underpinning a building 5 or other structure, which consists in forcing a pair of substantially parallel I-beams through the earth transversely of the foundation of said building or other structure 10 and closely adjacent the base portion thereof, in cleaning out the earth between said Ibeams and up to the base of the said foundation and filling the spaces between the top of said I-beams and the underside of said base 15 portion and the space between the side walls of said I-beams with grout or the like.

5. The method of underpinning a building or other structure, which consists in forcing a pair of substantially parallel I - beams 20 through the earth transversely of the foundation of said building or other structure, and closely adjacent the base portion thereof, in cleaning out the earth between said Ibeams and up to the base of the said founda-25 tion and filling the spaces between the top of said I-beams and the underside of said base portion and the space between the side walls of said I-beams with grout or the like, and in connecting the said beams to supporting 30 columns.

6. An underpinning for buildings or the like, comprising a supporting beam having side walls and open at the top located beneath the base portion of the foundation 35 thereof, and a filling of grout or the like in said beam and extending to the base of the said foundation and filling the spaces be-tween the top of said beam and the underside of said foundation, whereby an even and 40 uniform connection between the said beam and base portion of the foundation is provided, an underpinning column located in the earth and a pressure resisting connection between the said column and said supporting 45 beam.

7. An underpinning for buildings or the like, comprising I-beams located trans-versely of the foundation thereof and closely adjacent the base portion of said 50 foundation, a filling of grout or the like be-

tween the said I-beams and extending to the base of the said foundation and filling the spaces between the top of said beam and the underside of said foundation, where-55 by a uniform and continuous connection is

provided between the said I-beams and the base of said foundation, an underpinning column located in the earth and a pressure resisting connection between the said col-60 umn and said I-beams.

8. The method of underpinning a building or other structure, which consists in forcing a flanged beam transversely of the foundation thereof and closely adjacent the 65 base portion of said foundation, in remov-

ing the earth at the sides of said beam and between the beam and the base of the foundation and filling the space thus formed with concrete or the like whereby an even and uniform connection is made between 70 said beam and the said foundation.

9. The method of underpinning buildings or other structures, which consists in locating an underpinning column in the earth adjacent the structure to be underpinned, in 75 then temporarily supporting said structure upon said column, in forcing a flanged beam transversely of the foundation of said building or other structure and closely adjacent the base portion thereof, in removing the 80 earth at the sides of said beam and between the beam and the base of the said foundation and filling the spaces between the top of said flanged beam and the under side of said base portion and the spaces at the sides of 85 said beam with concrete or the like whereby an even and uniform connection is made between said beam and the underside of said foundation, and in connecting the said beam to said column.

10. The method of underpinning buildings or other structures, which consists in locating an underpinning column in the earth adjacent the structure to be underpinned, in forcing a flanged beam trans- 95 versely of the foundation of said building or other structure and closely adjacent the base portion thereof, in removing the earth between the top of the beam and the base portion of the said foundation, and filling the 100 space thus formed with grout or the like, whereby an even and uniform connection between the wall and said beam is formed and connecting said beam to said underpinning column. 105

11. A support for buildings or other structures comprising a flanged beam located in the earth transversely of the foundation of said structure, and a filling of grout or the like between the upper side of 110 said beam and the underside of said foundation, whereby an even and uniform connec-tion between the wall and said beam is formed.

12. A support for buildings or other struc- 115 tures comprising a flanged beam located in the earth transversely of the foundation of said structure, and a filling of grout or the like between the upper side of said beam and the underside of said foundation where- 120 by an even and uniform connection between the wall and said beam is formed, underpinning columns located in the earth adjacent the ends of said beams, and connections between said beam and said columns. 125

13. The method of underpinning buildings or other structures, which consists in forcing a flanged beam transversely of the foundation of said building or other structure and closely adjacent the base portion 130

90

thereof, in removing the earth between the top of the beam and the base portion of the said foundation, and filling the space thus formed with grout or the like, whereby an 5 even and uniform connection between the set of the beam and the base portion of the scribing witnesses. JOHN B. GOLDSBOROUGH. Witnesses: wall and said beam is formed.

In witness whereof, I have hereunto

GEORGE MILLER, JOSEPH F. SHWEDO.

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