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[54] PIPELINE TRANSMISSION SYSTEM

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[51] **Int. Cl.** **B61b 13/10**

[58] **Field of Search** 138/105, 106, 108, 138/111, 114, 115, 103; 137/312

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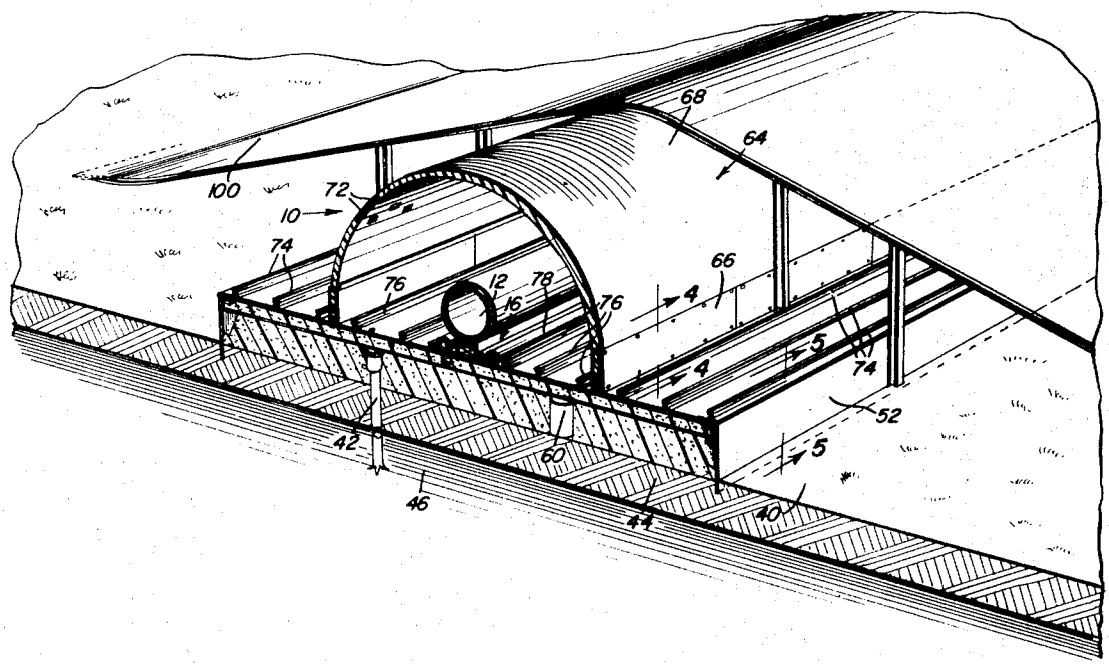
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[57] **ABSTRACT**

An elongated oil or gas pipe mounted on an elevated platform insulated from the ground surface. The pipe is enclosed within a full length insulated housing which contains service pipes, rails, and the like. At selected points along the system, game crossings are provided to enable a maintenance of the natural game paths and migratory patterns of the wildlife of the area.

9 Claims, 5 Drawing Figures



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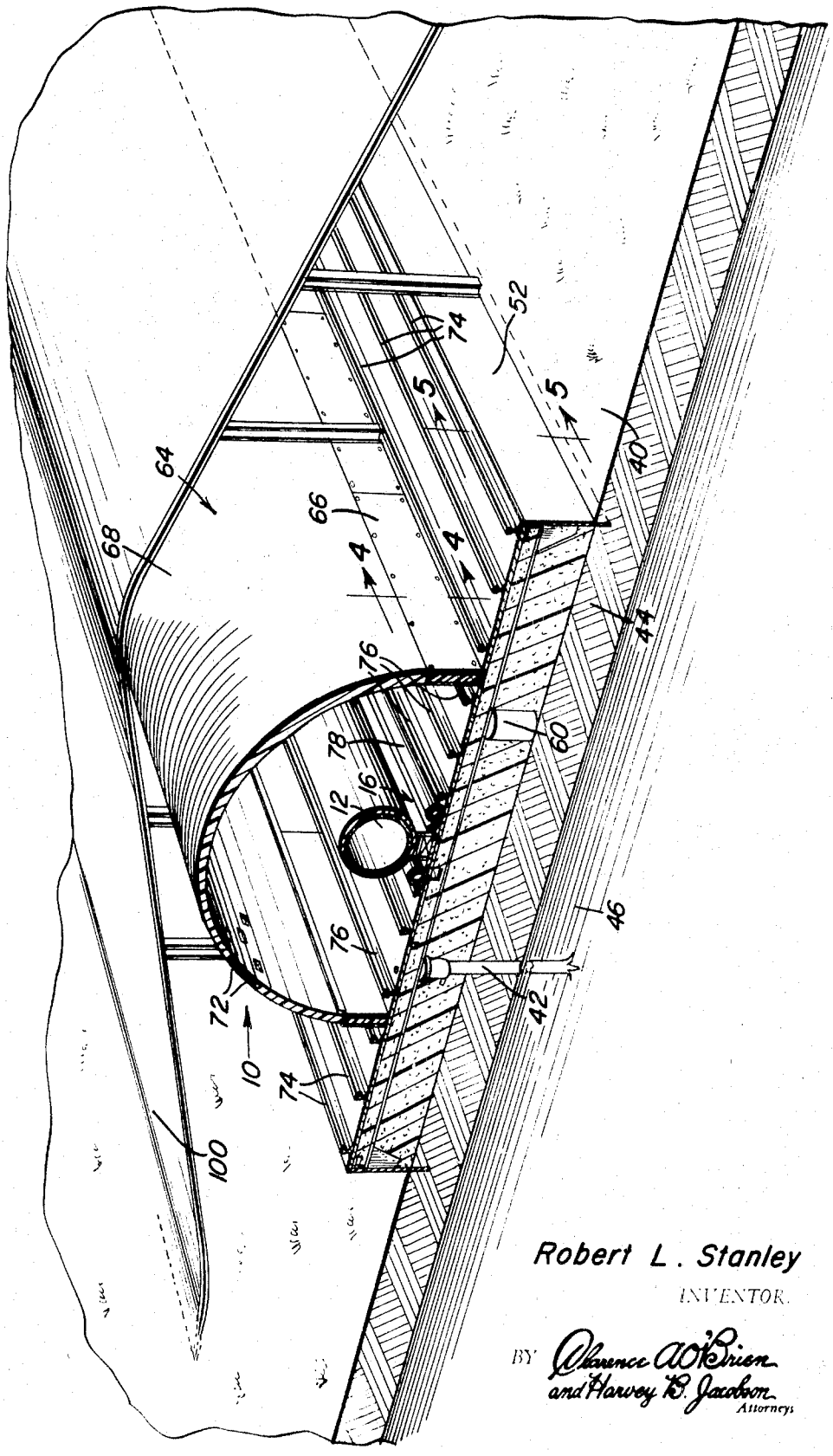


Fig. 1

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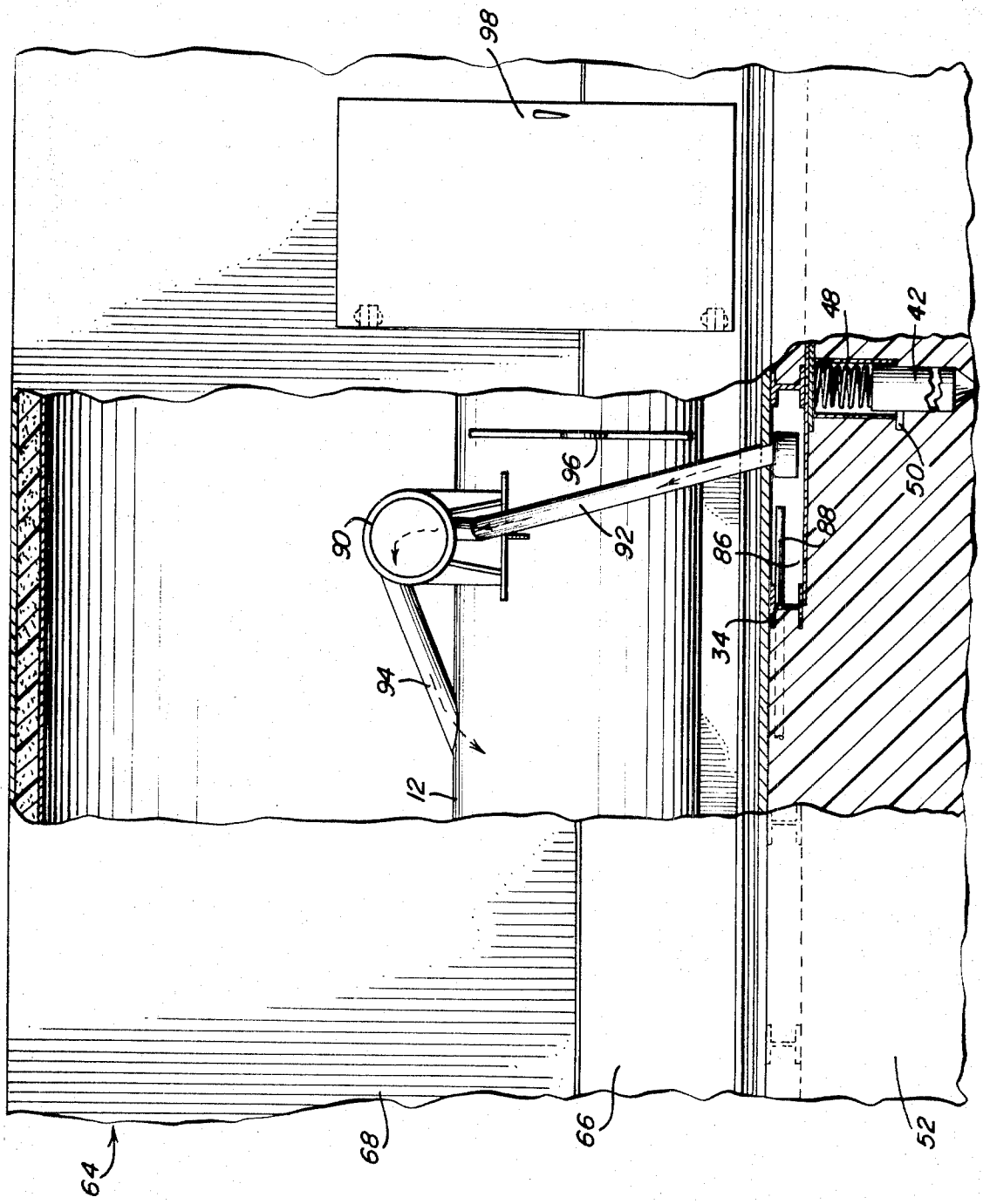
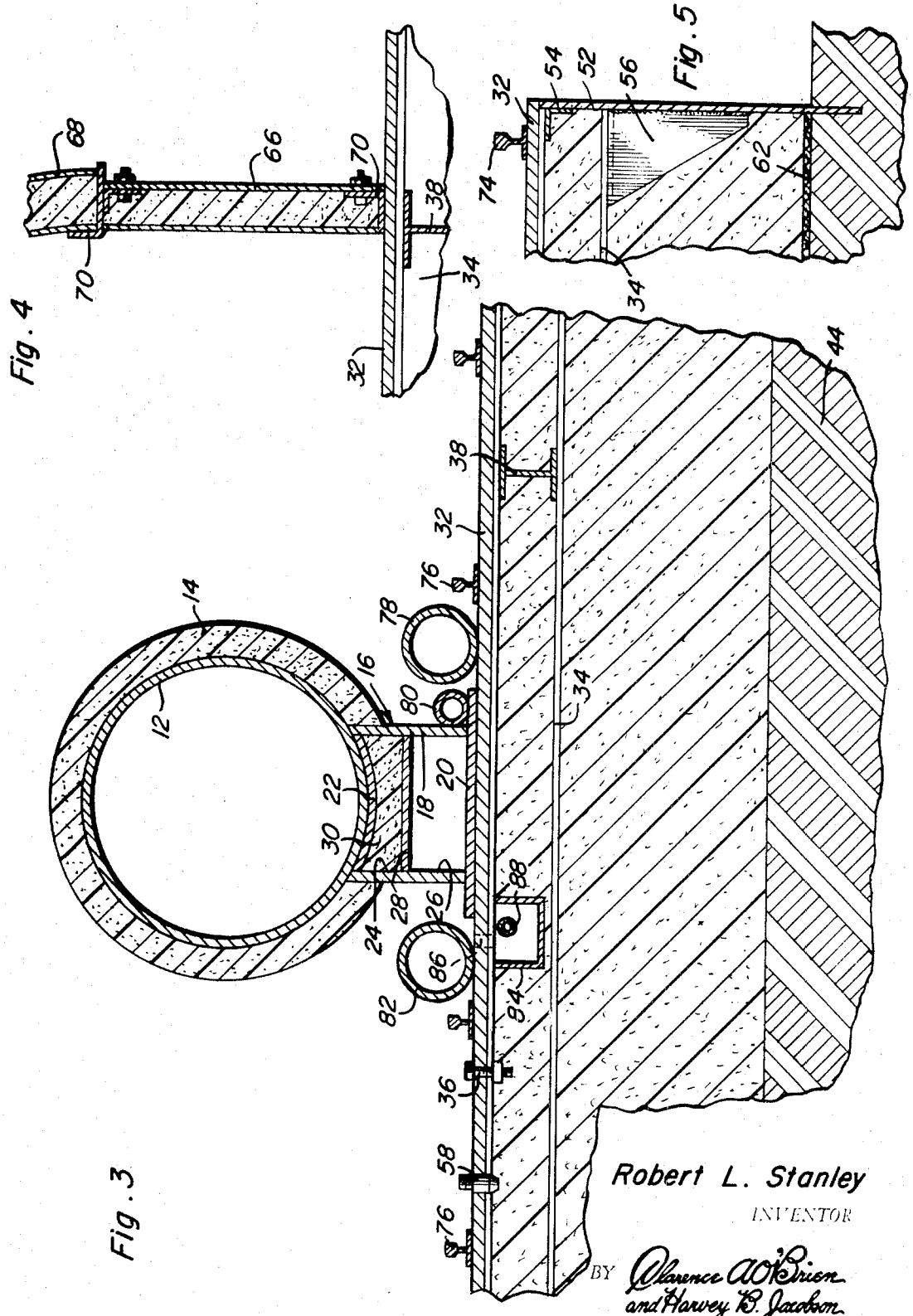


Fig. 2

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PIPELINE TRANSMISSION SYSTEM

The present invention is generally concerned with a system for the transport of fluids by pipeline, and more particularly involves a pipeline transmission system designed to transport crude oil through areas wherein a maintenance of the natural environment is essential.

The recent opening of the Alaskan oil fields has presented the involved oil companies with the substantial problem of transporting the crude oil across approximately 200 miles of the Alaskan Steppes without interfering with the physical features of the land and without adversely affecting the migratory patterns of the wildlife.

The oil must be transported at a constant temperature of approximately 180° through an appropriate pipeline. However, this results in a heating of the area adjacent the pipeline and a resultant penetrating of the permafrost barrier. Thus, the normally frozen ground becomes a permanent bog or sea of mud with the tundra and surface vegetation in the area disappearing. The wild life of the area will not cross the artificial barrier which would be presented by a conventional pipeline, nor will they cross or be able to cross the bog-like area or disturbed ground surface thereabout. This in turn would make it difficult or impossible for the animals to follow their normal migratory patterns in search of food, and would result in their ultimate extinction.

Thus, to permit the transport of oil by pipeline under conditions experienced in the Alaskan Steppes and similar locales, it is necessary that a pipeline system be devised which will preserve the existing natural conditions. In other words, the system must provide for the effective transport of the oil at the desired temperature while preventing any transmission of the heat to the surrounding area. In addition, the system must incorporate means for the servicing and repair of the pipeline, and prevention of the escape of spilled oil onto the surrounding ground surface. Provision must also be made so as to maintain the normal animal paths which will necessarily be crossed by the pipeline system.

The instant invention, in effecting such a system, provides an elongated insulated pipeline housed within an enlarged full length arched enclosure with the pipeline and enclosure being supported on a raised insulated base. Appropriate service lines, rails, conduits and the like are provided along the length of the pipeline, as are sump holes and periodic pumping stations incorporating sumps and sump pumps. Likewise, at points along the pipeline system where game paths or migratory paths are crossed, opposed gradually sloping ramps extend transversely over the pipeline and provide a natural game crossing for the free movement of the wildlife. The system itself is completely insulated from the surrounding area whereby no transmission of heat thereto results such as might affect the ecology of the area.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 illustrates a portion of the pipeline transmission system of the instant invention in both section and perspective;

FIG. 2 is a side elevational view of a portion of the system wherein the sump is located, a section of the construction being broken away for purposes of illustration;

FIG. 3 is an enlarged cross-sectional view through the pipeline and adjoining construction;

FIG. 4 is an enlarged cross-sectional detail through the lower portion of the housing wall, taken substantially on a plane passing along line 4—4 in FIG. 1; and

FIG. 5 is an enlarged cross-sectional detail taken substantially on a plane passing along line 5—5 in FIG. 1 and illustrating the construction at one side of the base.

Referring now more specifically to the drawings, reference numeral **10** is used to generally designate the over-all pipeline system comprising the instant invention. The pipeline itself is designated by reference numeral **12** and, while not limited thereto, will normally be at least 48 inches in diameter. An insulating blanket **14** of, as one example, 3-inch plastic foam such as Styrafoam will be provided about the pipeline **12.**

An elongated pipe saddle **16** underlies and supports the pipe or pipeline **12** along the full length thereof. This saddle **16** includes a pair of opposed vertical side panels **18** rising from a horizontal foot panel **20** and interconnected at their upper ends by a pipe receiving arcuate cradle **22.** It will be noted that the pipe saddle **16** engages directly against the pipe **12** for a firm positive support thereof, this saddle being divided into upper and lower full length chambers **24** and **26** by a transverse partition **28.** The upper chamber **24** will be filled with appropriate insulating material **30** preferably thicker than the pipe blanket **14.** The lower full length chamber **26** will constitute a controlled air duct through which cooled air will be moved to assist in avoiding any downward transferring of heat from the pipeline **12.**

The pipe saddle **16** is affixed centrally along a relatively wide floor or deck panel **32** which is formed of a series of steel plates bolted or welded to define the laterally enlarged deck along the full length of the system **10.** This floor or deck **32** is supported on a series of spaced transversely extending wide flange I-beams **34,** being appropriately welded or bolted thereto as generally indicated at reference numeral **36.** If deemed desirable, transverse braces or stabilizing beams **38** can be provided between adjacent ones of the beams **34.**

The beams **34** are in turn positioned in spaced relation, approximately 4 feet, above grade level **40** by means of a series of vertically elongated steel pilings **42** which are sunk through the tundra **44** and a substantial distance into the underlying permafrost area **46.** It is contemplated that the lower end of each of the pilings **42** be of the type which, after sinking, can be outwardly exploded so as to more firmly anchor. In addition, noting FIG. **2** in particular, each of the pilings **42** will preferably incorporate a spring-loaded cap **48** thereon with a limit stop **50** to accommodate slight ground movements or settling.

The enlarged supporting base, that is the area defined below the floor or deck **32,** has the opposed longitudinal sides thereof enclosed by vertical side plates **52,** the upper edge portions of the side plates **52** being appropriately welded or bolted to the floor **32** by corner angles **54.** Appropriate stiffeners or knee braces **56** are welded between each transverse beam **34,** at the opposed ends thereof, and the adjoining side panel **52.**

The base area defined between the side panels **52** and below the deck **32** is filled with insulation, preferably of a high density nature so as to also act in the manner of a floating support for the floor **32** in conjunction with the spring-loaded pilings **42.** This material can consist of cork, bales of cotton, or foam plastic, such as Styrafoam introduced through appropriate plugged apertures **58** formed in the deck **32.** Further, if deemed desirable, tightly compacted support modules **60** of, as an example, cotton or cork can be provided in conjunction with the pillings **42** for introducing an additional degree of support and stability to the base. Incidentally, noting FIG. **5** in particular, if a substantial unevenness exists in the terrain, it may be necessary to utilize a layer of wire mesh or expanded metal **62** thereon so as to assist in properly positioning and retaining the insulation.

An enlarged arched roof housing or enclosure **64** is provided over the pipeline **12** along the full length thereof with the housing **64** being approximately 24 feet wide and presenting approximately a 9 foot clearance over the top of the pipeline **12.** The housing **64** includes opposed vertical side walls **66** and an arched roof **68** extending therebetween. Both the side walls **66** and the roof **68** are preferably defined by inner and outer panels sandwiching insulation therebetween. Similarly, if so desired, external and/or internal layers of insulation can also be provided. As will be appreciated from FIG. **1** in particular, it is contemplated that the roof **68** of the housing **64** utilize corrugated panels. With reference to FIG. **4,** continuous oil seal angles **70** will be utilized in securing the side walls to the deck **32** and the corresponding roof edge in the manner whereby leakproof joints are provided. Continuous electrical conduits **72** are to be provided longitudinally through the arched roof **68** with these conduits **72** being selectively accessible from the interior of the housing **64** for use in the construction and maintenance of the system.

It will be noted that the deck of steel plate **32** projects laterally beyond both sides of the housing **64** for a substantial distance mounting, to each side of the housing **64,** three laterally spaced elongated rails **74.** The outermost pair of rails to each side of the housing **64** will, during the construction of the system **10,** be utilized to carry the gantry crane used to set up the construction material, and will also accommodate narrow gauge railroad cars for the transport of material therealong as construction progresses. Once the construction is completed, these outermost pairs of rails will provide a means for transportation along the system for inspection and maintenance purposes.

The two rails **74** immediately adjacent the housing **64,** one to each side thereof, will be used primarily during the construction of the system for the transport of prefabricated sections of the housing **64** to the point of installation.

Three rails **76** will also be provided along the deck **32** to each side of the pipeline **12** itself within the housing **64.** The two outermost pairs of rails **76** will be used in the same manner as the outermost pairs of rails **74** for the transport of equipment, materials and personnel both during the construction of the system **10** and subsequent thereto, while the innermost rails **76,** one to each side of the pipeline **12,** will accommodate equipment utilized to transport prefabricated sections of the pipe to the point of installation.

Also located within the housing **64** and extending longitudinally therealong immediately adjacent the pipeline **12** are an insulated or non-insulated air supply line **78,** water supply line **80,** and gas supply line **82** for a provision of these essentials both during the construction and maintenance of the pipeline system. It will of course be appreciated that appropriate valves, pumps and the like will be utilized as required in conjunction with these lines.

In order to accommodate any accidential leakage which might develop in the pipeline **12,** and prevent such leakage escaping from the system and causing damage to the surrounding environment, enclosed sump holes **84** are provided along the system immediately below the floor or deck **32** between adjacent ones of the transverse beams **34** with appropriate access holes **86** extending through the deck **32** and into communication with the sump holes **84.** The sump holes are in turn communicated with sumps **86** located at longitudinally spaced points along the length of the pipeline transmission system **10** by means of a longitudinally extending suction pipe **88** which extends through the aligned sump holes **84** and into the sump **86.** An appropriate motor driven sump pump **90** is mounted on the pipeline **12** and communicated with each sump **86** by an appropriate intake line **92,** and with the pipeline itself through an appropriate discharge line **94** for an efficient return of any leakage to the pipeline. The sump **86** will preferably be the width of the housing **64** and extend between a pair of adjacent beams **34.** In addition, it is contemplated that the sump pumps **90** be located at low spots along the pipeline so as to facilitate a pumping of any oil leakage back into the line. An appropriate check valve **96** is to be provided in the pipeline **12** generally in the vicinity of each of the sump pumps **90** whereby, in case of a leak in the line, the pressure will decrease and permit pumping of the oil back into the main line. Finally, an appropriate door **98,** so constructed as to be effectively clamped closed so as to seal the door opening, is provided at each pumping station through the side of the housing **64.**

As previously indicated, the pipeline system **10** will have to intersect and extend over natural wildlife paths used particularly in following migratory patterns. In order to not interfere with such patterns, the instant invention contemplates the provision of an animal crossing **100** at each such point. Each of these crossings will be in the nature of an enlarged ramp or pair of opposed ramps which slopes gradually upward from ground level to the opposite sides of the housing **64** so as to extend thereover and form in effect a gently sloping hill. These crossings **100** are to be so constructed as to provide a rigid platform over which wildlife can move without danger and in a manner which will appear natural to the wildlife involved. It will of course be appreciated that the width of each of the crossings **100** shall be sufficient so as to constitute a natural continuation of the path with the material of the crossings being particularly selected so as to conform as much as possible to the surrounding natural environment.

From the foregoing, it will be appreciated that a highly unique oil transmission system has been defined. This system incorporates an elevated insulated pipeline which enables a pumping and moving of the oil, at the required elevated temperature, without danger of transmission of the heat to the surrounding area. In addition, provision is made, through the utilization of ap-

propriate oil seals, which seals incidentally are also provided between the plates which form the deck **32** and the support beams **34**, and sump means, for precluding any possibility of oil leakage out of the system. The pipeline itself is mounted in an elevated position above grade on an enlarged insulating base providing, in conjunction with spring-loaded piles, a slight floating action to simplify the accommodation of the system to ground conditions and such variations as may occur therein due to alternate thawing and freezing or the like. There has thus been provided a particularly useful means for effectively moving oil over frozen areas such as the Alaskan Steppes without danger of adversely affecting the surrounding areas or interfering with the natural habitat of the wildlife.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. An above ground pipeline transmission system comprising a fluid transmitting pipeline, a ground engaging base positioned in underlying relation to the pipeline along the length thereof, said base maintaining said pipeline elevated above ground level, and an enlarged housing positioned over said pipeline along the length thereof and engaged with the base to the opposite sides of said pipeline, said base extending laterally beyond both sides of said housing, said base being insulated whereby heat transmission from the pipeline to the ground is precluded, said base including an upper deck, support means underlying said deck and maintaining said deck elevated above ground level, and insulating material underlying said deck and extending from said deck to ground level.

2. The system of claim **1** wherein said insulating material defines a floating support for said deck.

3. The system of claim **2** wherein said support means includes deck mounting beams and depending ground interlocked piles.

4. The system of claim **3** including an elongated pipe saddle mounted on said base along the length thereof and receiving and supporting said pipeline, said pipe saddle including upper and lower longitudinal channels, the upper one of said channels incorporating means for insulating the under portion of said pipeline along the length thereof, the lower of said channels defining a cool air duct for the accommodation of forced cool air to preclude a downward transmission of heat from the pipeline.

5. The system of claim **4** including sump means located at points along said base in underlying relation to said pipeline, and associated sump pump means for a return of any sump received oil leakage to said pipeline.

6. The system of claim **4** including supply lines extending longitudinally along said base within said housing and adjacent said pipeline, and service rails positioned on said insulated base along said pipeline laterally thereof both interiorly and exteriorly of said housing.

7. The system of claim **6** including transversely directed housing spanning crossings positioned at longitudinally spaced points along said housing, each crossing defining a natural continuation of a migratory game path and comprising a gradually sloping surface extending from the top of said housing to the ground level to the opposite sides of the housing for unencumbered passage of wildlife thereover.

8. An above ground pipeline transmission system comprising a fluid transmitting pipeline, a ground engaging base positioned in underlying relation to the pipeline along the length thereof, said base maintaining said pipeline elevated above ground level, and an enlarged housing positioned over said pipeline along the length thereof and engaged with the base to the opposite sides of said pipeline, said base extending laterally beyond both sides of said housing, an elongated pipe saddle mounted on said base along the length thereof, and receiving and supporting said pipeline, said pipe saddle including upper and lower longitudinal channels, the upper one of said channels incorporating means for insulating the under portion of said pipeline along the length thereof, the lower of said channels defining a cool air duct for the accommodation of forced cool air to preclude a downward transmission of heat from the pipeline.

9. An above ground pipeline transmission system comprising a fluid transmitting pipeline, a ground engaging base positioned in underlying relation to the pipeline along the length thereof, said base maintaining said pipeline elevated above ground level, and an enlarged housing positioned over said pipeline along the length thereof and engaged with the base to the opposite sides of said pipeline, said base extending laterally beyond both sides of said housing, said base being insulated whereby heat transmission from the pipeline to the ground is precluded, supply lines extending longitudinally along said base within said housing and adjacent said pipeline, and service rails positioned on said insulated base along said pipeline laterally thereof both interiorly and exteriorly of said housing.

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