No. 877,008. PATENTED JAN. 21, 1908.

F. W. SKINNER.

SHEET METAL PILING.

APPLICATION FILED AUG. 12, 1905. 2 SHEETS—SHEET 1.

Fig. 1.

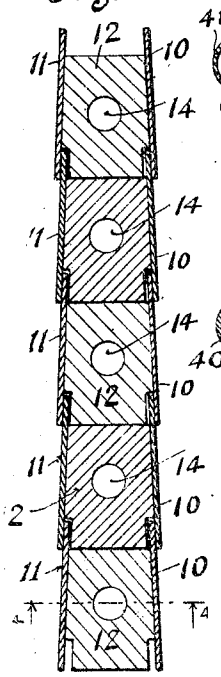


Fig. 8.

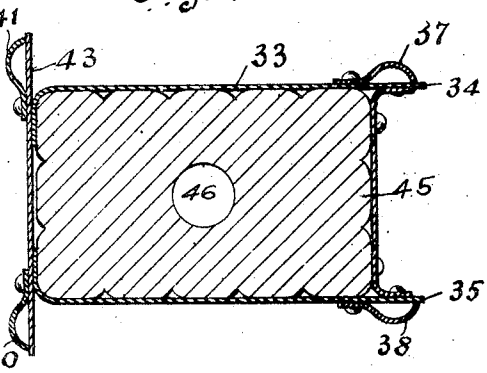


Fig. 3.

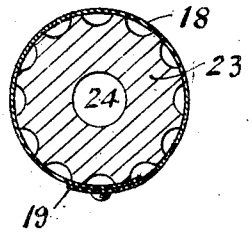


Fig. 6.

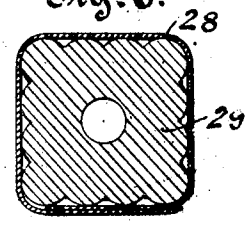


Fig. 2.

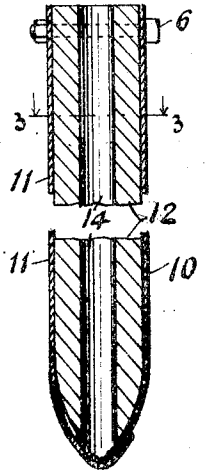


Fig. 4.

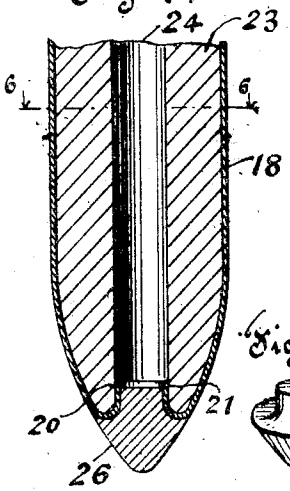
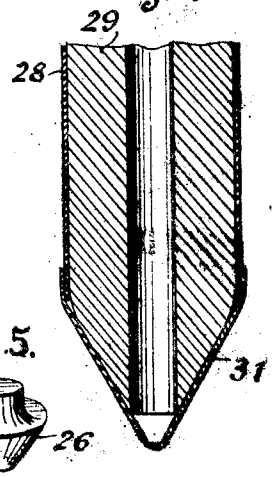


Fig. 5.



Fig. 7.



WITNESSES:

Charles Hammann

Henry Hoelbas

INVENTOR

Frank W. Skinner

BY Walter Brown

No. 877,008. PATENTED JAN. 21, 1908.

F. W. SKINNE

SHEET METAL PI. ING.

APPLICATION FILED AUG 2, 1905. 2 SHEETS—SHEET 2.

Fig. 12.

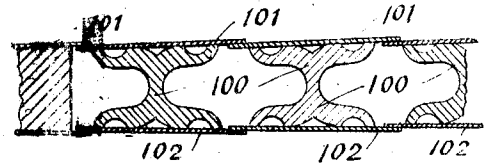


Fig. 9.

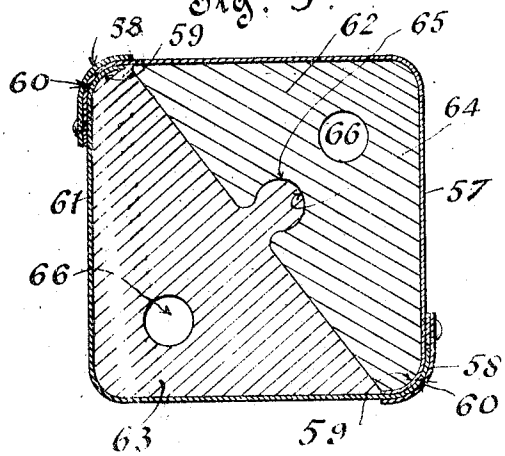


Fig. 10.

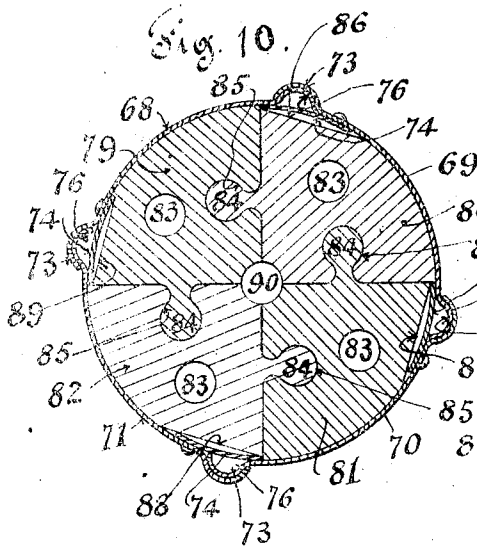
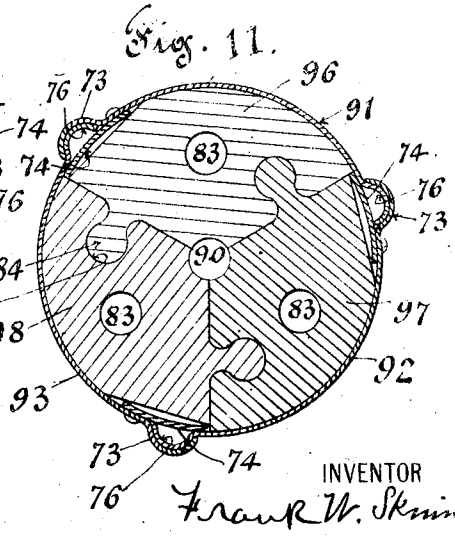


Fig. 11.



WITNESSES:

Charles Hanimann

Henry Hale Dow

INVENTOR

Frank W. Skinner

BY

Walter Brown

HIS ATTORNEY

UNITED STATES PATENT OFFICE.

FRANK W. SKINNER, OF NEW YORK, N. Y.

SHEET-METAL PILING.

No. 877,008. Specification of Letters Patent. Patented Jan. 21, 1908.

Application filed August 12, 1905. Serial No. 273,910.

To all whom it may concern:

Be it known that I, FRANK W. SKINNER, a citizen of the United States of America, and a resident of New Brighton, borough of Richmond, city of New York, State of New York, have invented certain new and useful Improvements in Sheet-Metal Piling, of which the following is a specification.

This invention relates to improvements in sheet metal piling, and particularly to "cellular piling", that is piling wherein two or more sheets or sections are placed adjacent to each other so as to leave a space which may be filled if desired with water, concrete, grout, clay or any other suitable material, and said structure may either consist of a plurality of adjacent sections which do not entirely inclose a space, or of walls or sections which do entirely inclose a space, as a hollow pile. In the former case a double row of piles may be driven on the required center line in pairs, and with or without lock joints, as conditions render preferable. If the sheet piling is not stiff enough to drive without backing, then it will be driven with spacing blocks, driving bars or cores, or both, between. After they are driven the blocks, bars or cores are successively removed and the space thus vacated is filled with concrete, puddle or other material, after which the sheet piles may be left in position or may be removed. Under some conditions it will suffice to drive plain flat plates without vertical locked joints, and these or other forms of sheet piles may be bent at the bottom so as to form, if desirable, a horizontal or inclined floor to the space between the rows of sheet piles. The cores or driving bars may be of any shape and have a square, pointed or beveled lower end, and may be made to conform to the surfaces of the sheet piles or in contact with them, and I may provide the peripheries of said cores or driving bars with grooves or ribs to decrease frictional surface and facilitate their withdrawal. If the piles are thin, the external pressure on them may tend to cause their collapse, distortion or displacement after the removal of the cores or driving bars, and to prevent this I provide a counter pressure by injecting water or any other material, as grout, etc., into the bottom of the space and filling it as fast as the core is withdrawn. In the case of the first pile driven this liquid may be injected through a longitudinal hole in the core, in other cases, if the space adjacent to this core has already been filled, it will only be necessary to fill more water into such space from the top, and it will of course fill the cavity beneath the core as fast as the core is withdrawn. Afterwards, at convenience, concrete is deposited in the space, displacing the water or other liquid, and forming, when set a continuous coffer dam or wall which may be easily reinforced with any desired system of steel bars or other strengthening device put in place before the concrete has set. After the concrete has set the piles which formed the mold may be removed, if conditions favor removal, or may be left in place if that is preferable.

The invention is as applicable as above stated to the case where the piles form a closed cell, as to that where they form parallel lines not necessarily connected by cross piles, and the drawings accordingly illustrate both arrangements, and show several of the constructions embodying the invention, which may be built as circumstances require; and it will be evident that the numerous other constructions may be adapted which equally embody that essential invention, those illustrated being selected from many, as useful examples.

The units of piling may be connected together by the spring locks, which are described and claimed in my other application for Letters Patent, filed in the United States Patent Office, Serial Number 272,465, and in the case of large piles both the shell and the core may be made in sections to facilitate driving.

Referring to the drawings which accompany the specification, Figure 1 is a horizontal and Fig. 2 a vertical section of a double wall of sheet piling with removable cores. Fig. 3 is a horizontal and Fig. 4 a broken vertical section of a round hollow pile with a removable core having ribbed or grooved periphery and a filling orifice, and Fig. 5 is a plug for closing the lower end of the pile. Fig. 6 is a horizontal and Fig. 7 a broken vertical section of a similar pile, but with substantially square form. Fig. 8 is a horizontal section of a rectangular pile provided with a similar core and with lock joints for connection with other piles. Figs. 9, 10 and 11 illustrate various sectional piles and cores, showing constructions which are especially adapted to large piles: Fig. 9 showing a substantially square pile constructed of two

sections with spring lock joints and a core in two parts; Fig. 10 a round pile constructed with four sections united by spring lock joints and a core in four parts; and Fig. 11 a round pile constructed with three sections united by spring locked joints and a core in three parts. Fig. 12 is a horizontal section illustrating the use of spacing blocks to support the piles after withdrawal of the cores.

In Figs. 1 and 2 are shown two substantially parallel lines 10, 11 of sheet piles, stiffened and spaced apart by rigid cores 12. The piling is shown as constructed with lap joints, the cores 12 being recessed for the inner-lapping ends of the sheet piles, and as clearly indicated, and said cores 12 also being provided with longitudinal filling orifices 14. While the peripheries of said cores 12 are shown flat in the drawings, they may be grooved like the core shown in other figures to reduce frictional surface, and will usually be greased to further facilitate their withdrawal. Said cores 12 will usually be withdrawn as each unit is driven. As the core is gradually withdrawn the vacant space beneath will be filled with water or other suitable material admitted through said filling orifice 14, or from the adjacent space, to resist external pressures, which might collapse the piling if the said space were left unfilled. After the said cores have been withdrawn, the said spaces may be filled with concrete, grout, puddle, or any other suitable material and I can manifestly form the sheet piling 10, 11 without the bent up or contracted lower ends, but with straight or slightly outwardly flaring sides so as to be capable of withdrawal after the concrete filling has set. Thereby withdrawing said sheet piles I leave in the ground concrete piles without metal shells.

Figs. 3 and 4 illustrate a circular pile with one-piece perforated cores ribbed or grooved to diminish surface friction. The pile 18 in one-piece may have a riveted lap joint 19 as shown, or the joint can be made in any other suitable manner, and the pile is represented as contracted at the lower end and there provided with bent up internal flanges 20, 21 forming spaces to receive the annular lower end of the core 23. A plug 26 may be employed to close the lower end of the filling orifice 24. The manner of using and withdrawing the core temporarily filling the pile with water and then with a final filler, will be plain from the foregoing description of the piling illustrated in Figs. 1 and 2.

The square pile of Figs. 6 and 7 has a shell 28 in one-piece with lap joint, and a one piece perforated core 29, but the lower end of the pile is formed with a jointed sheet metal cap 31, fitting the end of the said core. The manner of using this pile will be evident from the description of other figures herein contained.

Fig. 8 illustrates a pile provided with one form of my spring lock joint,—viz my single spring lock—for connection with other piles or structures. Two of the lock joints are illustrated as constructed by riveting near the projecting ends 34, 35 of the sheet pile 33, the resilient curved plates 37, 38, thereby forming one form of the locks described and claimed in my said application, Serial Number 272,465.

Two other similar locks are formed by riveting curved plates, 40, 41, to their respective ends of the plate 43, which plate is riveted to one side of the said pile 33; of course I may provide more or less than four lock joints on the pile, and other forms of the locks shown in my said application, Serial Number 272,465 might be employed. Since the manner of constructing and using the said spring lock joints are fully set forth in my said application and said joints are not specifically a part of the present invention, I do not herein further describe them. The core 45 is provided with the filling orifice 46, and has a ribbed or grooved periphery to diminish friction when withdrawing said core.

Fig. 9 shows a substantially square pile having a sectional sheet metal shell composed of two pieces, 57, 61 respectively united by double spring friction lock joints, each of which consists of the curved female members 58, 59, with which interlock the curved male members 60. The core is shown in two sections 62, 63 united by the longitudinal dovetails and grooves 64, 65, and each section may be provided with a filling orifice 66. The peripheries of said sections 62, 63 may be flat as shown, or may be grooved or cut away to diminish friction. After such a pile is driven the sections, which may have been greased, can be drawn up one by one, thus greatly diminishing the power required to withdraw the core. After the core has been withdrawn the pile may be filled with concrete, grout, or any other suitable material, and during the withdrawal of the sections of the core the space thereby left vacant may be filled with water through the orifice 66, in the manner hereinbefore described in connection with the other figures of the drawings.

Fig. 10 illustrates a sectional pile, in which the shell is formed of four pieces 68, 69, 70, 71 respectively, united by single spring lock joints, each composed of the outer and inner female members 73, 74, respectively, and the interlocking male members 76. The core of this pile is also made of four sections 79, 80, 81, 82 respectively, united together by longitudinal dovetails and grooves, 84, 85 respectively. To diminish friction between the core and shell the peripheries of the sections of the core may be cut away at 86, 87, 88, 89 respectively, or may be grooved, or both. Each section of core may be provided with a filling orifice 83, and the inner corner of each

said section may be formed on an arc of a quarter circle, so that when the cores are put together a central filling orifice 90 will be produced.

Fig. 11 shows a pile in general similar to that of Fig. 13, but with the shell and core each composed of three sections, respectively indicated by 91, 92, 93 and by 96, 97, 98. The spring lock joints, dovetails and grooves of the core sections and filling orifices are similar to those of the pile illustrated in Fig. 10.

One section of the shell of a sectional pile, together with its section of the core will be driven at a time, the next section of shell and core being then connected therewith and driven. The sections of the shell will be removably connected to their corresponding core sections in any suitable manner, as by removable bolts at the top, and bent up ends of the shell at the bottom, the construction being clear from description heretofore given of Figs. 1 to 7 inclusive. In some cases, also, where the nature of the ground permits, as in clayey soils, it may be desirable to drive a sectional pile or core without a shell, and to afterward remove the said pile or core, filling the cavity in the ground with concrete, grout or other material for a permanent pile, or column; and in certain other cases it may be desirable to leave said sectional core or pile in the ground to constitute of itself the permanent pile, and I consider my present invention to cover all such cases.

In some cases, it will be well to insert skeleton spacing blocks, 100, between the sheet piles, 101, 102 to support the piling when the cores are withdrawn. The water is then pumped out, and the concrete, grout, or other permanent filling material is then put in, and, as it is, the spacing blocks are gradually raised, being completely withdrawn when the piling is full of the permanent filling material. Or the spacing blocks may be left permanently in position with or without other filling.

Now having described my improvements, I claim as my invention.

1. A unit of piling having a sheet metal shell and a longitudinally perforated rigid removable core within said shell, substantially as described.

2. Piling consisting of a plurality of sections each of which is composed of sheet metal with a removable section of a core, substantially as described.

3. The combination of a hollow shell and a rigid non-expansible sectional core therefor adapted to be driven with said shell and removed after the shell is driven, substantially as described.

4. A pile consisting of a shell composed of sections locks to unite said sections, and a rigid non-expansible removable core, substantially as described.

5. The combination in piling of a sheet metal shell, and a rigid removable non-collapsible core provided with a filling orifice adapted to fill said shell as the core is removed, substantially as described.

6. In piling, the combination of a cellular pile adapted to be permanently left in the ground, and a temporary liquid filling therefor, substantially as described.

7. In piling, the combination of a cellular pile consisting of a shell adapted to be permanently left in the ground, and a temporary filling of grout therefor, substantially as described.

8. The combination of a sheet pile, and a plurality of rigid removable non-expansible driving bars therefor, substantially as described.

9. The combination of a sheet pile, removable rigid non-expansible driving bars therefor, and devices for temporarily connecting the driving bars and the piles, substantially as described.

10. In piling, a sectional core composed of units adapted to be separately driven and withdrawn, substantially as described.

11. In piling, a sectional core composed of interlocking units, substantially as described.

12. A sectional core for piling composed of a plurality of rigid non-expansible units, substantially as described.

13. A sectional core for piling composed of a plurality of units adapted to engage each other with longitudinal sliding joints, substantially as described.

Signed at New York city this 11 day of August, 1905.

FRANK W. SKINNER.

Witnesses:

HENRY H. DE VOS,

HENRY V. BROWN.