

Aug. 23, 1966

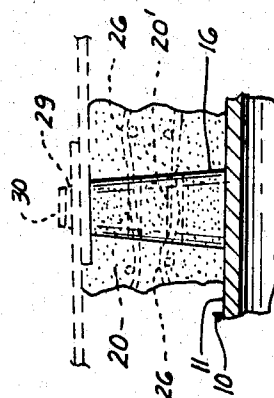
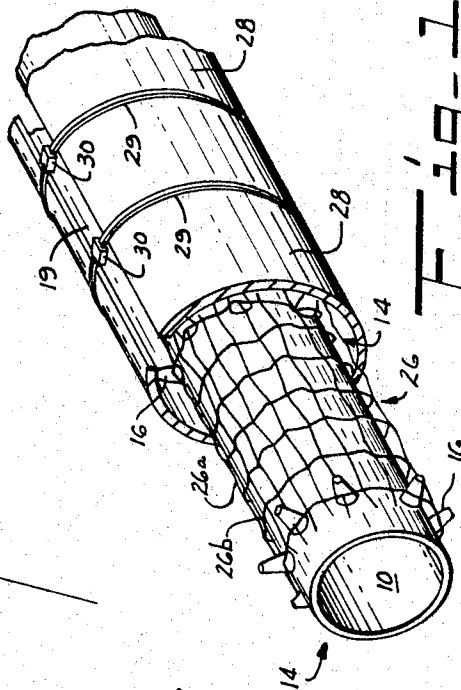
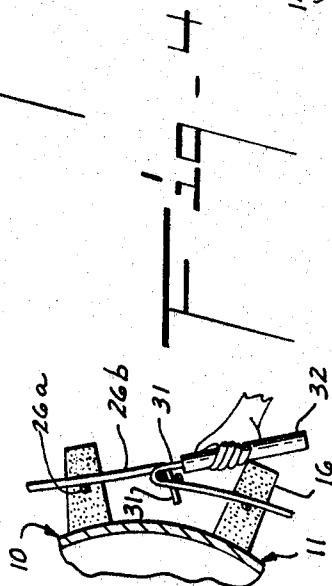
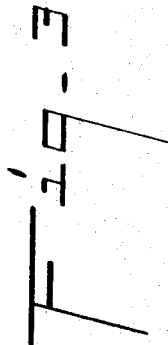
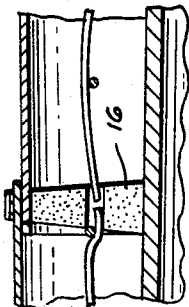
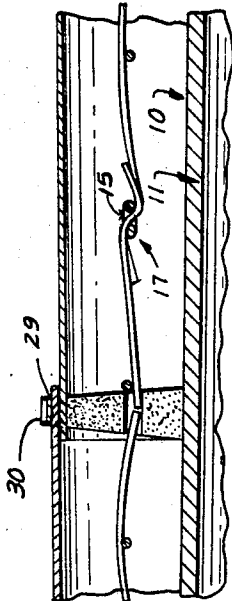
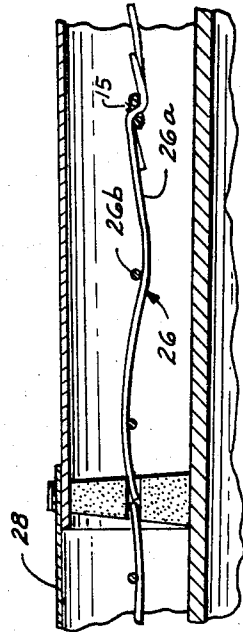
J. B. MALLARD

3,267,969

REINFORCED WEIGHTED PIPE

Filed Aug. 17, 1964

2 Sheets-Sheet 1



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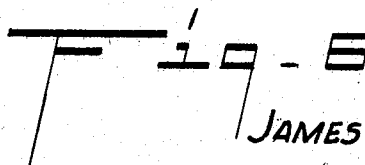
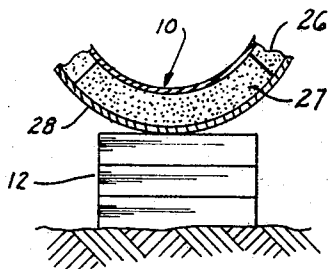
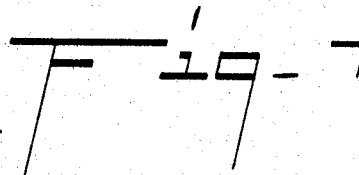
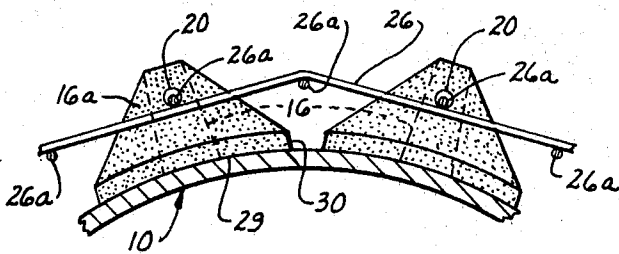
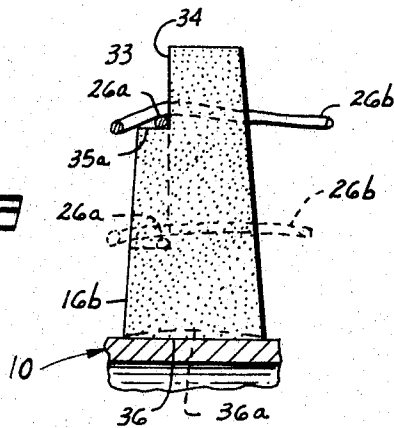
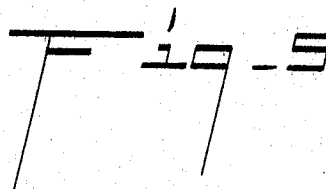
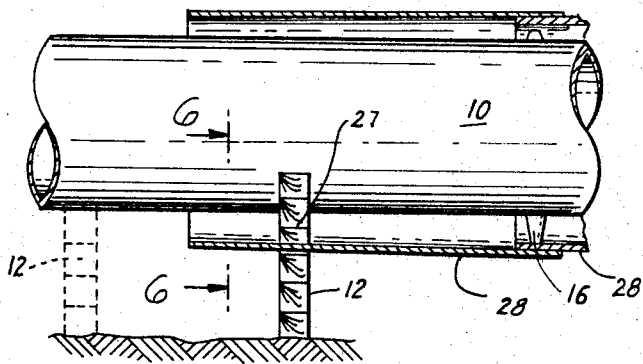
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3,267,969

REINFORCED WEIGHTED PIPE

Filed Aug. 17, 1964

2 Sheets-Sheet 2



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3,267,969

REENFORCED WEIGHTED PIPE

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Filed Aug. 17, 1964, Ser. No. 390,152

9 Claims. (Cl. 138—178)

This invention relates to a continuously weighted pipe or pipeline; this application being a continuation-in-part application of co-pending application Serial No. 348,720, filed March 2, 1964, for Pipe Weighting Method and Reinforced Weighted Pipe Achieved Thereby.

Heretofore, in weighting pipe, it has been necessary to install cast concrete form spacers with consideration having to be given to the problem of first positioning the spacers through the use of an independent positioning means to locate a ring of spacers at a predetermined station along a supported pipeline which is to be weighted. Thereafter, the independent positioning and hold-on means had to be tightened to take up any slack thereby to firmly locate the spacers in their proper places around the ring with spacer bases held firmly seated upon the pipe. These two steps were taken without consideration of the reenforcing wire mesh loosely installed about the pipeline, and as a third step, this wire mesh had to be disposed to be supported by the spacer hold-on means before the forms could be installed upon the spacers and banded into position. The hold-on means thus employed was embedded by the weighting material, as concrete, when the forms were filled, but being substantially weightless, it served but one purpose, although requiring two process steps to consummate its functioning.

Also, heretofore, the concrete forming the spacers has been poured of the same constituency as the concrete poured into the forms to continuously load the pipeline, whereas it can be much cheaper to substantially reduce or eliminate aggregate from the concrete poured into the forms for continuously weighting the concrete and increase the size and/or number of spacers and add special weighting material to appreciably increase proportion of spacer weight to total weight.

The spacer positioning and hold-on means has usually comprised a wire extending through a hole in each spacer of a spacer ring, the hole being spaced a predetermined distance above the base, and the spacers thus being turned so that the holes therein were transverse to the longitudinal axis of the pipeline. The wire through the ring of spacers had to be of same strength, usually a piano wire and a special twisting or tightening device had to be installed on the piano wire to tighten it in manner to firmly bind the spacers of a spacer ring in place upon the pipeline. Thereafter, the reenforcement means or wire mesh sheets, which the piano wires spaced from the pipe at pre-calculated distances, had to be installed upon the piano wires and in place in manner to leave the spacers free to space and support the forms.

The present invention eliminates all steps incident to the spacer positioning and hold-on means, as it eliminates the need for such a means and utilizes the reenforcement wire mesh itself to position the spacers and space them around the pipeline in rings of spacers at measured longitudinally spaced apart stations along the pipeline.

This is accomplished by cutting the longitudinally extending wire mesh at measured longitudinal distances apart equal to the distances between stations or spacer rings, with the wires cut at each station or transverse plane being spaced apart with parallel extending uncut wires in between; the number of wires cut being equal to the number of spacers at a station.

A spacer can then be installed at each cut wire simply by bending one part of the wire aside, first to install the spacer with the hole therein receiving the other part of

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cut wire, and thereafter the first part of the cut wire can be re-bent as inserted in the hole with the cut end faces of the cut wire in substantial abutment substantially centrally of the length of the hole. After a ring of spacers has been installed the wire mesh can be tightened in a periphery at substantially the distance of the spacer holes from the pipe simply by inserting a transverse wire end of the mesh, nearest to the plane of the cuts into a small tubular tool, as a pipe nipple, such wire end being bent under and back over the next overlapping longitudinal wire of the mesh with the tool working the point of bend to occur as far as possible from the end face of the wire end, thereby shortening the periphery of tightness.

Such a method thus employs the wire mesh itself to locate the spacers, to exert a tightening or hold-on force against the spacers, and at the end of these two steps the wire itself is in properly spaced and bound position around the pipeline, rather than having to be placed upon a piano wire positioning and hold-on means. As a consequence, the time in which reenforcement mesh and forms can be installed upon a pipeline is appreciably speeded up.

A preferred and fastest method employs the spacers to space the wire mesh from the pipe, and employs the wire mesh to position the spacers without the necessity of cutting any of the longitudinally extending wires of the mesh and this method is part of the invention included in the new part of this continuation-in-part application, as set forth hereinbelow. Such method involves no more than notching the upper end portion of each spacer to provide a transverse surface spaced below the top of the spacer and intersected by a surface perpendicular thereto and parallel to the axis, so that the transverse surface can support a longitudinally extending wire of the wire mesh at a predetermined distance above the base of the spacer, and so that the surface perpendicular thereto can bear against the side of the respective longitudinally extending wire whereby the spacer is located upon the pipe.

Since the aggregate, as rock and gravel, which is mixed with cement, sand and water to make concrete, can be expensive or difficult to obtain in some localities, it may be expedient to eliminate aggregate entirely from the concrete that is poured into the emplaced forms, and make up the difference in the lighter concrete thus resulting by adding weighing material to the spacer concrete, and also making the spacers to a much larger size than necessary to support the wire mesh, their original function. This can result in a much greater percentage of total weight being distributed in the spacers and a substantially lesser percentage of total weight being distributed in the concrete poured in the forms. However, this can be accomplished at very little increase in costs of spacers as compared with the great saving attained in the poured concrete by the elimination of aggregate therefrom.

Since the spacers have to be cast in any event, and the increased labor cost involved in casting heavier, especially weighted, and possibly a greater number of spacers is relatively insignificant as compared against the reduced costs of concrete composed only of cement, water and sand. At the same time, the advantages of a continuously weighted pipeline, such as the advantage of using reenforcement mesh, are obtained over a pipeline weighted by longitudinally spaced apart weights.

As a consequence of the foregoing, it can be stated that, as a primary object, the invention sets out to weight pipe in the quickest manner possible and at a minimum expense by providing spacer means installable in a unique manner for spacing and supporting both the reenforce-

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ment for the pipe weight together with the forms which enclose the pipe weight, the spacer means also being integrated as part of the weight when the weighting material or concrete is poured.

It is still another and further object of the invention to provide a pipe weighting method for a supported, weighted pipe by which the weighting of the pipe can be achieved with ease by changing location of the initial pipe supports to cooperate with a means included in the forms to space and support the pipe from the forms until the weighting material is poured and hardened.

It is still another object of the invention to provide a weighted pipeline and a method of weighting same in manner that the maximum weighting material may be poured as a unitary weight, to weight a continuous length of pipe with minimum expense and within minimum time.

It is also an essential object of the invention to provide a method of weighting pipe and a weighted pipeline in which the reinforcement spacers receive longitudinally extending reinforcement wires therethrough or thereon.

It is also a most important object of this invention to provide a method of weighting pipe with reinforced concrete, or the like, in which the length of the reinforcing wire mesh sheets and the length of the forms into which the weighting material is poured place no limitations on the spacing apart of the spacers by virtue of the manner in which the spacers are installed on the wire mesh.

It is yet a further object of this invention to reduce concrete costs by eliminating or substantially reducing the aggregate heretofore used in the concrete poured into the forms and compensating therefor by adding special weighting material to, and/or size and number, to the spacers.

Other and further objects will be apparent herein when the specification herein is considered in connection with the drawings, in which:

FIG. 1 is an isometric view of a pipeline with pipe form sections installed thereon and showing the manner in which reinforcing material is installed in position by means of the spacers, and tightened by a simple tubular tool applied to bend the ends of transverse wires of a sheet of reinforcing mesh wire to tighten the mesh with relation to the spacers;

FIG. 2 is a sectional view through a spacer, as cast; the spacer then having been installed upon a pipeline, as one of a spacer ring of angularly spaced apart spacers comprising one of the necessary longitudinally spaced apart, transverse spacer stations along the pipeline to be weighted, the view also showing the disposition of the reinforcing wire in the spacer, and the concrete weighting material poured to surround the spacer; phantom lines being shown to indicate the provision of an additional sheet of reinforcement mesh wire and to show the forms before removal;

FIG. 3 is a sectional view, longitudinally along a pipeline in preparation to be weighted, showing relative disposition of spacers with relation to the ends of the form sheets and of the reinforcing wire mesh sheets, thereby demonstrating that these relative lengths should not affect the distance between rings of spacers when installed with longitudinally extending reinforcement wire sections extending through the spacer holes;

FIG. 4 is a fragmentary view showing method and tool employed to tighten or latch a wire mesh sheet about a pipeline in a periphery adjacent a spacer station, thereby binding the spacers in position;

FIG. 5 is a sectional elevational view, taken along line 5—5 of FIG. 1, in which the reinforcement means is not shown;

FIG. 6 is a sectional elevational view taken along line 6—6 of FIG. 5, showing a chock block of weighting material within a form section employed to space the pipe, the view also showing the initial pipe supporting means as moved from initial position to support the form sec-

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tion and chock block therewithin which in turn supports the pipe prior to the hardening of the poured concrete;

FIG. 7 is an enlarged, fragmentary, transverse sectional view, showing a modification of spacer construction and the transverse spacing thereof; and

FIG. 8 is an enlarged elevational view showing a preferred form of spacer positioned upon a pipeline, and its relationship to the wire mesh supported thereby.

Referring now in detail to the drawings in which like reference numerals are applied to like elements in the various views, a pipeline 10 is shown in the drawings in process of being prepared to be weighted. Such pipeline has previously had the conventional thin protective layer or insulative, corrosion resistant covering or "dope" layer 11 applied to the outer, metallic surface of the pipe, as indicated in FIGS. 2 and 3.

Preparatory to being weighted, the pipeline is supported at spaced apart intervals along its length by support blocks 12 as shown in FIGS. 5 and 6. The blocks 12, shown in dotted lines in FIG. 5, are support blocks comprising wooden members, as 4" by 4" runners or beams, stacked one upon the other. It thus becomes necessary, when weighted material is to be installed at a point initially supported, to move the supports in manner that the pipe will still be supported while the weighting material is supplied; and the manner of accomplishing this movement will be set forth in detail herebelow.

As a first step in preparing the pipe to be weighted, weighting spacers 16 are fabricated, such spacers being shown in FIGS. 1-3, inclusive. Such a spacer 16 is shown in large scale detail in FIG. 2 as being a slightly tapered, truncated cone of concrete. Then spacers are poured into molds in advance of the contractor going to the pipe weighting location, the molds being vibrated to insure even and full distribution of the concrete therein, and cores being included within the molds to provide core holes 20 within the spacers 16. The holes 20 (and 20' if two wire mesh reinforcements are required) extend transversely diametrically across the spacers at some predetermined space distance above the base, which is to seat upon the pipe coating 11 of a pipe 10, and below the truncated top of the spacer. This distance is predetermined so that the axis of the hole above the base is the same distance as that distance at which the reinforcing wire mesh 26 average center line of wire is to be supported radially outwardly of the pipeline.

The overall heights of the spacers 16 are calculated by design to be sufficient to insure that the volume of concrete poured between the form and the pipe, plus the weight of the spacers 16 and the weight of the reinforcing mesh 26, will add up in each form section to that weight specified as necessary per unit length of pipe thereby to insure that the pipeline will remain in position at substantially that depth upon the right-of-way to which it must be initially entrenched to meet pipeline requirements. In this regard, the weight of the chock blocks 27, shown in FIGS. 5 and 6, must be calculated for those form sections in which such are included, in place of poured and reinforced concrete which would ordinarily occupy the same volume.

The spacers 16 are thus delivered to location ready for use, and that number of spacers are selected as may be necessary to support a form section from the pipe of known periphery and such are positioned upon the pipe at those angles with relation to a horizontal or vertical reference plane through the center of the pipe as best calculated to carry out the load requirements of form spacing.

FIGS. 1-4, inclusive, are directed to emphasize the steps by which the method of this invention is best carried out to obtain a weighted pipeline of the characteristic parts best demonstrated by FIG. 2. Initially a pipeline 10 has had wire mesh 26 placed upon the pipeline to extend loosely therearound, the wire mesh being cut from strips or rolls usually five feet (5'0") wide and in length

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about six inches in excess of the length of an imaginary circle passing through peripheral points spaced from the axis of the pipeline at that radius at which the wire mesh 26 is to be installed. Then a ring or station 14 of spacers 16 is installed upon the wire mesh 26 in a plane transverse to the pipeline axis, such planes or stations 14 being shown in FIGS. 1 and 2.

The method of installing the spacers 16 comprises cutting longitudinally extending mesh wires 26a in the selected transverse plane, the wires cut being equal in number to the number of spacers to be used at a station and, as best seen in FIG. 1, every third wire is cut to receive a spacer 16, one part of each cut wire 26a being bent aside to allow a spacer 16 to be installed thereon by inserting the cut wire into the hole or bore 20 formed through the spacer 16 when it is molded.

The spacer 16 is then manipulated to pass the opposed side of the holes 20 over the other part of the cut wire 26a and, as this occurs, the first part of the cut wire is re-bent so that the end faces of the cut wire substantially abut centrally within the bore 20, as shown in FIG. 3. Rings 14 of spacers 16 are thus installed at predetermined distances apart as will be dictated by the lengths of form sections 28 which are installed later upon the spacers, a center-to-center distance for spacer rings 14 being indicated as 46" in FIG. 3.

In the meantime, it can be asserted that, prior to installing the spacers, it goes without saying that the wire mesh sections 26 have been tied together by wires 15 where the transverse ends overlap, as indicated in FIG. 3 by the connection stations 17. The wire mesh sections 26 overlap as abutted end to end so that each sheet of wire mesh 26 extends 54" from transverse wire 26b at one end to the transverse wire 26b of the other end, while the adjacent transverse wires 26b of two abutting sheets are tied together in manner that they are separated by as short a distance as $\frac{1}{2}$ ". Therefore, each wire mesh section 26 extends approximately $54\frac{1}{2}$ " from junction to junction.

The 46" radial center line to vertical center line spacing of the spacers 16 is determined by the length of the form sections 28, which, in the case shown, may be said to be 48" long. The forms 28 are installed, as best seen in FIG. 3, with a trailing form to overlap the rear end of a leading form by an area of overlap 18, such overlap being represented as 2" in the drawings. The spacers 16 are then centered under the overlapping form parts 18 and thus the 46" center line to radial center line longitudinal spacing of the spacers 16 is determined, as aforesaid.

After the spacers 16 have been installed at their respective rings or stations 14, the wire mesh 26 may be tightened in closest adjacency to such ring by inserting an end 31 of a transverse wire 26b into a tool, such as a tubular nipple 32 and working the nipple to overlap as much as possible of the wire end into overlapping relation with the last longitudinal mesh wire 26a at the other end of the sheet 26 to latch the ends of the sheet 26 together thereby to bind the spacers 16 in place.

Under the aforesaid conditions, the wire mesh sections 26 may be connected rapidly in end to end relationship when applied loosely around the pipe, and thereafter the spacer stations or rings 14 may be rapidly installed and, with the dimensions set forth hereinabove as examples, there could rarely occur an occasion where there would be spacing interference between a calculated point of wire separation 19 and a wire mesh section connection station 17. In such rare case compensation could be obtained by shifting a spacer ring 14 with relation to the overlapping area 18. It can thus be said that the spacer rings 14 may be installed without the necessity of considering the wire mesh section junctions 17 and the forms 28 can thereafter be installed without considering any other structure other than spacer ring locations 14.

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The form sections 28 are held in position upon the spacers 16 by means of conventional steel bands 29 which have their ends drawn toward each other so that the ends may be clamped together when the bands are drawn tightly around the form sections, suitable conventional band clamps or clasps 30 being used for this purpose.

As to band spacing, it has been found desirable to apply one band 29 around a form section and immediately over a ring of spacers 16, thereby to band the forms 28 centrally over the areas of overlap 18. Additionally, a band 29 may be installed substantially centrally of the length of a form section, or the length of a form section may be divided into three lengths by two bands installed between the ends thereof. The number of bands employed, and the size and strength thereof are, of course, dependent upon the size of form sections to be banded, which are in turn determined in diameter and gauge thickness by the diameter of pipe to be weighted and the thickness of weight to be poured therearound.

As shown in the drawings, the form sections 28 do not extend all around the pipe to be weighted but leave a top opening 19 thereacross through which the concrete can be poured. As the concrete is poured it passes through the top portion of wire mesh which is supported by the opposed top spacers 16 of adjacent spacer rings.

When the form sections have been installed a continuous or monolithic weight may be poured over a very considerable length of pipe, the concrete being mixed on location and poured into the sections, either successively from one end, which is suitably dammed or closed, to an opposite end, likewise dammed or closed. Also, optionally, more than one concrete mixed may be used and spaced along a length of pipeline to be weighted so that pouring may be carried out from several points along a pipeline.

As poured, the concrete passes through the wire mesh which extends around the underside of the pipe within the form sections, and the poured concrete fills up the form sections to harden against the pipe and around the spacers and the mesh, the form sections being completely filled so that the hardened concrete stands up flush with the tops of the forms, pour holes 19, or otherwise flush with the uppermost form cones. This means the concrete extends at least up to the undersides of the bands 29 which hold the forms in place.

When the concrete has had time to harden, the bands 29 may be removed for further use, or optionally cut and expended, and the form sections removed and kept for further use within the range of pipe sizes for which such form sections may be adapted. That is, the same form sections can be used for the same or substantially the same diameters of pipe and for weights per unit lengths of the same, substantially the same, or lesser thickness. That is, if used for pouring weights of lesser thickness and/or for weighting smaller diameter pipe, the excess form dimension in circumference can be bent back outwardly so that the effective form sections in transverse dimension or circumference is that required dimension less than the dimension to which the form sections were originally cut.

The form sections 28, shown in the drawings, are of sheet metal and the bands are metallic. Under present practice such form sections and bands are required to be removed after the concrete has been poured and has hardened, one reason being to avoid any possibility of corrosion being set up between the metal of bands and forms and the metal of the pipe. However, the invention extends to cover a form and bands which may be insulative in character and thus expended by being left on the pipe for additional weight and/or insulation.

As the costs of plastic sheets is continually being cheapened as the plastic industry develops new production methods and less costly basic materials, occasion arises to employ plastic forms and bands, especially on locations and under conditions where it may not be practicable to remove forms and bands for further use. Thus, the

invention includes the use of forms and/or bands which are expendable on location, as well as spacers.

As a special feature of the invention, it is possible to employ the spacers 16 to serve as special weight elements in addition to their other functions, one or various combinations of substances such as lead, magnetite and barite being added in the concrete mixture or aggregate to increase the specific gravity of the spacers whereby the concrete poured into the form may be composed of less expensive elements. For instance, no aggregate, as gravel, need be used in the concrete, but simply sand and water need be mixed with the cement. This can result in a much cheaper total weighting cost since the spacers 16 have to be cast as special items in any event.

Since the volume of a frusto-cone is

$$0.2618h(D^2 + Dd + d^2)$$

where h =height of frusto-cone, D =base diameter, and d =top diameter, it can be seen that the volume of the spacers, and thereby the weight, can be increased in some proportionate relationship to the ratios of the base diameters. In other words, should the top diameter and height be maintained constant in the spacers 16, shown in FIG. 4, if the base diameter should be doubled, the volume would be increased by 2.6; if tripled, the volume would be increased by 5.1; if quadrupled the volume would be increased by 8.5 as indicated in FIG. 7, which is to 1½ times the scale of FIG. 4.

Also, as shown in FIG. 7, the spacers 16a have one longitudinally extending reinforcement wire 26a therein-between, whereas two are shown transversely between the spacers 16 in FIG. 1, thereby the number of spacers in a ring or at a station is shown increased by 50%. Then, since the spacers may be cast with a material or materials added, such as lead, magnetite, barite, and the like, in place of conventional aggregate, this change can increase the specific gravity of the spacers to say three (3) times the specific gravity of a spacer comprised simply of cement, sand and water, the weight of spacers per ring can be increased $1\frac{1}{2} \times 3 = 4\frac{1}{2}$ times by increasing the number of spacers per ring and the specific gravity thereof; then, as shown in FIG. 7, since the base diameters of the spacers can be quadrupled without overlap, it is possible to increase the spacer weight at each ring or station by $8.5 \times 4\frac{1}{2} = 38$ times, approximately, without, in any manner, interfering with the functioning of the spacers to space and support the reinforcing wire mesh or the forms.

It can be understood that simply by taking the spacers as conventionally spaced apart and sized, and adding weighting material thereto to increase their weight 3 times so that they approximate 9% of total conventional weight, permits the concrete to be reduced from 97% to 91% of total conventional weight. Concrete could then be reduced, by leaving out aggregate, by ¼ its weight, or less than ¾ its conventional weight, thus to amount to approximately 70% of the total required weight. Thus, if spacers three times the specific gravity of conventional concrete were used, the volume to be devoted to spacers would have to be 30/3, or approximately 10% of the total conventional weight.

As a five (5) foot long total slab of concrete 8" thick in a 36" diameter pipe occupies 31.4 cu. ft. by volume, should 3.14 cu. ft. or 10% of this space be devoted to spacer volume with specific gravity increased by 3 times, the need for the additional weight of aggregate would be eliminated, so that the specific gravity of the concrete used to fill the forms could be reduced by one-fourth. Even without changing the number of spacers, assuming the spacers shown in FIG. 4 to be 4" at base and 3" at top, and with height and multiplication factor a constant, volume is calculated on functions of $D^2 + Dd + d^2$ where D =base diameter and d =top diameter, or

$$16 + 12 + 9 = 37$$

which is proportionate to 3%, by volume, of the 8" thick slab covering a 5 foot length of a 36" diameter pipe with spacer bases and tops 4" and 3", respectively. Thus, with spacers kept at the same number, multiplying

$$37 \times \frac{10}{3} = 123.3$$

and this becomes the number corresponding with 37, to give 10% spacer volume. If d or top is kept constant, the formula becomes $D^2 + 3D + 9 = 123.3$, or solved algebraically $D = 9.3$ ". Thus, the same number of spacers per station, with bases increased to 9.3" from 4" and specific gravity tripled, should permit the aggregate to be eliminated or greatly reduced.

As shown in FIG. 7, the spacers 16a are substantially larger in cross-sectional area than the cross-sectional area of the conventional spacers 16, shown in dotted lines therein. In cases where such enlargement of base causes the base to have a diameter of a number of inches, it may be advantageous to make the under surface of the base arcuate in configuration to better fit the pipe as shown at 29 in FIG. 7.

In the preferred form of the invention shown in FIG. 8, the spacer 16b is cast in manner to provide a vertical or upstanding surface 34 and a surface 35 at substantially right angles thereto. There is thus provided a recess 33 by relieving the top of the otherwise frusto-conical spacer 16b in this manner. When the spacer 16b is seated on the coating 11 of the pipeline 10, the wire support surface 35 falls at the proper height to space the wire mesh at the pre-calculated distance necessary to dispose it in the concrete when such is poured in this form.

In case two layers of reinforced wire are to be used, a notch 37 (shown in dotted or phantom lines in FIG. 8 as an alternative form), is provided in the spacer 16b to receive the transverse wire 26a of a lower or inner layer of wire mesh 26.

As shown in FIG. 4, the aforesaid longitudinally extending wire ends 31 of longitudinally abutting sheets of wire, are connected in manner aforesaid, using the tubular tool 32. However, since the transverse wires 26b fall at predetermined longitudinal distances apart, as say 6"; since the sheets of wire mesh 26 are cut from rolls of predetermined width and thereby have junctions or sheet abutments spaced apart at say the aforesaid 54½"; since the spacer rings 14 are spaced apart at say the aforesaid 46", as determined by form lengths; or since the wire mesh is in say 6" x 6" squares; on occasions ordinary spacing can appear to dictate that the spacer ring 14 might tend to all in interference with a transverse wire 26a. However, since the longitudinal distance intercepted by a spacer is relatively short, expediency adjustment can be made in such cases. For examples, the extent of form overlap can be varied, or variation of the distance between connected transverse wires 26a can be made at junctions as shown in FIG. 4, or wire mesh sheets 26 can be cut to slightly shorter length; the consequence in each case resulting in a specific transverse wire 26a falling at the junction of spacer surfaces 34, 35, as shown in FIG. 8 (or in a notch 37 in the case of two sheets of mesh 26 being used). Or in the form of the invention best shown in FIG. 3, such expediency adjustment will cause transverse wires 26b to fall outside of the spacers of a spacer ring 14.

The invention is not limited to any specific spacer construction but considers spacers of pyramidal shape, or any shape having rectangular sides, as beams or bars, as well as the modified frusto-conical shape shown in FIG. 8, it only being through essential to provide one surface for spacing the transverse wires 26b above the pipe 10, and one surface thereabove to space the form.

In effect the invention is not limited by specific structures or specific method steps, but considers a wider variety of shapes and methods as long as such may fall within the broad spirit of the invention, and the broad

scope of interpretation claimed for the merited by the appended claims.

What is claimed is:

1. A pipeline having additional weight per running foot added thereto by the application of a reenforced weighting material outwardly of the pipe periphery, said pipeline comprising a length of metallic pipe with outer surface covered with an insulative, corrosion resistant coating, reenforcing means for said weighting material spaced outwardly of the pipe outer surface and form spacer means thus spacing the reenforcing means and in turn positioned by said reenforcing means upon the pipe and extending radially outwardly beyond said reenforcing means, and weighting material of substantially high specific gravity concentric about the pipe and including said reenforcing means therein and said spacer means therein to the height of said spacer means.

2. A pipeline having additional weight per running foot added thereto by the application of a reenforced weighting material outwardly of the pipe periphery, said pipeline comprising a length of metallic pipe reenforcing means for said weighting material spaced outwardly of the pipe's outer surface and form spacer means thus spacing the reenforcing means and in turn positioned by said reenforcing means upon the pipe and extending radially outwardly beyond said reenforcing means, and weighting material of substantially high specific gravity originally pourable and hardened upon the pipe and embedding said reenforcing means therein and said spacer means therein to the height of said spacer means.

3. A weighted pipeline as claimed in claim 2 in which said weighting material includes, at intervals of necessity, a short arcuate, unreenforced chock block extending radially coextensive with said weighting material and embedded therewith.

4. A weighted pipeline as claimed in claim 2 in which said spacers are installed in rings transversely of the pipeline axis at predetermined intervals and in which said reenforcing means comprises wire mesh with selected angularly spaced apart longitudinally extending wires split in the transverse planes of said rings, the opposed split faces of each cut wire abutting in a hole provided transversely through the spacer positioned by said wire.

5. A weighted pipeline as claimed in claim 2 in which said reenforcing means is of greater transverse dimension than a perimeter defined by the wires of said mesh, and in which the overlap of wire mesh in said transverse dimension forms a latch assuring even spacer means disposition.

6. The combination of a form spacer and wire mesh reinforcement for weighting a pipeline comprising a cast concrete, truncated cone spacer having a hole therethrough spaced intermediate the height thereof, said reinforcement having a longitudinal wire split and disposed with split faces in substantial abutment within said hole, whereby, with said form spacer seated on the pipeline, it spaces said reinforcement radially from said pipeline and said reinforcement spaces said spacer peripherally with relation to the pipeline axis.

7. A weighted pipeline comprising longitudinally spaced apart rings of spacers, each ring comprising a plurality of substantially truncated cone shaped spacers transversely, angularly spaced apart and seated upon the pipe, each spacer being of concrete, including therein weighting material selected from the group of weighting materials comprised of lead, magnetite, barite and the like, each spacer having a bore therethrough above its base at the height the reenforcing wire mesh is to be spaced above the pipe, said bore receiving therein the ends of a longitudinally extending reenforcing wire, whereby the wire mesh locates the spacers transversely and the spacers locate the wire mesh radially.

8. A concrete weighted pipeline comprising continuously extending pipe, reinforcement wire sheets within the concrete joined end to end and spaced concentric about the pipeline, and rings of spacers at predetermined spaced apart distances along the pipe, each ring comprising a plurality of spacers, each spacer of a ring being based on the pipeline and providing a surface thereabove to support a selected wire extending in one direction of the wire mesh and also providing a higher surface above said first surface even with the outer periphery of the concrete, said spacers of a ring being selectively positionable with relation to the longitudinally extending wires of the mesh thus to be guidably disposed in angularly spaced apart relation around the pipeline.

9. The combination of cast concrete spacers and wire mesh reinforcement for weighting a pipeline, each spacer having a base to seat upon the pipeline and being notched from the top thereof down to a predetermined level intermediate the top and the base to provide a support surface substantially parallel to the base and to provide a side surface substantially perpendicular thereto and extending upwardly from said support surface to the top, whereby a transversely extending wire of said mesh may be supported by spacer support surfaces and bear against spacer side surfaces as said spacers thus space said wire mesh concentrically around said pipeline and as said spacers are disposed sidewardly in relation to respective selected longitudinally extending wires of said mesh which thus guidably dispose said spacers in angularly spaced apart relation around the pipeline.

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