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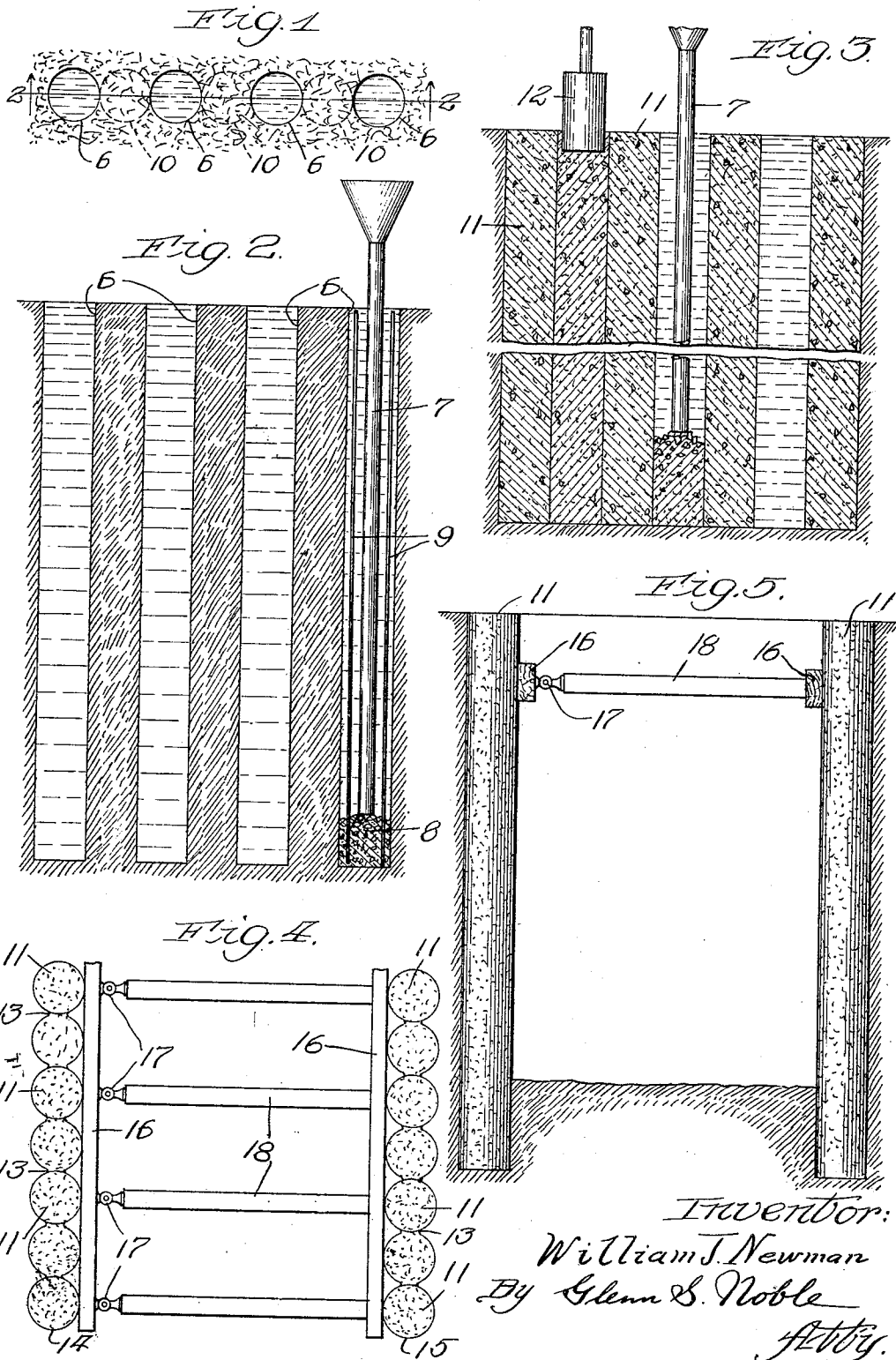
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METHOD OF MAKING A RETAINING WALL

Filed Aug. 4, 1930

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Fig. 6.

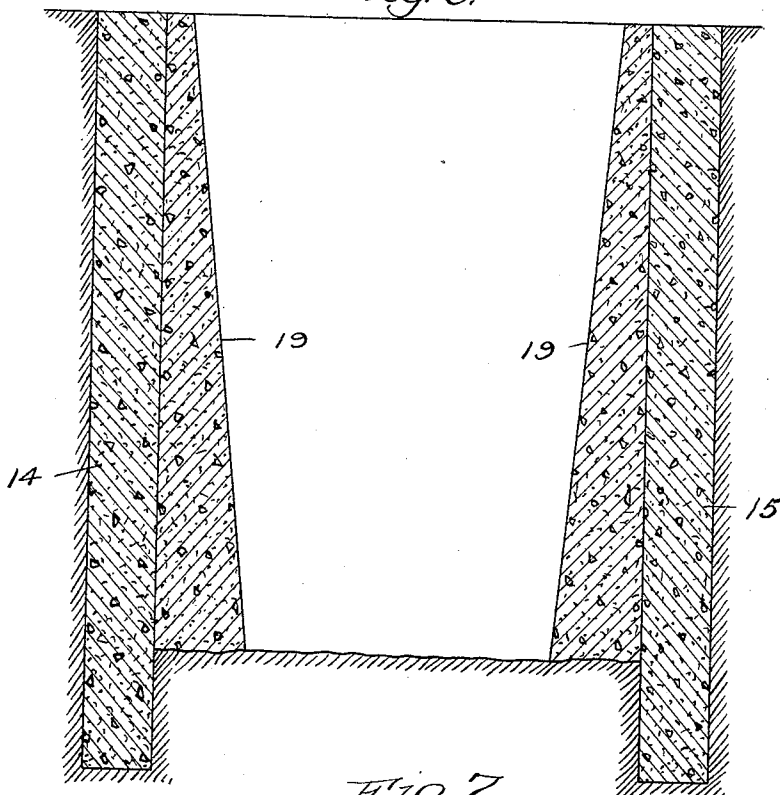
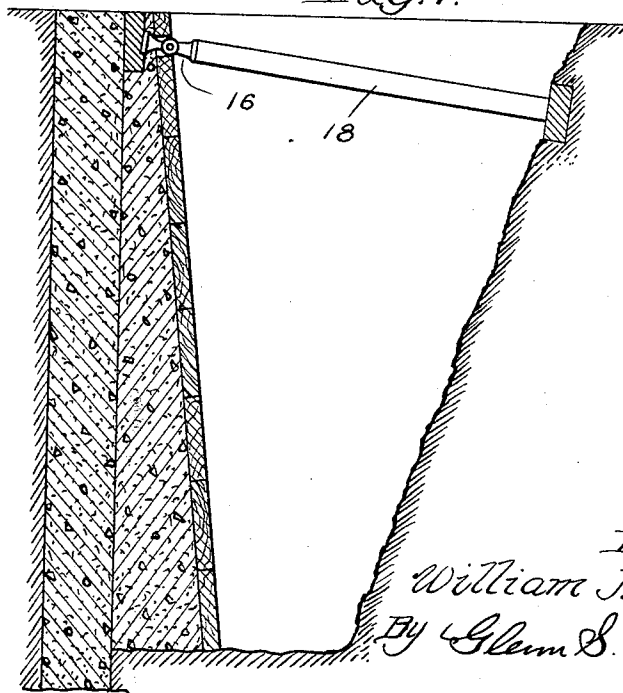


Fig. 7.



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METHOD OF MAKING A RETAINING WALL

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This invention or discovery relates to underground construction work and more particularly to methods of drilling and excavating and to the formation of retaining walls. It is particularly adapted for use in making retaining walls adjacent to buildings or foundations which would ordinarily require supporting or shoring but which will ordinarily require no additional support when adjacent walls are formed in accordance with this method. It is also adapted for use in building retaining walls where water is apt to be encountered in drilling or excavating and will be particularly effective for making retaining walls for subways or the like.

The objects of this invention are to provide an improved retaining wall and a novel method of making the same; to provide a method of making a wall by forming alternate sections and then filling in between the sections; to provide a method for forming a wall underground in which the trench or excavation is made by digging or drilling a plurality of holes which are then filled with concrete; to provide an improved method for forming retaining walls and constructing a subway, basement or the like; and to provide such other improvements in construction and advantages as will appear more fully from the following description.

In the accompanying drawings illustrating this invention;

Fig. 1 is a plan view showing the first row of holes which are spaced apart or arranged intermittently;

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1 and showing the filling of one of the holes with concrete;

Fig. 3 is a sectional view similar to Fig. 2, illustrating the next step of filling the intermediate holes which have been drilled or dug between the posts or columns formed in the first named holes;

Fig. 4 is a plan view showing one method of placing bracing between two parallel walls or two series of columns formed as above shown;

Fig. 5 is a vertical sectional view indicating the partly completed retaining walls.

Fig. 6 is a sectional view of an excavation with completed retaining walls; and Fig. 7 is a sectional view showing the method of shoring when a single wall is to be built.

It will be understood that these drawings are more or less diagrammatic and are not intended to illustrate all of the details incident to the carrying out of the method but should be sufficient for anyone familiar with this work to perform the same.

The first stage of operation as illustrated in Fig. 1, consists in the boring or drilling of a series of holes or wells 6, preferably of the same diameter and spaced apart a distance of approximately equal to the diameter thereof. These holes or wells are preferably made under water pressure, that is, each well is kept full of water during the entire drilling or boring operation. By maintaining the pressure in this manner the wells are not apt to cave in and there will ordinarily be little or no settling of the adjacent ground so that it will not be necessary to brace or protect any adjacent buildings or structures. One well may be bored and filled and then the next succeeding well bored and filled through the series, or if conditions are suitable, the whole series may be bored and then filled.

The holes are filled with concrete by placing a tube or pipe 7 in the hole, which extends to the bottom and then depositing the concrete through this tube, raising the tube as the hole fills up. As shown in Fig. 2, the concrete 8, as it is deposited in the hole gradually forces the water or liquid contents upwardly and out of the hole until the hole is filled. If desired, any suitable reinforcements such as steel rods 9 may be placed in position for reinforcing the concrete in any well-known manner.

When the series of holes 6 has been filled with concrete, another series of holes as indicated at 10 is made between the holes of the first series. These holes are made as large as possible and preferably so that they will be tangential to or in contact with the columns or pillars 11 formed in the first named series. These holes are also preferred.

ably bored under water pressure, that is, by leaving water or liquid sludge or the like, in the holes as the boring progresses, the same as described in connection with the boring of the first named series. These holes are then filled with concrete which is deposited under the water or liquid through a tube 7 as shown in Fig. 3 and the water or liquid gradually forced out at the top. As soon as the hole has been substantially filled with concrete, the concrete is subjected to the action of a tamper or weight 12 of any suitable kind, which is adapted to press or pound the concrete down into the hole and to force the same outwardly against the sides and particularly to force the same against the surfaces of the adjacent columns. During this tamping or pressing action the concrete in one of the intermediate holes 10 will be forced against or spread around a portion of the outer periphery of the adjacent columns 11 as shown at 13 in Fig. 4. This tamping is preferably done by means of a pile driver or other suitable apparatus which will provide sufficient force to drive the concrete into any voids in the sides of the wells or which may exist between the columns or first set of holes and the respective holes of the second series. This forms a substantially continuous wall which is adapted to support the adjacent earth in a manner similar to sheathing or in some cases may serve as a complete retaining wall. A wall of this character made in accordance with my improved method is particularly adapted to be made through clay, quicksand, sand and water or where the conditions are difficult for digging and making a wall in the usual manner. While the above described method of boring or drilling alternate holes in the series, filling them with concrete and allowing the concrete to set before drilling the intermediate holes is adapted for use in some instances, I have found from actual construction that if the third hole of the series is drilled before the concrete in the first hole is set, the concrete may tend to break through the intervening wall of earth thereby greatly interfering with the operation. It may therefore be advisable in order to expedite the work to vary this order of operation. For instance, instead of drilling and filling the first hole, as indicated in Figure 1, and then the third hole, I have found that it may be advisable to drill the first hole and then skip two or more spaces before drilling the next succeeding hole. This is advisable as the work on the second hole may proceed without waiting for the concrete in the first hole to set. After the first holes consisting of the first, fourth, seventh, etc. in a series, for instance, have been drilled and filled, then the next succeeding holes, two, five, eight, etc. may be

drilled and filled and then the final set consisting of the holes three, six, nine, etc. thus completing the wall in an expeditious manner without any delays incident to waiting for the concrete to set.

In building a subway, basement, or the like, two parallel or opposed walls 14 and 15 may be made as shown in Fig. 4 and bracing placed between these walls to support the same while the earth or material is being excavated therebetween. As shown in this figure, beams or walers 16 are placed along the columns forming the walls 14 and 15 and these are pressed against the walls by means of jack screws 17 and drums or braces 18 thereby providing suitable shoring for holding the walls until the material between the same is excavated, for instance, as indicated in Fig. 5. Of course, any number of shoring devices may be used and if necessary additional shoring put in position as the excavating proceeds.

If a single wall is to be built the shoring may extend to the opposite face of the ditch or excavation as shown in Figure 7 instead of engaging with another set of columns. When the excavation is completed any desired forms may be placed in position inside of the row or columns and the walls can be completed as indicated at 19 in Fig. 6, which shows an additional facing or bracing wall which may be made sufficiently thick, and properly battered or tapered to withstand the pressure after the shoring has been removed. It will be noted, that by means of this improved method, walls may be formed along the sides of a street without injuring or interfering with the adjacent buildings and the material then removed from between the walls as for a subway or the like. It will also be noted that this improved method is adapted for building retaining walls of all kinds and therefore I do not wish to be limited to any particular construction or arrangement herein set forth and described except as specified in the following claims in which I claim:

1. The herein described method which consists in making two or more holes in the earth, which are spaced apart, said holes being kept full of water or sludge during the making thereof, then filling said holes by discharging concrete through pipes extending to the bottom of the holes, which pipes are gradually raised as the holes are filled and the water forced out therefrom; then making holes intermediate of the first named holes, said last named holes being substantially tangent to the adjacent holes, then filling the last named holes in the same manner as the first named holes and finally tamping or pressing the concrete in the last named holes before it is set to force the same against the adjacent columns formed in the first named holes.

2. The method of building retaining walls which consists in drilling a series of holes which are spaced apart, filling said holes with concrete, then drilling intermediate
 5 holes between the holes of the first named series, then filling said intermediate holes with concrete and forcing the concrete downwardly to make contact with the adjacent columns, then bracing the wall thus
 10 formed at one side thereof and excavating the earth adjacent to such side and finally constructing a reinforcing abutment wall on the face of the wall.

3. A method of forming a retaining wall
 15 below the surface of the ground which consists in making a series of holes which are spaced apart, filling said holes with concrete and allowing the same to set, then removing the earth from between the columns
 20 of concrete thus formed and then filling such holes with concrete to complete the wall.

4. The herein described method for forming a wall which consists in boring a series
 25 of excavations at intervals substantially equal to the diameter of said excavations, then filling the same with concrete and allowing the same to harden into a series of columns and then boring a second series of
 30 excavations in the intervals between the first series of columns and then filling the same with concrete and allowing the same to harden to complete the wall structure.

5. The method of forming a wall structure which consists in forming a series of excavations at intervals substantially equal to
 35 multiples of the diameter of said excavations, then filling the same with concrete and allowing the same to harden into a series of columns, then boring another series
 40 of excavations in the intervals between the first series of columns and contiguous to said columns, filling the same with concrete and allowing the same to harden and continuing such operations until all of the intervals be-
 45 tween the first-named columns have been filled to complete the wall structure.

6. The method of forming a wall structure which consists in making a plurality of holes in the earth which are spaced apart,
 50 then filling said holes with concrete and allowing the same to set, then making holes between said concrete-filled holes whereby substantially all of the material is removed from between adjacent concrete-filled holes
 55 and finally filling the intermediate holes with concrete.

7. The method of forming a trench or well with side walls which consist in making
 60 walls on either side thereof by forming a series of excavations at intervals substantially equal to multiples of the diameter of said excavations, then filling the same with concrete and allowing the same to harden into a series of columns, then forming an-
 65 other series of excavations in the intervals

between the first series of columns and contiguous to said columns, filling the same with concrete and allowing the same to harden and continuing such operations until the intervals between the columns have been
 70 filled to complete the wall structure, then placing braces between the upper portions of the opposite walls and finally excavating the material from between the walls.

8. The method of building a subway structure or the like which consists in drilling
 75 a series of holes on either side of the structure at intervals substantially equal to multiples of the diameter of said holes, then filling the same with concrete and allowing it to harden into a series of columns,
 80 and then boring other holes in the intervals between the first series of columns and contiguous to said columns, filling the same with concrete and allowing it to harden and continuing such operations until all of the
 85 intervals between the first-named columns have been filled, then applying transverse bracing between the opposed faces of the columns on either side of said subway, then
 90 excavating the earth to the desired depth, and finally constructing reinforcing facings on the inner sides of the first-described walls.

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