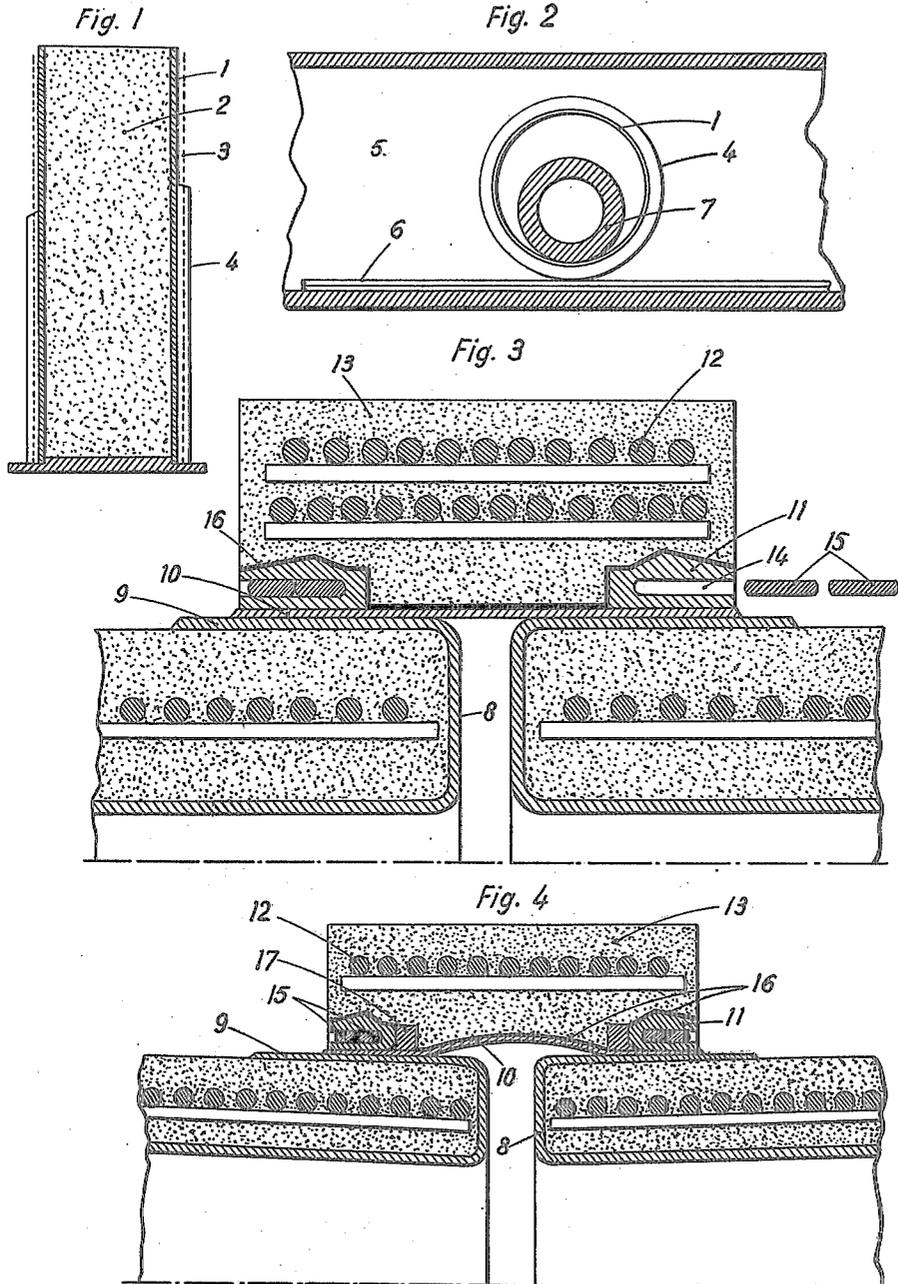


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PROCESS OF MAKING PIPES OF CEMENT.
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att.

UNITED STATES PATENT OFFICE.

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PROCESS OF MAKING PIPES OF CEMENT.

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To all whom it may concern:

Be it known that I, LÉON BILLÉ, engineer, citizen of the Republic of France, residing at Nogent, Department of the Seine, in France, have invented certain new and useful improvements in Processes of Making Pipes of Cement, of which the following is a specification.

This invention relates to a process of making pipes of bitumenized reinforced cement, without liners, or moulds, and assembling the said pipes by means of rings of reinforced cement cast in situ, and covering the joints with malleable metal laid and prepared whereupon, after caulking, a water-tight joint will be produced.

In order that the invention may be clearly understood reference is made to the accompanying drawings, which shew diagrammatically in Figures 1 to 4 the method of carrying out the present invention.

Fig. 1 is a view partly in section illustrating the manner of building the reinforced cement about the previously formed hollow bitumen cylinder.

Fig. 2 is a view partly in section illustrating the manner of rolling the softened bitumen on the interior of the pipe after the concrete has set.

Figures 3 and 4 are detail views in section illustrating methods of coupling or assembling the pipes.

In the first place as shewn in Figure 1, a hollow cylinder 1 of bitumen or a fabric coated with bitumen or reinforced bitumen is formed in one or more layers. Instead of bitumen any mixture having a base of bitumen, asphalt, tar, pitch, etc., may be used.

The tube so formed is erected vertically and filled with sand 2 to ensure cylindricality, whilst the lower part rests on a suitable closing disc.

Round the said sand filled tube a metallic armature or reinforcement 3 is applied capable of resisting the internal pressure to which the intended pipe is to be subjected. The exterior surface of the core is then coated with cement mortar 4 so as to encase the metallic armature 3 in the cement. Such sheathing of the metallic armature may be carried out, either by roughing or smoothing like a vertical lining for a reservoir wall, or by applying the cement mortar by means of a cement projector or by any other suitable method.

When the cement mortar is sufficiently set

the sand is removed from the interior of the core and the pipe is placed horizontally inside an oven 5 (Figure 2) heated to a suitable temperature in order to soften the bitumen and heat the cement. When the pipe is hot, a metallic cylinder, hollow or solid 7 and longer than the pipe, is placed within the latter and the hot pipe is rolled on a rolling surface 6 either in the oven itself, or when leaving the same, so that the metallic cylinder rolls the softened bitumen upon the inner wall of the reinforced cement. The metallic cylinder may, if necessary, be cooled by means of a current of cold water circulating inside, in order to prevent the bitumen from adhering thereto.

Under the rolling action of the metallic cylinder and owing to the heat of the reinforced cement pipe, the softened bitumen penetrates the interstices of the cement and adheres to the latter. Furthermore, such rolling has the advantage of doing away with any bubbles in the bitumen. The bitumen becomes thinner and extends under the effect of such rollings and runs over outside the pipe. This surplus amount of bitumen is applied with an iron to the extremities of the pipe, whilst still hot as at 8 (Fig. 3) and also on the outer part of the ends of the pipe at 9 at the parts intended to receive the joint. The pipe is then allowed to cool.

The assembly of the said pipes is effected as follows:

After they have been put in position, they are covered at the ends, with a sleeve of thin malleable metal 10 (Figures 3 and 4). A ring of U-shaped section of malleable metal 11 is placed on each side; they are then covered round with one or more steel armatures 12 and such armatures are sheathed with mortar cement 13. The cement assumes the external shape of the rings and cannot penetrate to the pipes owing to the metallic sleeve 10 which surrounds their extremities. When the reinforced cement coupling is sufficiently hard or set and strong, one or more wedges 15 of malleable metal, with the same curve as the rings 11, are engaged in the neck of the said rings and then driven in and caulked. During the caulking, the wedges open the two wings of the U-shaped rings and powerfully compress them against the walls of the pipes and the adjacent walls of the coupling, assuming the exact shape of the same, whilst producing an absolutely water-tight joint.

By the effect of caulking, the wings of the ring emerge slightly from the joint and they are turned down upon the packing wedges.

The packing may be effected with pieces of various shapes. Such wedges or pieces may be placed in the neck 14 beforehand.

In order to avoid contact between the malleable metal sleeve 10 and the rings 11, with the cement mortar of the ring, before applying the cement mortar 13, the exterior of the sleeve 10 and the rings 11 is coated with a thick solution 16 having a bituminous base or any other similar substance.

The rings 11 of malleable metal rests on the sleeve of malleable metal 10 and the sleeve 10 itself rests on the bitumen 9 of the extremities of the pipes, the result being that the water at the joint comes nowhere in contact with the cement. The actual water-tightness of the pipe is also assured by the bitumen and that of the rings and the metallic sleeve 10

When it is desired to give great flexibility to the pipes and coupling, the metallic sleeve 10 is vaulted, as shown in Figure 4. Before putting the mortar of the coupling in its position, a rubber washer 17 is placed behind the rings 11 and the exposed outer parts of the sleeve and rings are coated with a bituminous solution. Over the rubber and lead joints so prepared is placed the metallic armature of the coupling and then the cement mortar. When the latter is sufficiently hard or set, the joints are caulked with lead. The rubber washers are compressed to the utmost by the effect of caulking of the wedges 15 in the interior of the neck of the rings 11.

This method of making pipes and assembling the same is possessed of considerable advantages which may be summed up as follows:

It avoids the use of moulds, and allows any thickness in the pipes and assures perfect water-tightness, by the rolling of the bitumen or lining. This applies to the pipes. As to the joints the advantages are: water-tightness, elasticity, flexibility and the possibility of producing perfect assemblages, even when the pipes are not perfectly cylindrical, whilst the water cannot attack metals in a manner which is capable of impairing its purity, inasmuch as the sleeve of malleable metal 10 is made of tin or any other suitable malleable metal, and the cement will also have no action upon the metal, as the latter is protected by bituminous linings and rubber rings.

The tube of bitumen, or asphalt and bitumen above described is produced by applying a mixture of hot bitumen and asphalt or any other mixture with a base of bitumen, asphalt, pitch, etc., upon an extensible metallic mandrel or on an earth core. The thickness of the coat of asphalt

may be controlled by means of a regulating device running along the tube or by a hot cylinder with a shaft parallel to the mandrel rotating outside the tube. Any armature may be fixed round the tube of asphalt if necessary. Whilst the asphalt is still hot, there may be applied to the outside surface of said tube stone waste which may be imbedded therein, or also gravel or sand or any other rough substance capable of increasing adhesion between the asphalt and the cement, which substances may be previously heated, if required. The asphalt tube may be covered over with a coating of pure hot bitumen or with a cold solution of bitumen and then with a coat of sand, etc., imbedded half way into the bitumen.

Instead of using a sand core therein for the asphalt tube 1, as hereinbefore described, the asphalt and bitumen tube may be left upon the mandrel or the core on which it has been made. In such case the shaft of the mandrel or of the core is placed horizontally on suitable supports or between the centers of a lathe. Bands of expanded metal or steel or iron bars as generatrices are fixed upon the exterior of the bitumen tube. They are sheathed in cement mortar which is held round the pipe, if necessary, by means of a band of coarse or wide mesh packing cloth rolled round the tube. Upon such first coating of cement mortar, the requisite number of steel or iron wire spirals are wound for the purpose of resisting the internal pressure which the intended pipe has to bear. Such spirals are then sheathed in cement mortar and held in position by rolling over packing paper reinforced with string or a band of cloth. The thickness of the cement mortar may be regulated by means of a regulating device placed along the pipe or supported by the carriage of a lathe capable of displacement along the said pipe. The extensible mandrel may then be removed, as the interior tube of bitumen and asphalt is solidified and be filled with sand as and when the mandrel emerges so as to prevent the tube from becoming deformed. When the cement mortar is sufficiently hard or set, the packing paper or the band of cloth or fabric which holds the cement may be removed. A metallic armature may afterwards be put on the first pipe and sheathed in cement mortar in order to produce a complete pipe of greater resistance.

The bitumen tube is hot-rolled when the cement is sufficiently set. Several methods may be adopted for such hot-rolling, viz:—

1. The pipe is placed horizontally in the oven which is heated until the mixture of bitumen and asphalt is completely melted. The pipe is rolled so that the mixture may cover the whole surface. The pipe is withdrawn and with the aid of an internally

heated cylinder the bitumen and asphalt are rolled over until an approximately uniform and adequate thickness of the coating is obtained throughout. If need be, some more bitumen and asphalt are added in the pipe. Rolling is then proceeded with, with a cold cylinder, if necessary.

2. When the cement mortar has become sufficiently hard or set, the coat of bitumen and asphalt may be rolled with a solid cylinder previously heated or with a hollow cylinder heated internally by electricity, gas, etc., without the necessity of heating the pipe itself in the oven. The mixture of bitumen and asphalt becomes soft when the hot cylinder passes over it, heats the cement mortar which supports it and becomes strongly adherent to the cement mortar after cooling. The interstices in the coat of bitumen and asphalt rolled by the hot cylinder close under the action of such rolling. If necessary, the rolling is completed, in this instance, as in the order, by a cold cylinder.

3. The pipe is placed vertically in an oven heated with a metallic cylinder inside the bitumen tube. The mixture of bitumen and asphalt melts under the influence of the heat and penetrates the interstices of the cement mortar. After cooling, the metallic cylinder is slightly re-heated for the purpose of detaching it when the pipe is placed in a horizontal position, and the coat of asphalt is rolled with the said cylinder.

4. The internal asphalt tube may also be withdrawn after the cement pipe is sufficiently hard. Reinforced cement pipes which are extremely light are thus produced, but they are not perfectly watertight. They may, however, be made watertight afterwards by pouring hot bitumen inside and rolling such bitumen with an internally heated cylinder or with a hot cylinder. Any composition prepared with a view to resisting liquids, acids, gases, etc., may be substituted for bitumen.

It is also possible to make beforehand, particularly in the case of pipes of small and medium diameters, the assemblage couplings above mentioned at one end only of the pipes by caulking in situ where it is manufactured, a single joint on the said end and supplying the pipe provided with its ring. The other joint remains prepared in the empty portion of the ring which forms a champ and on the spot it is sufficient to introduce into the semi-ring of a pipe the male end of the following and then to caulk the joint supplied ready to complete the assemblage.

Instead of assembling the pipes with reinforced cement rings metallic sleeves may be used provided with a clamp on each side to introduce the bituminized or asphalted reinforced cement pipes and assemble the said pipes with the joints described in the patent.

For the purpose of putting on the asphalt

or bitumen a distributing apparatus including an electrically heated reservoir may be used.

In certain cases it may be advisable to place upon the mandrel or core for the purpose of constructing the pipe, a sheet of lead or any other metal and to solder the said sheet so as to turn it into a tube upon which the bitumen or asphalt is applied, whilst at once rolling the said bitumen and asphalt externally with a hot cylinder or hot iron. The reinforced cement casing is constructed as previously stated and asphalt or bitumen is put around the extremities and upon such extremities a lining of the same metal, as the internal tube is applied and is soldered to it. A system of pipes will thus be produced as follows, starting from the interior:—

- (1) a sheet of metal,
- (2) a coat of bitumen and asphalt,
- (3) a casing of reinforced cement mortar with an armature sufficient to resist the internal pressure to be borne by the intended pipe.

In such case the assemblage joints should be made upon the metal which covers the bitumen or asphalt at the extremities of the pipe.

Claims:

1. A process of making bituminized reinforced cement pipes without the aid of molds or the like, by first producing a hollow cylinder of reinforced bitumen or asphalt, second, introducing sand into said cylinder providing a core therefor, next applying a metallic reinforcing coil about said cylinder and finally covering said cylinder with, and imbedding said reinforcing coil in, a sheath of cement.

2. A process of making bituminized reinforced cement pipes without the aid of molds or the like, by first producing a hollow cylinder of reinforced bitumen or asphalt, second, introducing sand into said cylinder providing a core therefor, next applying a metallic reinforcing coil about said cylinder, thereafter covering said cylinder with, and imbedding said reinforcing coil in, a sheath of cement, afterwards removing the sand core and finally heating and then rolling, by means of a metallic cylinder, the inside of the bituminous cylinder, whereby the excess bitumen will be turned over the extremities and applied to the exterior portions of said cement pipe.

3. A process of making bituminized reinforced cement pipes without the aid of molds or the like, by first producing a hollow cylinder of reinforced bitumen or asphalt, second, providing a removable core therefor, next applying a metallic reinforcing coil about said cylinder, thereafter covering said cylinder with, and imbedding said reinforcing coil in, a sheath of cement and finally ap-

plying another layer of reinforced cement.
 4. A process of making bituminized reinforced cement pipes without the aid of molds or the like, by first producing a hollow cylinder of reinforced bitumen or asphalt, second, introducing sand into said cylinder providing a core therefor, next applying a metallic reinforcing coil about said cylinder, thereafter covering said cylinder with, and
 5 imbedding said reinforcing coil in, a sheath of cement, removing the core and finally hot-rolling, by means of a metallic cylinder, the

inside of the bituminous cylinder, whereby the excess bitumen will be turned over the extremities and applied to the adjacent exterior portions of the cement pipe formed around said bituminous cylinder. 15

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LÉON BILLÉ.

Witnesses:
 EMILE KLOK,
 F. NOHT.