April 7, 1953 G. B. SHIELDS 2,633,713

CAGE FOR USE IN EXCAVATING TRENCHES

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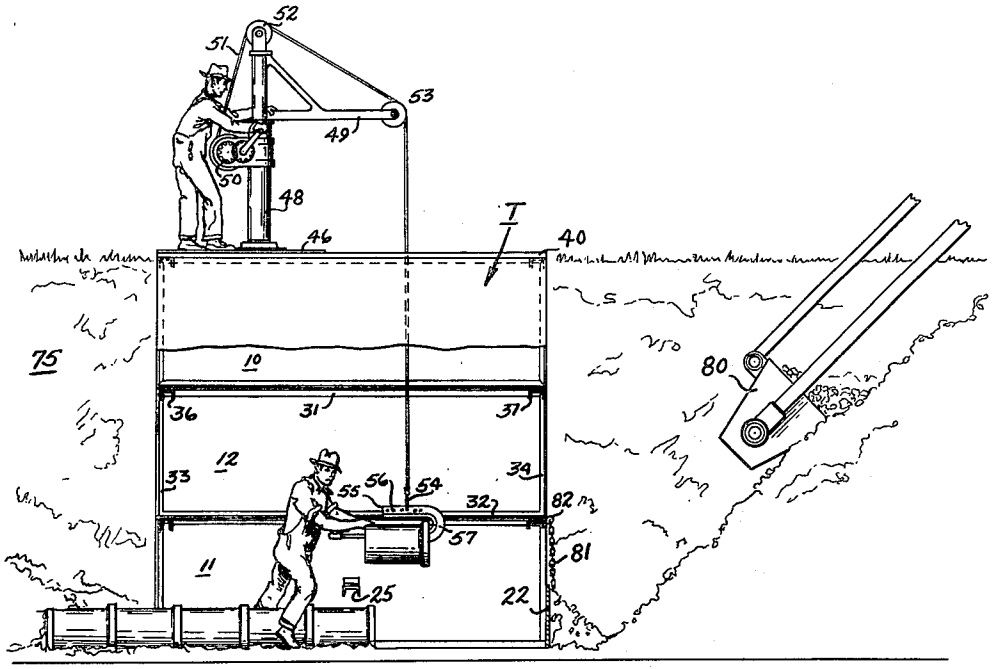


Fig. 1

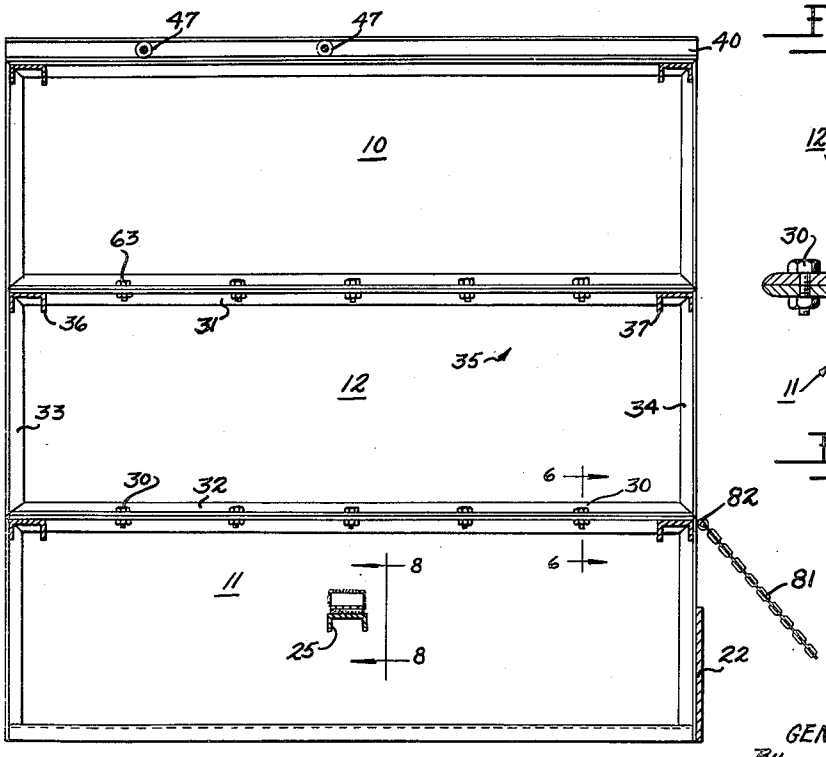


Fig. 2

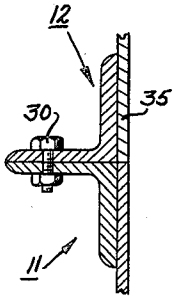


Fig. 6

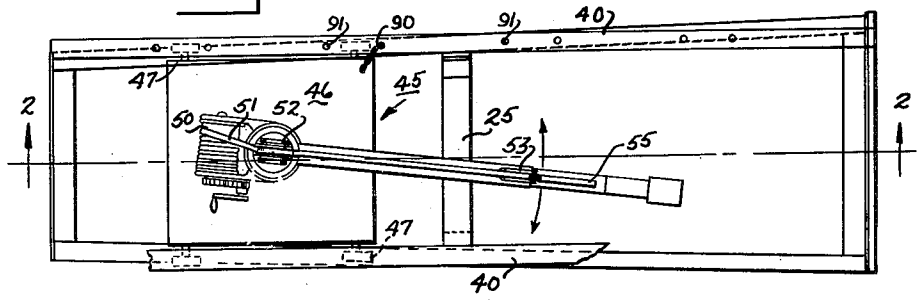
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Fig. 3



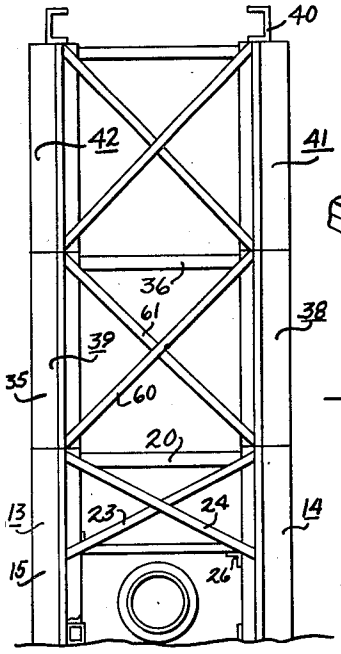


Fig. 4

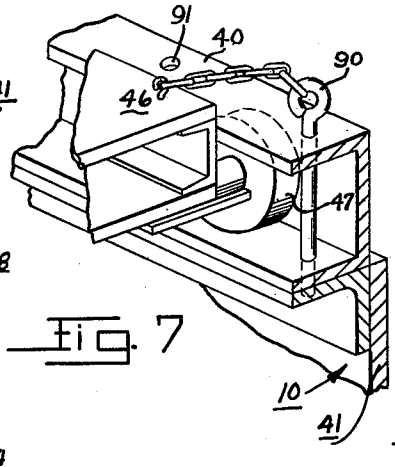


Fig. 7

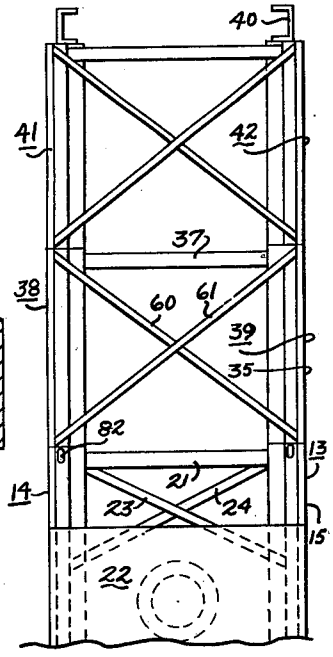


Fig. 5

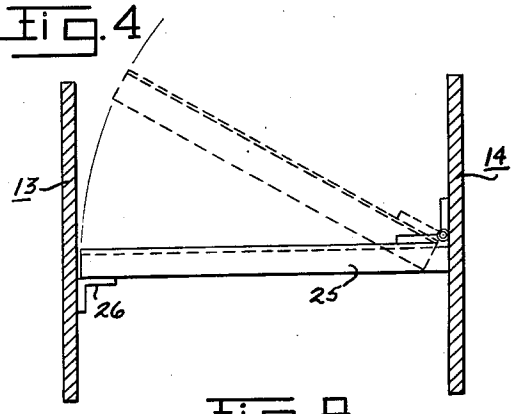


Fig. 8

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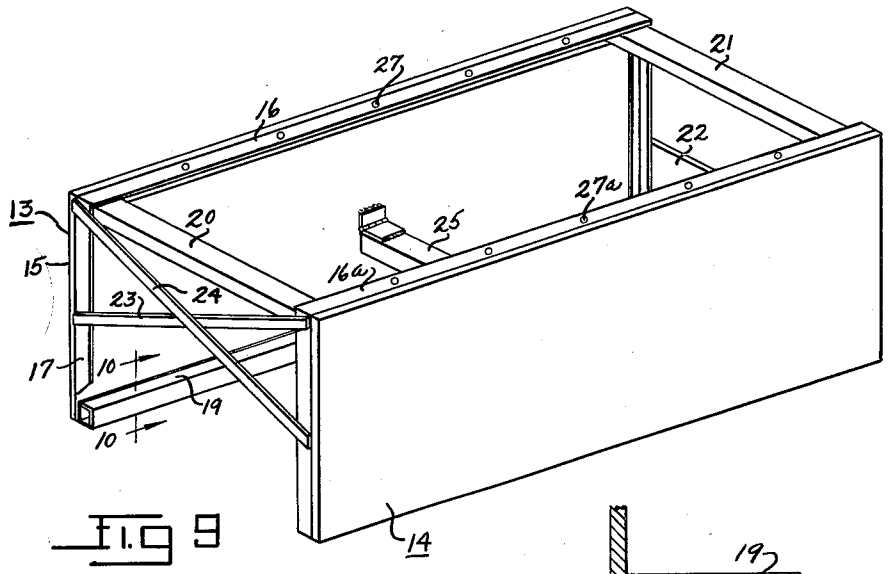


Fig 9

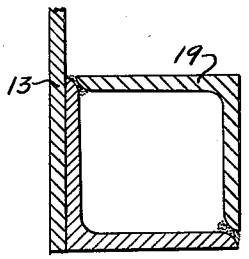


Fig 10

Fig. 11

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CAGE FOR USE IN EXCAVATING TRENCHES

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2 Claims. (Cl. 61—41)

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This invention relates to a trench cage that is adapted to be placed in a narrow trench to prevent the walls of the trench from caving in upon workmen in the trench.

The installation of storm sewer and sanitary sewer lines are requires that a deep trench be excavated, for the reason that the storm sewer line or the sanitary sewer line must be below the drain level of the basement of the deepest building that will use the line.

It is conventional to excavate such trenches to some ten or twelve feet in depth. Naturally, the dirt sidewalls of a narrow trench of a type excavated for sewer lines are rather insecure so that the position of workmen in the bottom of a trench laying the sewer tile is extremely hazardous.

It has been conventional practice, in order to safeguard workmen in deep trenches, to shore the sidewalls of the trench by the use of planking and suitable cross braces. However, the installation of the shoring is, in itself, a hazardous job, since the workmen are working in an unshored trench. Also, the installation of shoring is an expensive procedure, and after the sewer line is laid, the shoring must be removed before the trench can be back filled.

Again, the planks used in shoring trenches have a relatively short life so that this again adds to the expense of laying sewer lines, or any other line that is to be laid in a deep trench.

Normally, narrow trenches, up to some seven or eight feet in depth, do not present any particular problem, but, when trenches reach the depth of ten, twelve or fourteen feet, the dirt sidewalls of the trench are too insecure for safety of workmen in the trench. Thus, it is imperative that some type of support be provided for the wall of the trench, at least in the area in which workmen will be present.

It is, therefore, an object of this invention to provide a steel cage that can be lowered into a trench to prevent cave-ins of the sidewalls and thus safeguard the workmen within the area of the cage.

It is a still further object of this invention that, after the cage is lowered into a trench, the cage be moved along in the trench from one position to another as the laying of the pipe line, or sewer tile, progresses so that the area within which workmen are present will always have the walls of the trench supported, or at least the walls of the trench will be prevented from caving in upon the workmen. In the portion of the trench following the position of the cage,

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that is, in that portion of the trench in which the pipe line, or sewer tile, has been laid, the removal of the cage, or advancement of it in the direction of laying of the pipe line, will remove support from the walls of the trench, and if these unsupported walls should cave in, no trouble will be incurred since the pipe line has already been laid and the workmen are no longer in that portion of the trench.

It is still another object of the invention to provide a cage for use, according to any of the foregoing objects, wherein the cage is constructed in sections so that a cage of any desired height can be built up, depending upon the depth of the trench into which it is placed.

It is still another object of the invention to provide a trench cage for use in accordance with any of the foregoing objects, wherein the cage is so constructed and arranged that it will not wedge between the walls of a narrow trench, and should the walls of the trench cave in against the cage, the cage can be withdrawn from the cave-in section, the cage being tapered from the forward advancing wall toward the rear trailing wall thereof for this purpose.

It is another object of the invention to provide a trench cage incorporating any of the features of the foregoing objects, and wherein the cage supports a winch along the upper edges thereof to permit raising and lowering of pipe sections into the cage.

It is still another object of the invention to provide an improved and safe method of laying pipe line, wherein an excavator is used for excavating a trench of a desired depth and width that is immediately followed by a cage in the freshly excavated trench, in which caged area pipe line can be laid, and wherein excavation of the trench can occur immediately in advancement of the caged area, and as the pipe line is laid within the caged area and the trench is excavated in advance of the caged area, the cage of the caged area can be advanced into the just excavated area for continuous laying of the pipe line with continuous trench excavation.

Further objects and advantages will become apparent from the drawings and the following description.

In the drawings:

Figure 1 illustrates a longitudinal cross section through a trench in which the cage of this invention is placed, and excavation is proceeding simultaneously with pipe line laying to illustrate the method of laying pipe according to this invention;

Figure 2 is a vertical cross sectional view of the cage of this invention taken along line 2—2 of Figure 3;

Figure 3 is a plan view of the cage of this invention;

Figure 4 is an elevational view of the lefthand end of the cage illustrated in Figure 3;

Figure 5 is an end elevational view of the right-hand end of the cage illustrated in Figure 3;

Figure 6 is a cross sectional view taken along line 6—6 of Figure 2, illustrating the manner of attachment between the sections of the cage;

Figure 7 is a perspective elevational view, illustrating the track that carries the winch on one of the cage sections;

Figure 8 is a transverse cross sectional view of the bottom section of the cage, illustrating a removable brace member;

Figure 9 is a perspective elevational view of the bottom section of the cage;

Figure 10 is a cross sectional view taken along line 10—10 of Figure 9;

Figure 11 is an elevational view of a winch for use on the cage, and including a hook for carrying pipe or tile sections into the cage.

The trench cage of this invention consists of a top section 10, a bottom section 11 and any number of intermediate sections 12. In the cage illustrated in Figure 2, each cage section is approximately four feet high and twelve feet long so that the use of one top section, one bottom section and one intermediate section will provide a cage approximately twelve feet high and twelve feet long to take care of average trench depths in laying sewer tile or in laying sewer line. However, any number of intermediate sections 12 can be used to increase the height of the cage to meet any depth condition required.

The bottom section 11 of the sectional cage consists of the sidewalls 13 and 14. Each of the sidewalls comprises a sheet metal plate 15 that is supported along the longitudinal edge by an angle iron member 16 and along the transverse edge by the angle iron member 17. The bottom longitudinal edge of the plate 15 is supported by the box iron structure 19. The various members of the wall 13 are welded together to form a unitary structure. The wall 14 is similarly constructed.

The wall members 13 and 14 of the bottom section are spaced apart in relatively parallel relation a suitable distance by means of channel iron members 20 and 21 placed at each upper corner of the wall sections 13 and 14, as illustrated in Figure 9.

At the forward end of the lower section 11, there is provided a sheet metal plate 22 that prevents dirt in the bottom wall of the trench from rolling into the cage section when it is advanced through the trench.

Cross braces 23 and 24 extend between the opposite walls 13 and 14 to provide strength at this end of the structure. These cross braces are suitably welded to the walls 13 and 14, and if desired, at the point at which they cross one another.

The box frame structure 19 along the bottom edge of the sidewalls 13 and 14 gives additional rigidity to the trench section to prevent substantial inward movement of the walls 13 and 14.

However, should there be any substantial inward movement of the walls 13 and 14 in the bottom section 11 that takes the greatest strain in the event of a trench wall cave-in, there is provided a removable cross brace 25, illustrated in Figure 8. This cross brace is hinged to the

wall section 13 so that it can be moved upwardly into an inoperative position along the wall 13, or be placed in operative position against a stop 26 secured to the wall 14 to give additional cross bracing at the mid point of the wall sections 13 and 14.

The angle iron members 16 and 16a each have a series of holes 27 and 27a that correspond to a like series of holes in the intermediate frame section 12 for attachment of the intermediate frame section to the bottom section 11 by the use of suitable bolts 30, as illustrated in Figures 2 and 6.

The intermediate frame section of the cage is constructed in a manner very much like that of the bottom section 11 of the cage except that the bottom edge of the sidewalls of the frame section 12 are provided with an angle iron reenforcing member in place of the box structure member 19 provided along the bottom edge of the bottom frame section 11. Also, the intermediate brace member 25, used at the bottom section 11, is not used in the intermediate section 12, but, if such intermediate brace should be necessary, it can, of course, be used in the intermediate frame section as well as in the top section 10.

The intermediate frame section 12 for the cage is thus constructed of a rectangular angle iron frame consisting of the longitudinally positioned members 31 and 32, and the transversely positioned members 33 and 34 that are suitably welded together and which support the sidewall sheet metal member 35.

The channel iron members 36 and 37 extend between opposite walls 38 and 39 of the intermediate section 12 to space these walls from one another the same distance that the channel iron members 20 and 21 space the walls 13 and 14 of the bottom section 11.

Cross braces 60 and 61 extend between the walls 38 and 39 at each end of the intermediate section 12 to give additional rigidity.

The intermediate section 12 is secured to the top section 10 by bolts 63 in the same manner that the intermediate section 12 is secured to the bottom section 11. The intermediate section 12, as well as the bottom section 11 and the top section 10, is tapered from the forward advancing wall of the cage toward the rearward trailing wall thereof so that the cage can be readily advanced through a trench wall of slightly varying width, and to provide for a more easy removal of the cage in the event of a cave-in of the trench wall against the cage.

The top section 10 of the cage is constructed like the intermediate section 12, except that tracks 40 are secured along the top edges of the walls 41 and 42 of the top section 10 to support and guide a winch 45.

The winch 45 may be of any desired construction, but is illustrated in Figure 11. It consists of a platform 46 containing the rollers or wheels 47 that operate in the tracks 40.

A vertical standard 48 extends upwardly from the platform 46 and supports an arm 49 that is rotatably positioned upon the standard 48.

A suitable winch drum 50 is carried on the standard 48. The drum 50 carries the cable 51 that passes over the pulleys 52 and 53 and carries a hook 54 on the end thereof. The hook 54 supports a pipe hook 55 engaging one of the openings 56 provided in the pipe hook.

The pipe hook 55 is U-shaped in form and is provided with a plurality of holes 56 in the

flanged reenforcing member 57 to provide for horizontally balancing of pipe of different lengths when carried on the winch hook 54.

To lock the winch in place on the tracks, one or more pins 90 can be positioned in holes 91 provided in one or both of the tracks 40.

In Figure 1 the trench cage of this invention is illustrated in use. A trench 75 has been excavated and the trench cage T has been lowered into the excavated part 75 of the trench. The trench cage T has been advanced into an excavated portion of the trench to protect a workman laying tile within the trench. The unsupported portion of the trench 75 is behind the area in which the workman is located so that the workman in the caged area is safe from trench cave-ins, even though the trench should cave in behind the caged area.

On the forward side of the caged area, an excavator is operating the excavating bucket 80 for producing a trench in advance of the caged area. It will thus be noted that a workman can work with entire safety within the caged area while the trench is being excavated in advance of the workman, the cage itself eliminating any danger of injury to the workman from any accidental movement of the excavating bucket 80 into the working area, since the cage T limits the movement of the excavating bucket.

When the trench is excavated a sufficient distance in advance of the cage T, and workmen have completed laying tile within the caged area, a chain 81 attached to the bottom cage section 11 by means of eyes 82 is engaged by the excavating bucket 80 so that the operator of the excavator can pull the cage forward into the freshly excavated trench area by use of the power of the excavator.

As the cage T moves forward, as dragged by the excavator, the forward wall 22 at the bottom section 11 of the cage T will prevent excess earth from passing into the cage, thus eliminating the necessity of any manual digging or removal of earth from within the caged area. Thus, when the cage is moved forward, the bottom wall of the trench is smooth and ready to receive the tile or pipe that is being laid. It will thus be seen that the use of the cage T provides an improved and safe method of laying pipe in deep trenches wherein the excavation of the trench can proceed simultaneously with the laying of the pipe and immediately in advance of the area in which pipe is being laid. The method thus eliminates the necessity of digging long trenches and the shoring of the trench before pipe laying operations can proceed, and eliminates the necessity of removal of the shoring upon completion of the pipe laying operation.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A unitary trench cage structure comprising, a structure substantially that of a truncated cone in horizontal transverse cross section having closed vertical sidewalls and open end walls and top and bottom walls, said structure including structural members extending between said closed walls at opposite ends of the structure to retain said closed walls in spaced relationship, reenforcing members extending longitudinally and transversely of said closed walls to reenforce the same secured together and to said walls forming a frame along the edges of the walls, and a plate member extending transversely between said closed walls at the narrow end of the structure with the bottom edge of the plate member in substantially the same plane as the bottom edges of said sidewalls.

2. A unitary trench cage structure comprising, a structure having a horizontal transverse cross section substanitally that of a truncated cone and having closed vertical sidewalls and open end walls and top and bottom walls, said structure including structural members extending between said closed walls at opposite ends of the structure to retain said closed walls in spaced relationship, and reenforcing members extending longitudinally and transversely of said closed walls to reenforce the same, and a brace member extending between said closed walls near the bottom thereof and intermediate the opposite ends thereof and movable into and out of a position transverse of said walls.

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