Dec. 8, 1936. W. AUSTERMÜHLE 2,063,142

PILE

Filed Aug. 7, 1935

Fig. 1

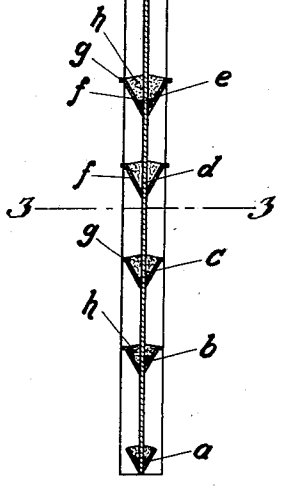


Fig. 2

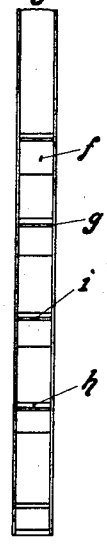


Fig. 3



Fig. 4

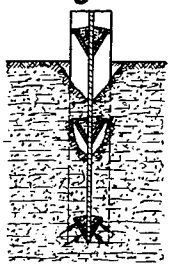


Fig. 5

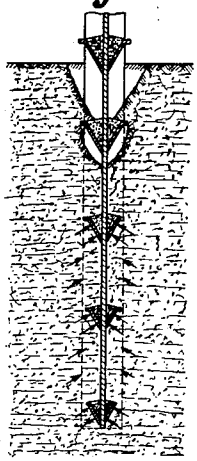
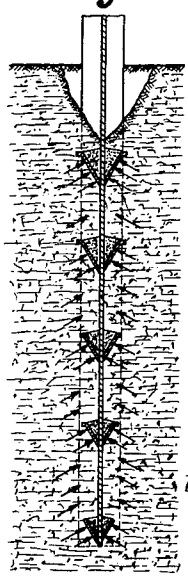


Fig. 6



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2,063,142

PILE

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In Germany April 18, 1931

10 Claims. (Cl. 61—53)

Pile foundations usually consist of piles made of wood or ferro-concrete.

The various kinds of piles used all exhibit many defects, and difficulties are involved with respect to wooden piles for deep foundations, in procuring such piles of great length, while such piles are also more expensive; added to which there is the disadvantage with wooden piles that wood can be used only under water, that is to say only where there is no possibility of rotting. When driving piles through very hard strata it also often happens that the piles are driven in out of the straight, and where the foundations are exceptionally deep wooden piles are out of the question because of their shortness. In such cases it is usual to employ ferro-concrete piles. One objection to piles of ferro-concrete is that they must be of large dimensions, thus involving considerable weight, and necessitating the use of heavy crane and ram apparatus for fixing them in place; another objection is that ferro-concrete piles develop cracks or even break while being transported or driven into position.

With both kinds of pile the supporting capacity increases practically proportionately with the ramming depth.

The present invention has among its objects to avoid the disadvantages mentioned by using iron from which to make the piles.

Iron piles can be procured in any length required for practical work. They can be easily driven in, they do not crack when driven in, and they are the best of all rams for breaking through obstacles; they can be effectively protected against rust, as by the addition of copper, by the application of paint, and so on.

The multi-point pile according to the invention consists principally of an I or double channel beam with wide flanges. Between the flanges metal plates are so oppositely disposed in pairs that each pair of oppositely disposed plates forms a wedge-shaped point, the angle at the wedge-shaped points being any angle that is suitable. Above the lowest point (driven point with solid centre) further points are disposed at equal or unequal distances apart—according to the nature of the strata and the kinds of earth through which the piles are to be driven—in such manner that the wedge-shaped points are provided with progressively larger widths of head in the upward direction for the reception of earth. The hollow cavities at the wedge-shaped points may be filled with concrete or other suitable material. The outer edges of the oppositely disposed plates of metal are flanged to a form adapted to the nature of the earth, so that they assist in taking the earth down. The flanges are formed with grooves so that when the piles enter ground water, the water and the muddy earth can escape upwardly as the pile is driven in.

It will be understood that the wedge-shaped plates can be applied to the outside of the flanges of the beam in a very similar manner, in order thus to be effective all around the pile.

With a pile of the form of construction described there is over a large part of its length but little friction to be overcome in driving it into the ground at the commencement; the driving of the pile thus becomes easy and rapid, and only after the pile has filled the hollow spaces between the series of wedge-shaped metal plates by taking down the earth, and has compressed the earth, does the earth offer greater resistance; the earth is then in a state of compression, and this compression is increased by the further driving in of the pile, in such manner that earth rubs against earth, and the pile in this way reaches a high supporting capacity; for according to the general rules of physics friction is greatest where like substances rub against each other. The earth placed under compression in the spaces between the wedge-shaped metal plates of the pile must thus be valued on a much higher scale with reference to its supporting capacity.

To increase the supporting capacity in loose or compact ground it is possible to supply to the pile, during driving, filling material to assist in the compression of the earth, such as sand, gravel, concrete, cement and the like.

A further advantage of the pile constructed according to the invention is that the pile does not need so thick a layer of earth as compared with a pile of solid cross-section, for passing on its weight to the earth and thus the pile becomes fixed sooner and there is a consequent saving in length of pile. The multi-point pile according to the invention thus has a greater supporting capacity than other piles, where the ramming depth is the same. The pile according to the invention is furthermore much lighter in weight than the ferro-concrete pile.

The pile according to the invention can with great advantage be used for the production of dolphins and the like, apart from foundations where it can be used both as a compression pile and as a tension pile.

By using the iron multi-pile according to the

invention it is possible more easily to overcome the existing structural and financial difficulties that arise.

A pile according to the invention is diagrammatically illustrated in the accompanying drawing in which,

Figure 1 shows the pile in section through the web,

Figure 2 shows the same pile in side elevation viewed towards the web,

Figure 3 is a horizontal section on the line 3—3 of Figure 1, viewed in the downward direction,

Figure 4 shows the pile at the beginning of the ramming, only the lowest point (the driven point) offering resistance,

Figure 5 illustrates the pile at an advanced stage in the driving, where the spaces between the first and second points have filled and the pile commences to become tightly fixed,

Figure 6 shows the pile at the completion of the driving operation where all the spaces between the points have filled, and the single points have taken up the resistance in the ground, and furthermore earth rubs against earth in the intermediate spaces.

Referring to the drawing, *a* is the driven point with solid centre, *b*, *c*, *d* and *e* are the points above the driven point *a* increasing in width in the upward direction, *f* are the oppositely disposed plates, *g* are the flanged plates, *h* is the earth which fills the cavities between the oppositely disposed plates, and *i* are the grooves in the flanges.

I claim:

1. A multi-point metal pile formed from open section rolled metal having wide flanges and comprising a number of wedge-shaped points distributed in spaced relation along the length of the pile, the head width of each wedge-shaped point being greater than that of the wedge-shaped point below it.

2. A multi-point metal pile according to claim 1, having the wedge-shaped points disposed at equal distances apart.

3. A multi-point metal pile according to claim 1, having the wedge-shaped points disposed at unequal distances apart.

4. A multi-point metal pile according to claim 1, wherein the wedge-shaped points of the pile are formed to carry with them from the upper strata into which the pile is driven the earth needed for compressing the sub-soil.

5. A multi-point metal pile according to claim 1, wherein the wedge-shaped points are formed in their upper parts with cavities for the reception of suitable filling material for the increase of the supporting capacity of the pile when used in loose or compact earth.

6. A multi-point metal pile according to claim 1, wherein the wedge-shaped points are formed by oppositely disposed plates of metal positioned on oppositely disposed sides of the pile and forming between them an angle which is divided by the web of the pile.

7. A multi-point metal pile according to claim 1, wherein the wedge-shaped points are formed by oppositely disposed plates of metal positioned on oppositely disposed sides of the pile and flanged outwardly at the upper and outer edges.

8. A multi-point metal pile according to claim 1, wherein the wedge-shaped points are formed by oppositely disposed plates of metal positioned on oppositely disposed sides of the piles and flanged outwardly at the upper and outer edges, with the exception of the lowermost driving point.

9. A multi-point metal pile according to claim 1, wherein the wedge-shaped points are formed by oppositely disposed plates of metal positioned on oppositely disposed sides of the piles and flanged outwardly at the upper and outer edges, the flanged parts of the oppositely disposed plates being provided with passageways for liquid.

10. A multi-point metal pile according to claim 1, wherein the lowermost point is provided with a solid centre.

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