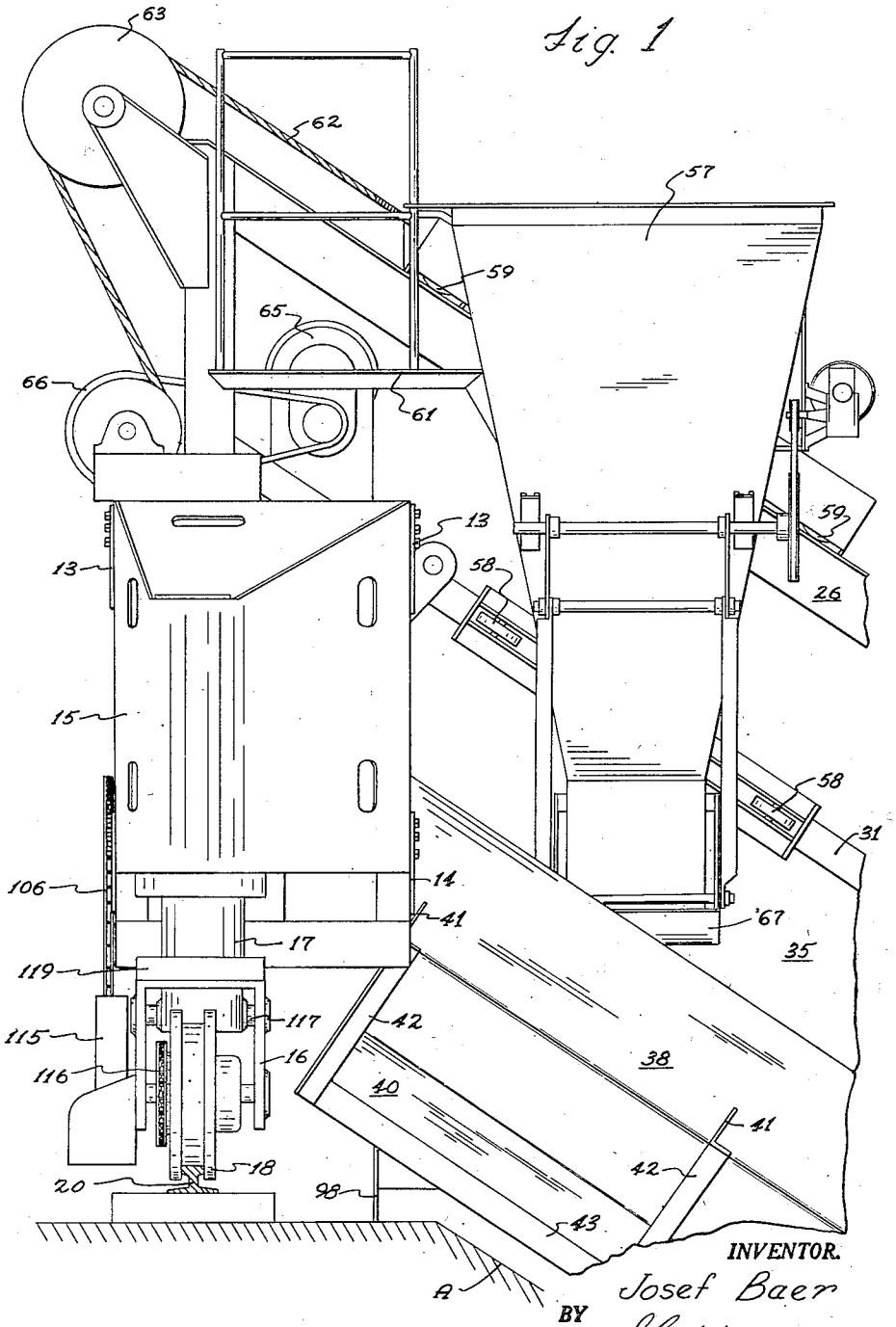
March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

Filed Dec. 20, 1954 10 Sheets-Sheet 1

Fig. 1



INVENTOR.

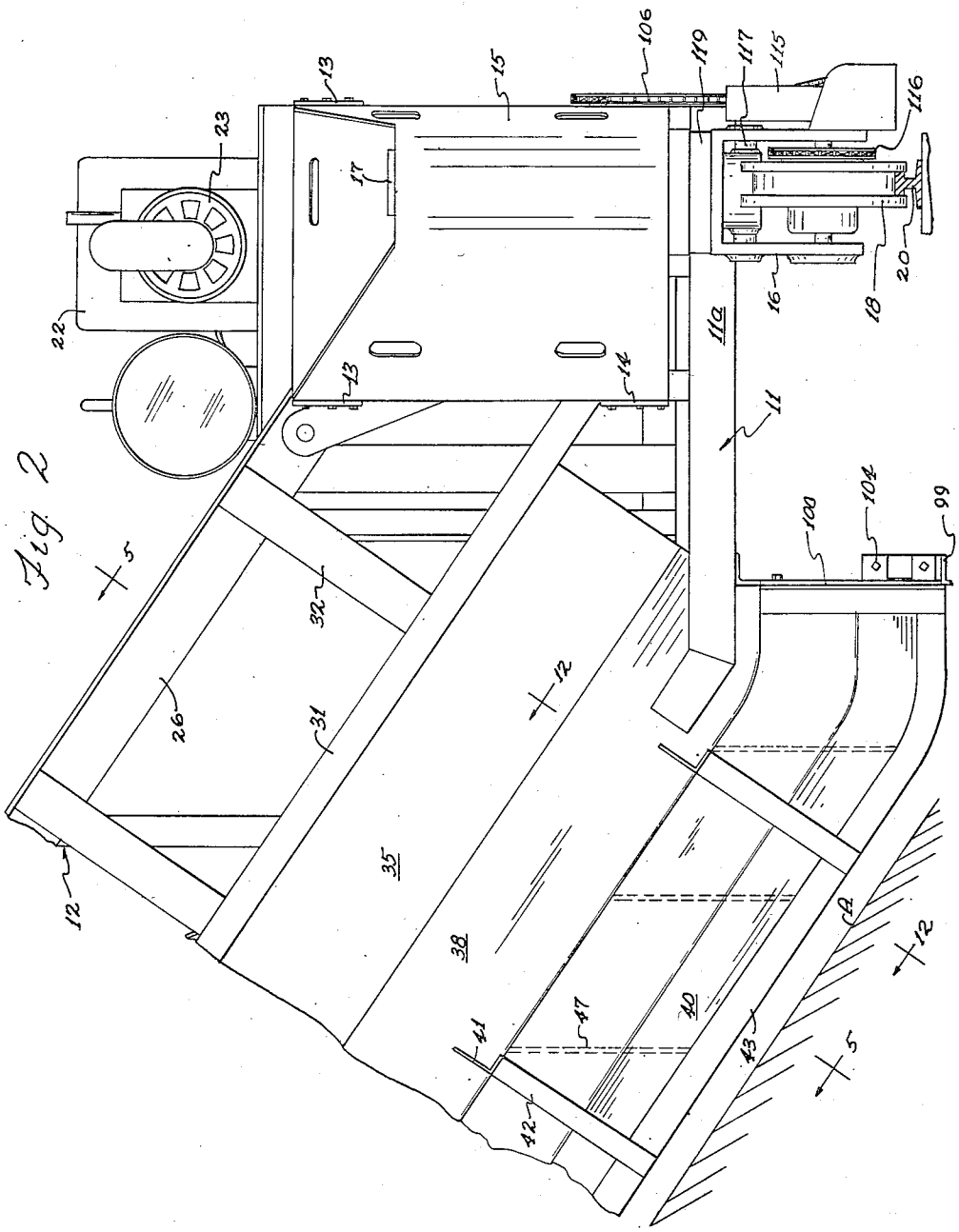
BY Josef Baer

Atty.

March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

Filed Dec. 20, 1954 10 Sheets-Sheet 2



INVENTOR.
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BY
Atty.

March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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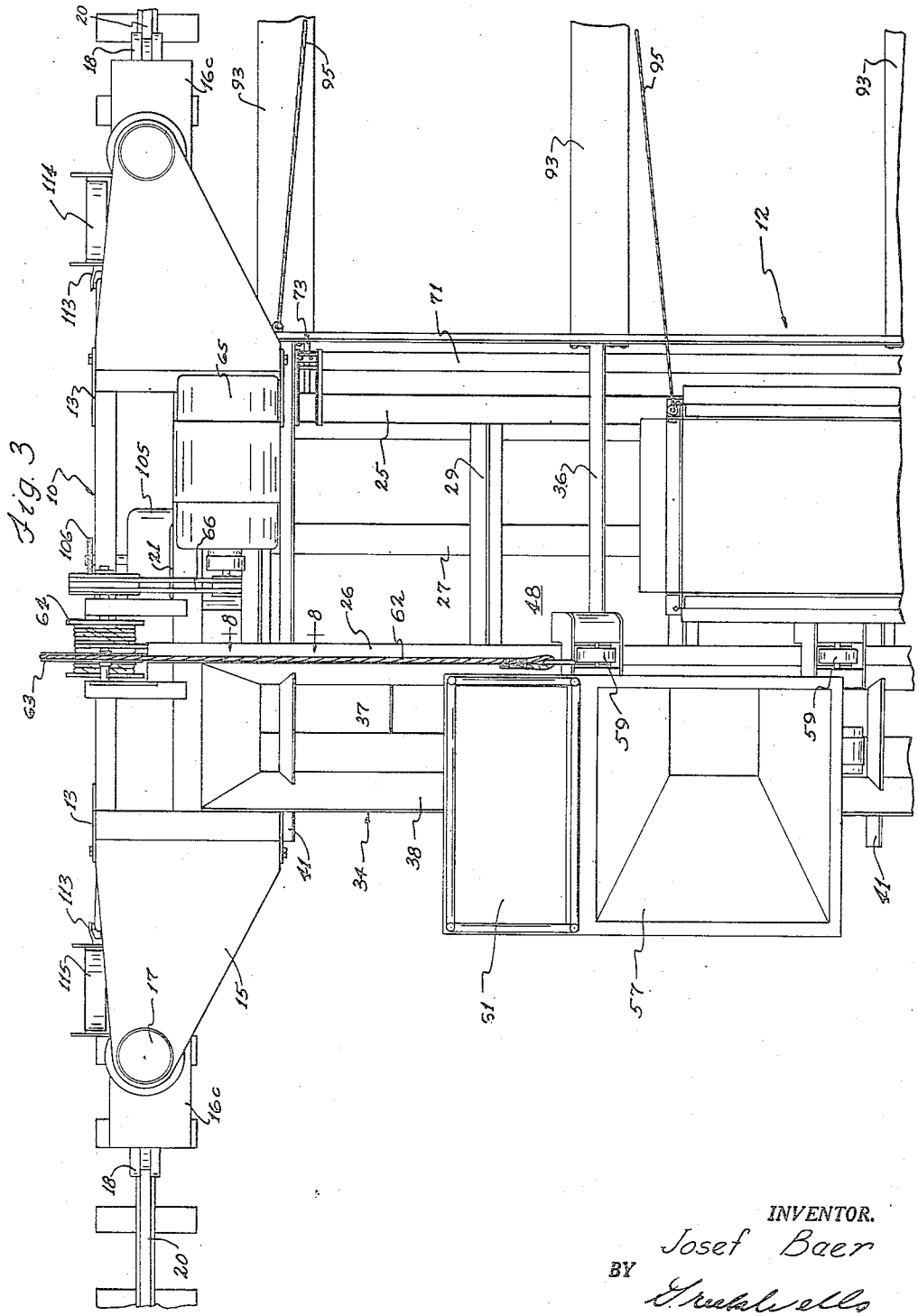


Fig. 3

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Hauskwells
Atty.

March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

Filed Dec. 20, 1954 10 Sheets-Sheet 4

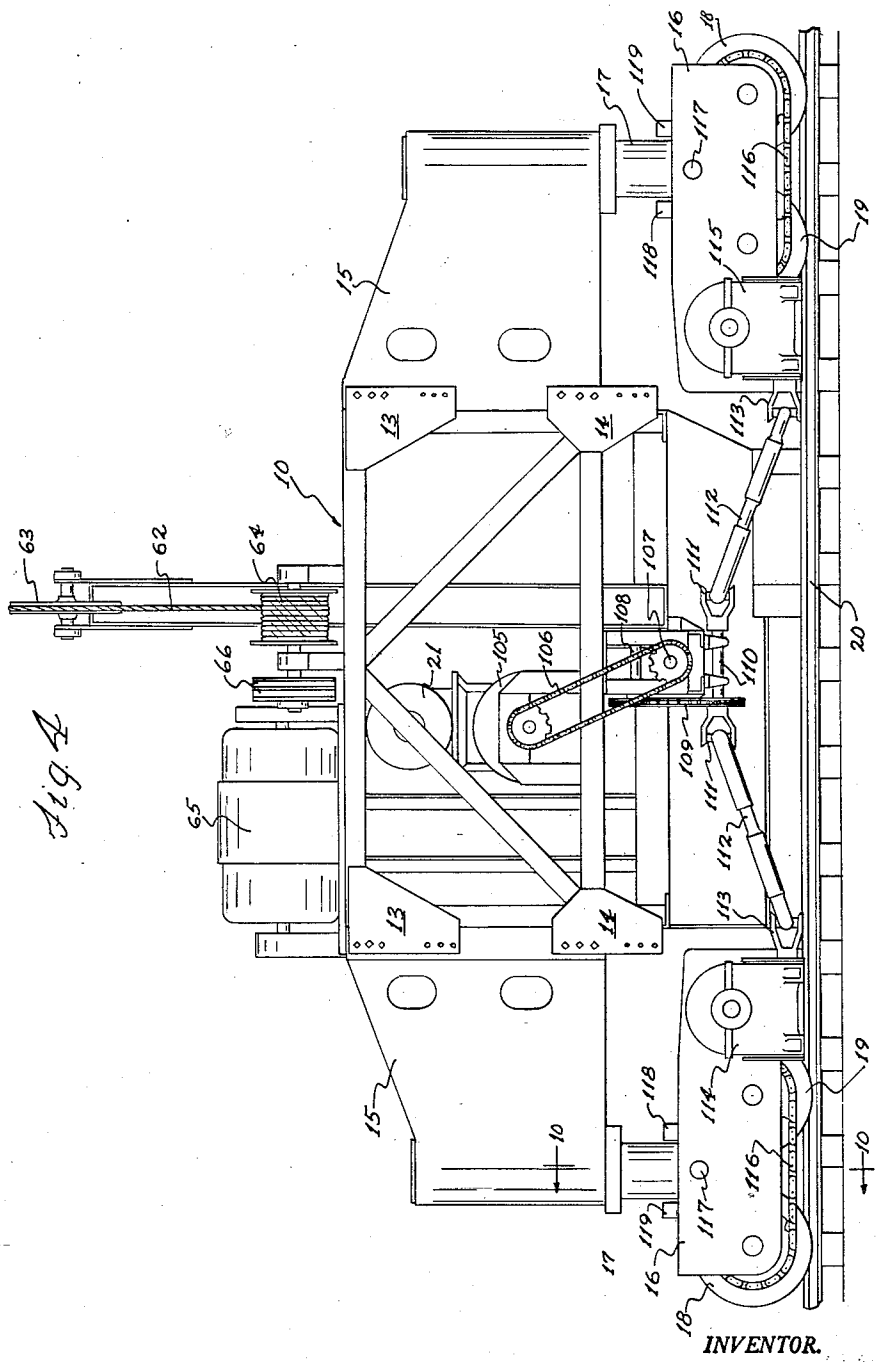


Fig 4

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March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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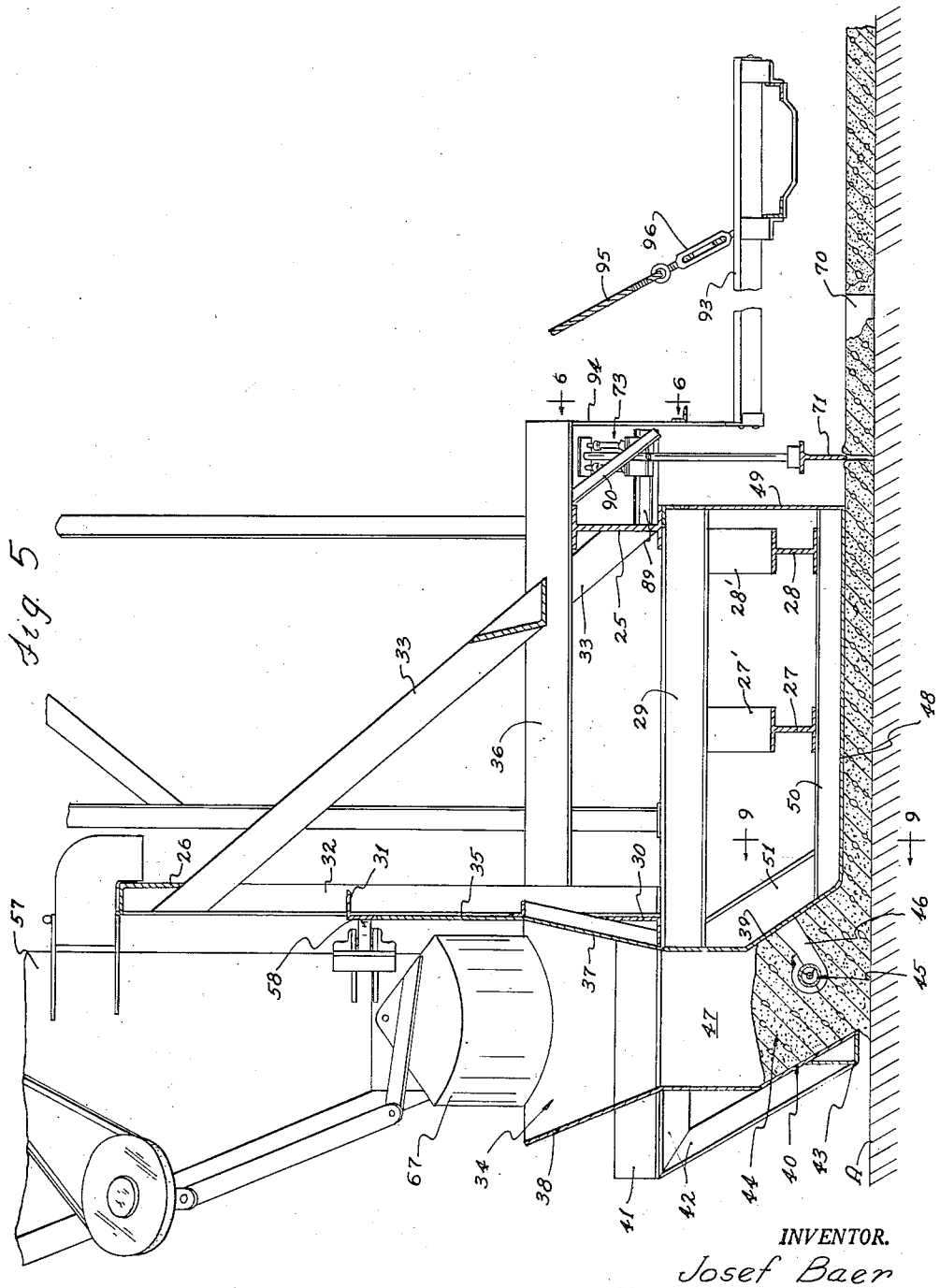


Fig. 5

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March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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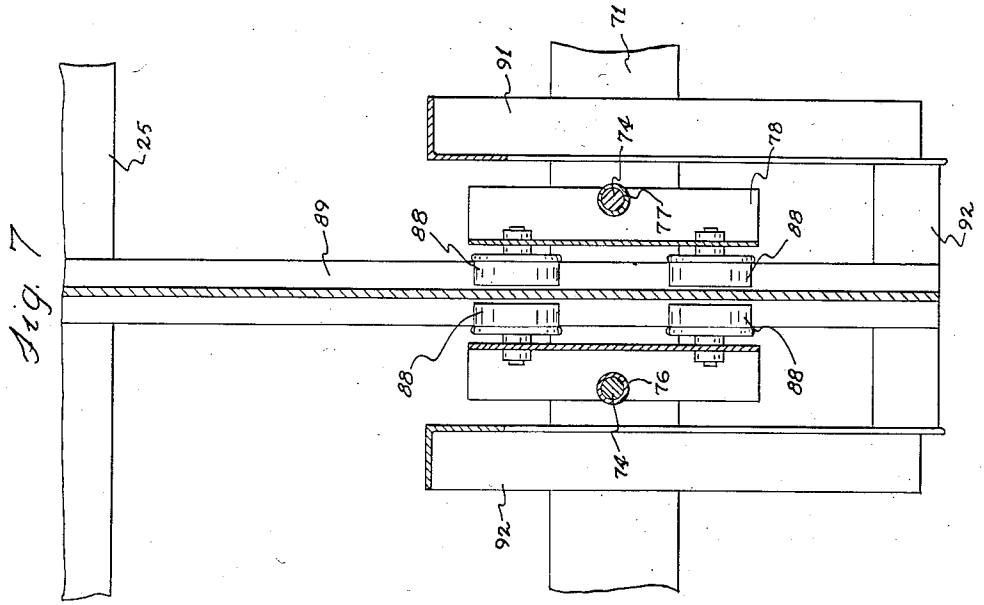


Fig. 7

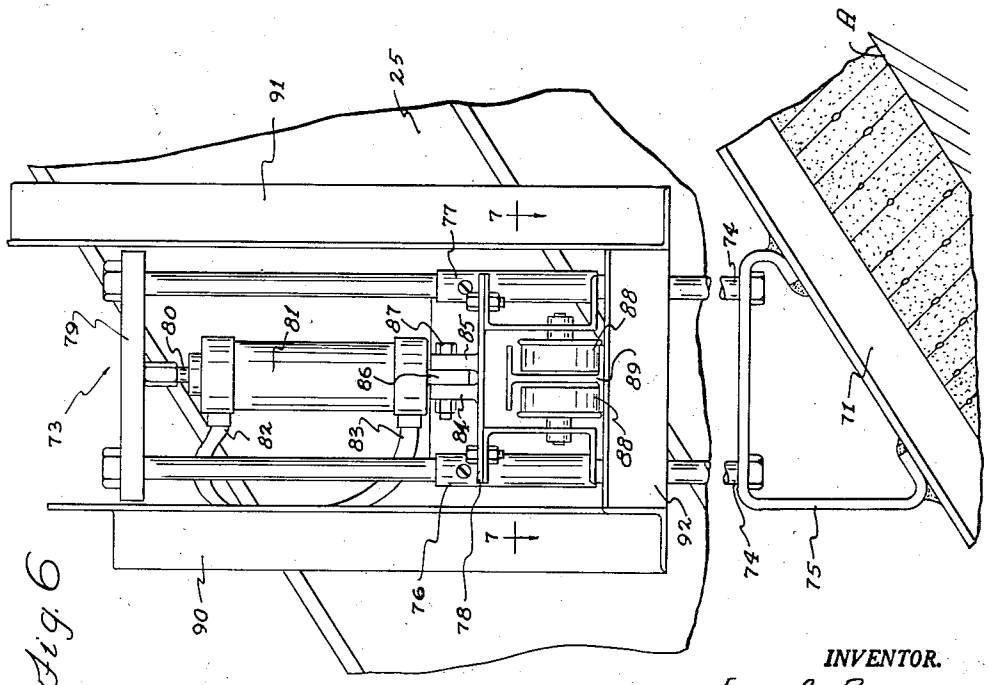


Fig. 6

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March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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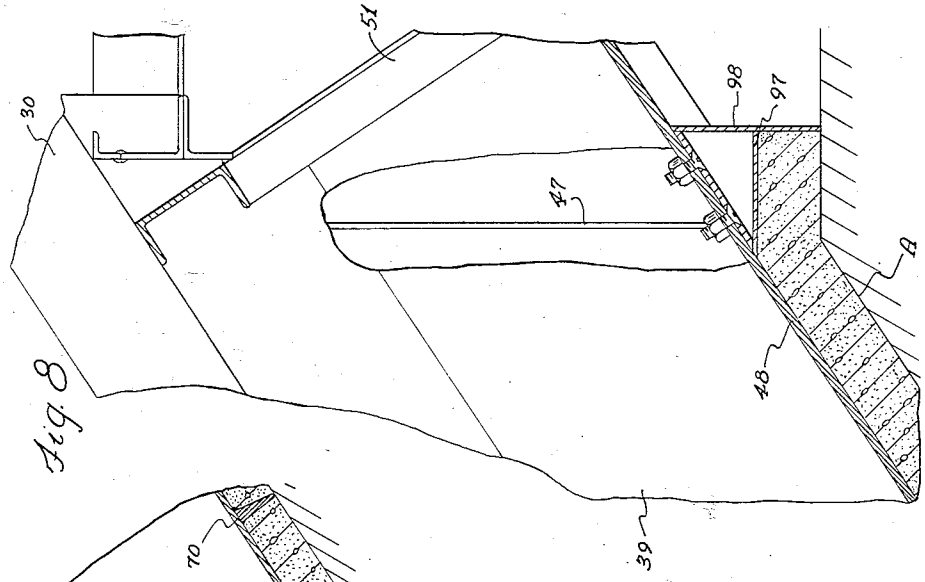


Fig. 8

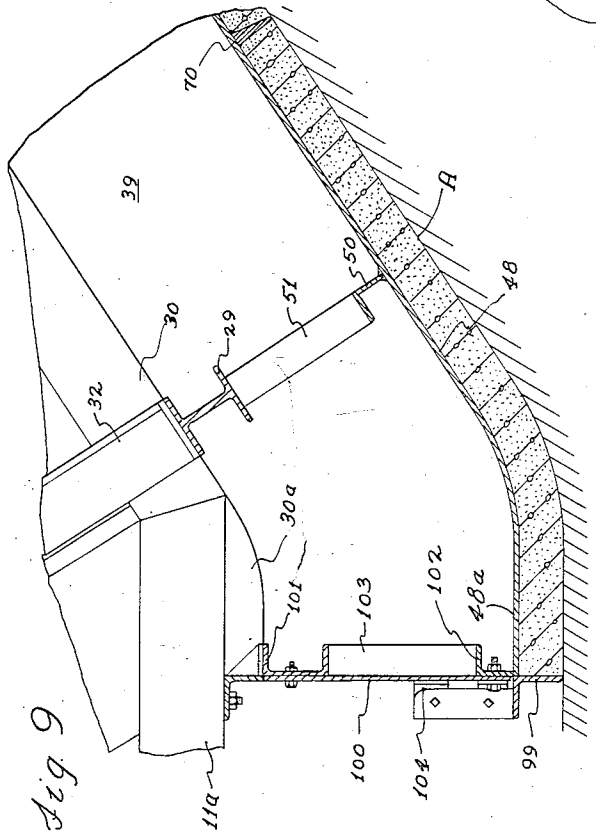


Fig. 9

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March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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Fig. 10

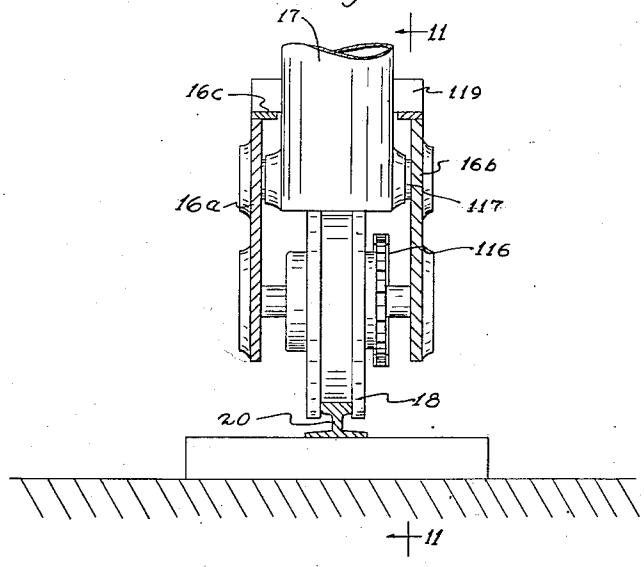
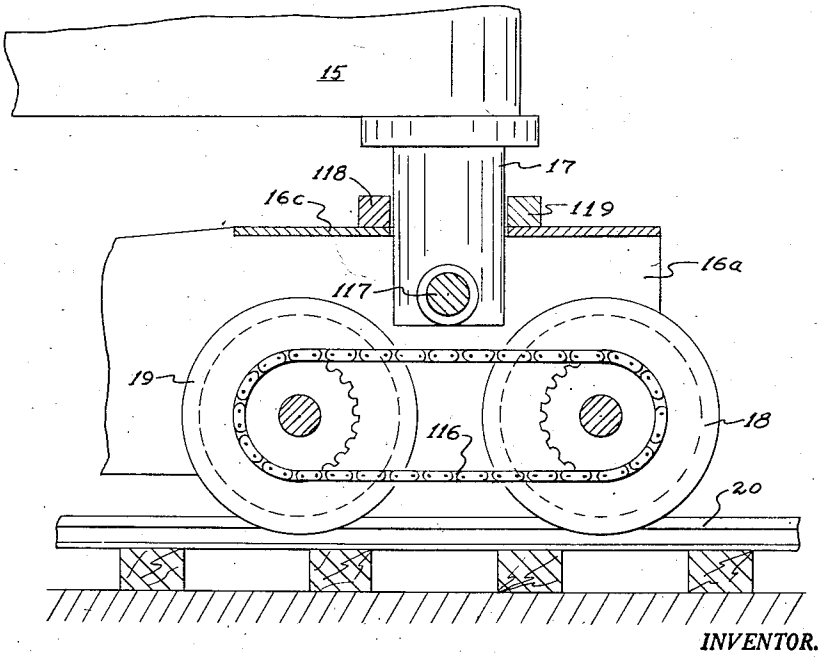


Fig. 11



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BY Josef Baer

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March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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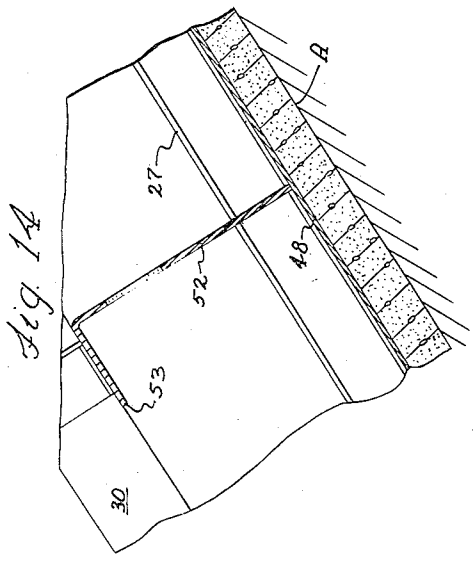


Fig. 14

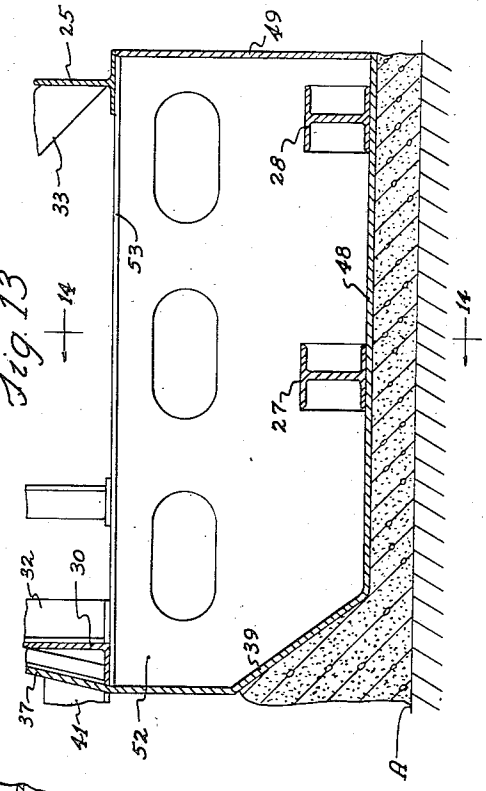


Fig. 13

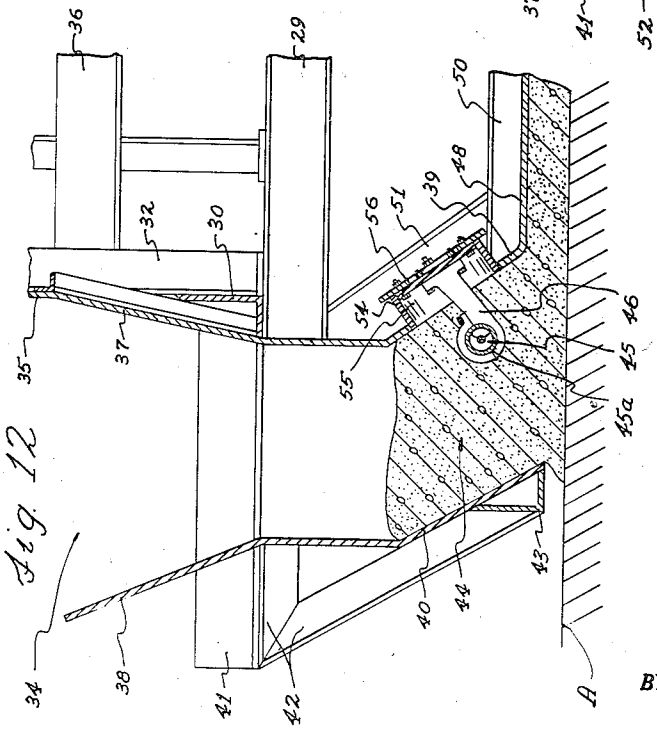


Fig. 12

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March 25, 1958 J. BAER 2,827,771

CANAL LINING MACHINE

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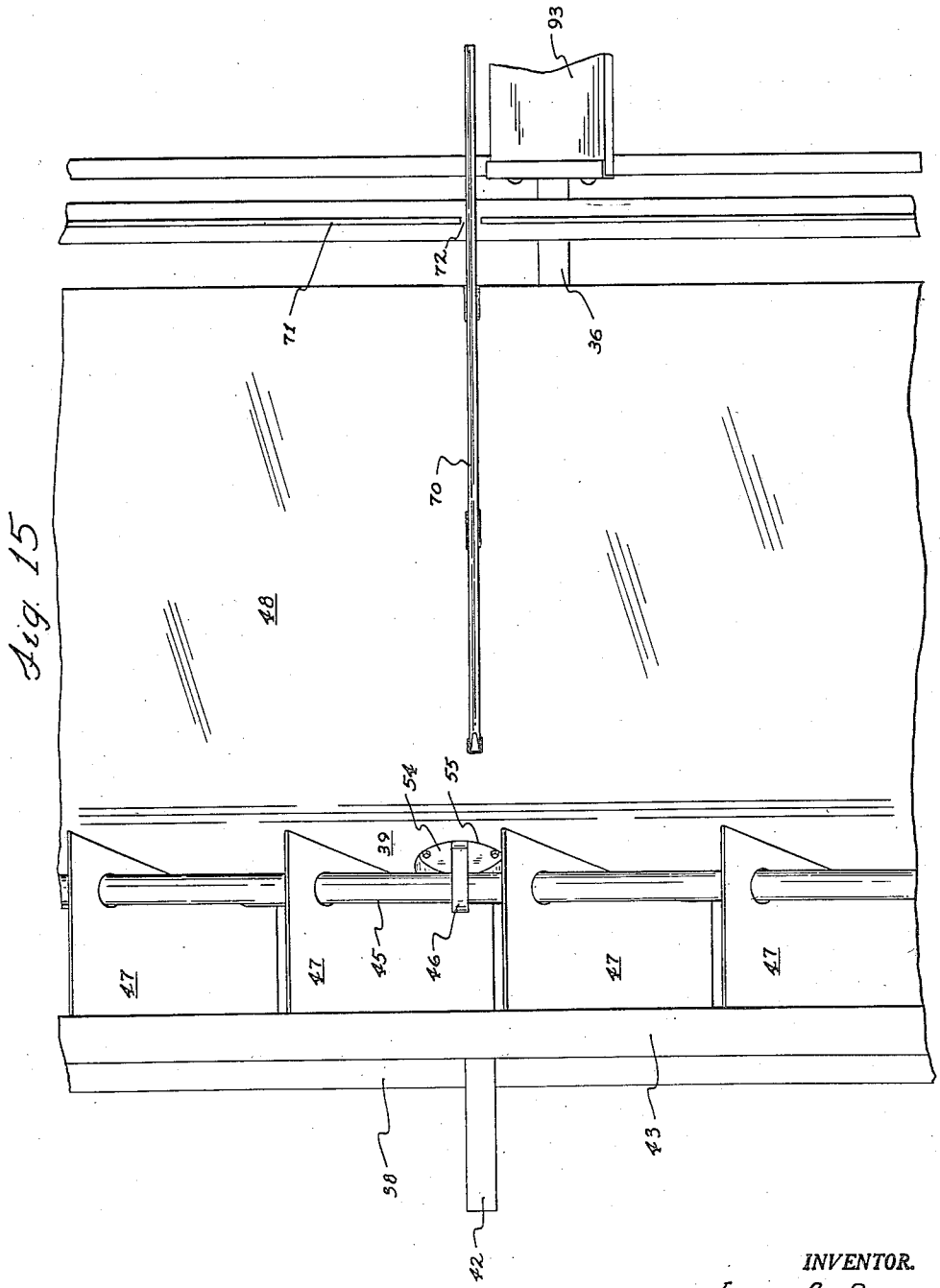


Fig. 15

INVENTOR.
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BY Brock Wells
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United States Patent Office

2,827,771

Patented Mar. 25, 1958

2,827,771

CANAL LINING MACHINE

Josef Baer, Auburn, Wash., assignor to Baer Steel Products, Inc., Auburn, Wash., a corporation of Washington

Application December 20, 1954, Serial No. 476,372

6 Claims. (Cl. 61—63)

My invention relates to improvements in a canal lining machine. It is the purpose of my invention to provide a machine which can travel along a canal that has been dug and shaped to the broad V-shaped cross sectional contour and which will as it travels, place a lining of concrete along one sloping wall of the canal, forming expansion joints both lengthwise and transversely of the concrete lining. The machine has its own power units and supporting structures which are guided lengthwise of the canal by one rail in the bottom of the canal and another rail along the canal bank at the top of the sloping wall.

In the construction of large canals that are used for distributing water in irrigation districts, the canals are first dug and filled in, in such a way as to provide a broad V-shaped channel which has a certain amount of substantially flat surface at the bottom of the channel. The sloping side walls and the bottom of this channel have to be packed and filled with a loose aggregate so that the walls will not later settle and cause difficulty. The excess aggregate is then trimmed off and the canal walls are provided with a lining, usually of concrete, to complete the construction.

My invention contemplates a canal lining machine which consists primarily of a main supporting frame that has an upper truck mounting portion, a lower truck mounting portion and an inclined framework connecting these portions. Each of the truck mounting portions has front and rear wheeled trucks for supporting them and the trucks have flanged wheels to ride on rails that are laid in the bottom of the canal and along one side of the canal. The truck mounting portions of the main frame are so constructed as to detachably mount the trucks.

The inclined framework has an open bottomed trough or hopper at its front side for admitting the concrete mix. This trough has a lower throat portion which is provided with front and rear walls that incline downwardly and rearwardly toward the framework itself. The rear wall of the throat portion has means for resiliently mounting a plurality of arms to support a vibrator that extends lengthwise of the throat portion from the top to the bottom. The rear wall of the throat portion also forms the front face of a slip form shoe which extends rearwardly beneath the inclined framework and which is secured to it. This shoe carries parallel blades on its bottom face for forming expansion joints lengthwise of the canal wall as the concrete is laid beneath the shoe. The inclined framework has a blade suspended from it behind the shoe for forming transverse expansion joints in the concrete lining as the shoe passes over it. The blades on the bottom face of the shoe extend rearwardly from the shoe so that the inclined transverse blade actually sets down over these blades. This makes it necessary to notch the transverse blade. Since the lining machine moves continuously along the canal, I provide lowering and raising members for the inclined blade

which are mounted on the framework for forward and rearward movement. When the inclined blade is lowered down into the concrete, the lowering and raising members move rearwardly with respect to the framework so that they remain stationary with respect to the lining. When the lowering and raising members lift the inclined blade, they can then be moved forwardly into position to form the next transverse expansion joint.

The trough or hopper in the front of the inclined framework is charged with concrete by a travelling bucket that is moved up and down on the inclined framework by a power unit on the upper truck mounting portion of the main frame. This bucket or hopper carries an operator's platform from which the control of the equipment is carried out.

In order that the nature and advantages of my invention will be more clearly understood, a specific example thereof will be described hereinafter in connection with the accompanying drawings which illustrate a preferred form of the invention. It should be understood, however, that the drawings and description are illustrative only and are not intended to limit the invention except insofar as it is limited by the claims.

In the drawings:

Figure 1 is a front view of the upper portion of my canal lining machine showing the inclined framework broken off;

Figure 2 is a front view of the lower portion of the canal lining machine, it being understood that the portions shown in Figures 1 and 2 are joined by the inclined framework which is varied in length according to the length of the sloping canal wall;

Figure 3 is a top plan view looking down on the mechanism shown in Figure 1;

Figure 4 is a view in side elevation of the upper end of the canal lining machine, looking at Figure 3 from the left hand side but with the concrete supplying bucket lowered out of sight;

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 2;

Figure 6 is an enlarged fragmentary sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a sectional view taken on the line 7—7 of Figure 6;

Figure 8 is an enlarged fragmentary sectional view taken on the line 8—8 of Figure 3;

Figure 9 is a sectional view taken substantially on the line 9—9 of Figure 5 at the lower end of the machine;

Figure 10 is an enlarged fragmentary sectional view taken on the line 10—10 of Figure 4;

Figure 11 is a sectional view taken on the line 11—11 of Figure 10;

Figure 12 is an enlarged fragmentary sectional view taken on the line 12—12 of Figure 2, illustrating the mounting of the vibrator in the throat of the concrete distributing trough or hopper;

Figure 13 is a transverse sectional view on an enlarged scale, taken substantially on the line 5—5 of Figure 2 but showing a modified slip form shoe construction;

Figure 14 is a sectional view taken on the line 14—14 of Figure 13; and

Figure 15 is a bottom plan view of the shoe and hopper construction.

Referring now in particular to Figures 1 to 5 inclusive of the drawings, my canal lining machine comprises a main frame which is made up of an upper truck mounting portion 10, a lower truck mounting portion 11 and an inclined framework 12 which extends between the portions 10 and 11 and connects them together. Each of the portions 10 and 11 have upper and lower gusset plates 13 and 14 at the front and rear thereof on both

sides for mounting brackets 15 that are supported on wheeled trucks 16 by pedestals 17. The wheeled trucks 16, two for the upper truck mounting portion 10 and two for the lower truck mounting portion 11, all have flanged wheels 18 and 19 for running on rails 20 that are laid along the bottom of the canal and along the side of the canal at the top of the sloping wall.

The wheels 18 and 19 of the truck 16 are driven in a suitable manner from power units such as the electric motor indicated at 21 in Figure 4 of the drawings, so as to propel the canal lining machine lengthwise of the canal at a slow regular rate. The entire power necessary for the operation of the machine is obtained from an engine 22 which is mounted on the lower truck mounting portion 11 of the main frame. This engine 22 drives a suitable generator 23 which supplies electric current for the motors 21 and other power consuming devices which are necessary in the operation of the machine.

As illustrated in cross section in Figure 5 of the drawings, the inclined framework 12 is constructed of I-beams and angle irons. A main rear beam 25 extends from the lower truck mounting portion 11 to the upper truck mounting portion 10. An upper front angle iron 26 likewise extends the length of the inclined framework and joins the two truck mounting portions together. Two slip form shoe backing beams 27 and 28 extend lengthwise of the inclined framework 12 and form a part thereof, these beams being connected to cross beams 29 that extend across the framework 12 at intervals. An angle iron 30, spaced in front of the beam 25 at the same level provides a front support for the cross beams 29. The angle iron 30 extends the length of the framework 12. Another angle iron 31 between the angle iron 30 and 25 also extends the length of the framework 12. The framework 12 is further braced by diagonal braces 33 which connect at intervals the beam 25 to the angle iron 26 and the uprights 32 at intervals.

Referring now to the hopper 34 which is used to supply concrete for the lining, this hopper is mounted at the front of the framework 12. A rear wall of the hopper 34 comprises an upper wall portion 35 which extends downwardly from the angle iron 31 to cross braces 36 that are mounted on top of the beam 25. The rear wall then has an intermediate section 37 which extends downwardly in front of the angle iron 30 and the cross beams 29. The hopper 34 has a front wall 38 spaced from the wall 37 and these two walls have downwardly and rearwardly sloping portions 39 and 40 which provide a throat through which the concrete is fed to the sloping wall A of the canal. Supporting frame members 41 and 42, which are secured to the framework 12, carry a front lip member 43 which comprises an angle iron that runs the length of the sloping canal wall A and terminates slightly above it as indicated in Figure 5. The throat portion 44 of the hopper 34 contains a vibrator 45 which is suspended within the throat portion 44 by a plurality of arms 46 that are resiliently mounted on the rear wall 39 of the throat 44. In order to keep the concrete from flowing down along the slope, a plurality of vertical partitions 47 are provided in the throat and in the hopper. These partitions 47 terminate at the level of the frame members 41 which extend across the hopper and are joined to the angle iron frame member 30 to serve as supports for the frame members 42 and the hopper 34. A shoe 48 is formed integrally with the rear wall 39 of the throat 44 and extends rearwardly beneath the framework 12. This shoe is supported by the beams 27 and 28 which are connected to the cross beams 29 by suspension members 27' and 28'. At the rear of the shoe 48 a closing panel 49 extends upwardly over the rear ends of the beams 29. In the form of the shoe shown in Figure 5, the shoe 48 is braced at intervals by frame members 50 that are welded to the lower flanges of the beams 27 and 28 and to the shoe 48. Other frame members 51 are welded to the rear wall 39 and extend from the frame members 50 up to the cross frame 29 so as to support the rear wall 38 against the pressure forces of spreading the concrete.

In the form of the invention shown in Figures 13 and 14, the frame members 50 and 51 are replaced by plates 52 which are welded to the shoe 48 and which are bent over at their tops to provide flanges 53 that are welded to the beam 25 and the angle iron frame member 30. With this construction the cross beams 29 are not needed and the longitudinal beams 27 and 28 are welded to the plates 52 and rest directly on the shoe 48. In other words, the plates 52 replace the parts 27', 28', 29, 50 and 51 in order to provide a rigid connection between the shoe 48 and the members 25 and 30 of the framework 12.

The vibrator 45 is of a well known construction and comprises a tube 45a with a suitable means for vibrating the tube, such for example, as that shown in the Wood patent, No. 2,094,974. The arms 46, which carry the vibrator 45, are resiliently mounted by supporting rubber plates 54 which are set in wells 55 at intervals along the rear wall 39 of the throat 44 of the hopper 34. These rubber supporting plates 54 are carried by cap members 56 on the wells 55 and provide a resilient support for the arms 46.

Concrete is supplied to the hopper 34 by a bucket 57 which travels up and down the framework 12. The bucket has rollers 58 thereon which ride on the angle iron frame member 31, additional rollers 59 that ride on the top of the frame member 26 and rollers 60 that engage the face of the frame member 26 on the opposite side from the bucket 57. The bucket 57 has a platform 61 thereon upon which the operator for the bucket may stand. This platform preferably also has the control means by which the travel of the bucket 57 along the hopper 34 is controlled. The bucket 57 is moved along the hopper 34 by a cable 62 which passes over a pulley 63 and down to a winch 64 that is mounted on the upper truck frame 10. The winch 64 is driven by a motor 65 and a belt drive 66 illustrated best in Figures 3 and 4. The operator keeps the hopper 34 supplied with concrete by moving the bucket 57 along the hopper and opening a dump gate 67 of the bucket 57 to deliver the concrete wherever it is needed. The details of the mechanism for opening the dump gate 67 are well known so they will not be further described herein.

Referring now to Figures 5, 6, 7 and 15 in particular, the means by which the expansion joints are provided in the concrete lining as it is laid will be described. The shoe 48 rides over the concrete and spreads it as the machine is moved along the canal. In order to form the expansion grooves lengthwise of the canal wall A, I provide a plurality of blades 70 at intervals on the bottom of the shoe 48. These blades are tapered bars that are tack welded to the shoe 48. They begin about one-third of the way back from the junction of the shoe 48 with the wall 39 and they extend rearwardly beyond the shoe 48 as illustrated in Figures 5 and 15. In order to form the transverse expansion joints at intervals along the length of the canal wall, I provide an inclined blade 71 at the rear of the framework 12. This inclined blade 71 is suspended from the inclined framework 12 behind the shoe 48 and is notched as indicated at 72 so as to fit down over the blades 70 wherever the inclined blade 71 crosses a blade 70. Blade lowering and raising members 73 are provided on the framework 12 at intervals throughout the length of the inclined blade 71. One of these members is illustrated in detail in Figures 6 and 7, and since the members are all alike, it is believed a description of one member will suffice. The inclined blade 71 has lifting rods 74 secured to it at intervals by brackets 75 fixed on the blade 71. The rods 74 project upwardly through a pair of guides 76 and 77 on a wheeled framework 78 and are connected together at their upper ends by a cross bar 79. The cross bar 79 is supported on a piston rod 80 of an hydraulic jack 81. The jack 81 has connections 82 and 83 for supplying fluid under pressure to it for moving

the piston rod 80 up and down. The jack 81 is supported on the framework 78 by lugs 84 and 85 on the framework, a lug 86 on the jack and a connecting bolt 87. The wheeled framework 78 has four wheels 88 that support it on a rearwardly extending frame member 89 which is secured to the beam member 25 of the framework 12. The frame member 89 is in the form of an I-beam and is braced by braces 90 and 91 which connect to a cross bar 92 beneath the outer end of the frame member. The braces 90 and 91 extend upwardly and are secured on the cross frame members 36.

In operation the inclined blade 71 is pushed down into the concrete at the desired intervals by supplying fluid under pressure to the jack 81. Owing to the mounting of the framework 78 so that it can roll along the member 89 when the blade 71 is pushed down into the concrete, it remains stationary in the concrete while the lining machine continues to move forward, the wheel 88 rolling along the member 89 rearwardly to permit this. As soon as the blade 71 is lifted by reversing the fluid supply to the jack 81, the blade can be manually shoved forward until it is against the rear closure wall 49 of the shoe 48. The machine can thus form both longitudinal and transverse expansion joints in the lining of the canal wall as the lining machine travels forward.

I provide platforms 93 rearwardly of the supporting structure for the inclined blade 71 in order that workmen may clean out the expansion joints where the two blades 70 and 71 intersect each other. There is always a certain amount of cleaning that has to be done at this point in order to prepare the expansion joints to receive their fillings. The platforms 93 are suspended from the framework 12 by bars 94 on the rear ends of the cross frame members 36 and cables 95 extend upwardly to the framework 12. The cables 95 include turn buckles 96 connecting them to the platforms 93 so that they may be adjusted.

Referring now to Figure 8, this figure illustrates the construction at the upper end of the shoe 48 by which the top curb is formed at the top of the sloping wall A of the canal. A horizontal extension plate 97 is attached to the shoe 48 and extends horizontally outwardly to an end plate 98 which forms the stop for the upper end of the concrete lining in such a fashion as to leave a horizontal portion of the lining at the top of the canal.

Figure 9 illustrates the way in which the shoe 48 is curved to provide a horizontal portion 48*a* at the lower end of the sloping canal wall so as to extend the concrete lining out on the flat bottom portion B of the canal. A curb forming stop 99 is secured at the end of the shoe portion 48*a* so as to form a stop for the concrete lining at this point. A closure plate 100 extends upwardly from the member 99 and is anchored to the bottom frame member 11*a* of the lower truck mounting portion 11. There is an upper channel member 101 attached to the lower end of the frame member 30 that forms a part of the framework 12. This lower end 30*a* of the frame member 30 is bent to extend substantially horizontally as shown in Figure 9. An angle iron 102 is secured to the channel 101 by a depending strap 103 and is also welded to the horizontal extension 48*a* of the shoe 48. The plate 100 is bolted to the channel 101 and the angle iron 102 and to the frame member 11*a*, and the member 99 is fastened to a flange 104 that is welded on the plate 100 so that the member 99 can be taken off if desired. The plate 100 can also be taken off to provide access to the shoe 48 at the lower end.

Referring now to the trucks 16 and particularly to Figures 1 to 4, inclusive, these trucks are driven from the motors 21 in the same fashion for both the upper trucks and lower trucks. The motor 21 is connected through a reduction gearing 105 to a drive chain 106 which drives a cross shaft 107 that in turn drives another shaft 108 which is connected by a chain drive 109 to a shaft 110. The shaft 110 is connected by universal joint 111, extensible shafts 112 and universal joints 113 to gear boxes 114 and 115 which supply power to the adjacent wheels 19 of the truck 16. The outer wheels 18 of the truck 16 are also driven by a chain drive 116 that connects the wheels 18 and 19. Current for the motors 21 is of course, supplied from the generator 23 which is mounted on the lower truck mounting portion 11 of the main frame.

One of the characteristics of this lining machine is that it depends upon the weight of the machine pressing down on the shoe 48 to spread the concrete that is fed down through the hopper 34 over the canal wall. The tendency of the shoe is to be lifted at its forward edge by the pressure on the cement. The weight of the machine is normally adequate to keep the shoe substantially level with the canal wall but additional weights may be used if desired. The trucks however, must follow any unevenness that exists between the rail 20 and the slope of the canal. It is necessary therefore to have some ability for the trucks to rock on their pedestals while at the same time they must pull the frame wall. The pedestals 17 of course are held rigidly to the frame by the members 15. To permit the trucks to rock, I pivot truck 16 to the pedestal 17 by providing the lower end of the pedestal with a cross shaft 117. This shaft is fixed in the two side walls 16*a* and 16*b* of the truck 16 and pivots the pedestal 17. Then on top of the truck 16 I provide the cross wall 16*c* with reenforcing stop bars 118 and 119 so as to limit the rocking movements that the trucks may take with respect to the pedestal 17.

The general operation of the machine will, it is believed, be understood from the foregoing description. The trucks carry the machine along the canal at a slow rate of speed of the order of about three or three and a half feet per minute so that by the time the shoe 48 is moved off the lining, there is a sufficient set of the concrete as compacted by the weight of the shoe for it to remain in place. The concrete mix used is quite dry so that it is necessary to have the vibrating mechanism in the throat 44 to keep the concrete fluid in the hopper and cause it to feed down over the shoe 48. When the shoe passes over the lining, the blades 70 keep their expansion joints open until after the blade 71 has formed the transverse expansion joint. All the cleaning out that the operator has to do is to clean out the small amount of concrete that is left where the blade 71 extends down on both sides of the blades 70. The blades 70 and 71 are tapered so that there will always be a slight amount of material to be cleaned out at this point.

It is believed that the nature and advantages of my invention will be clear from the foregoing description.

Having thus described my invention, I claim:

1. In a canal lining machine, a main supporting frame comprising an upper wheeled truck mounting portion being positioned on the upper edge of a canal, a lower wheeled truck mounting portion being positioned on the bottom of the canal and an inclined framework connecting said portions, front and rear wheeled trucks supporting each of said portions, each truck having flanged wheels for supporting the trucks on rails; an open bottomed hopper trough carried by said inclined framework at its front side, said trough having a lower throat portion provided with front and rear walls inclined downwardly toward the framework, a vibrator extending lengthwise of the throat portion, arms resiliently mounted to the rear wall of said throat portion and suspending the vibrator between said front and rear walls, a slip form shoe comprising a continuation of said rear wall, extending rearwardly beneath and secured to said inclined framework, parallel blades secured to the bottom face of said shoe and extending rearwardly therefrom, an inclined blade suspended from said framework behind the shoe and extending substantially parallel to the inclined framework,

and blade lowering and raising members mounted on said framework for forward and rearward movement with respect to the framework and carrying said inclined blade, the blade lowering and raising members operable to project the inclined blade into and out of the concrete.

2. In a canal lining machine, a main supporting frame comprising an upper wheeled truck mounting portion being positioned on the upper edge of a canal, a lower wheeled truck mounting portion being positioned on the bottom of the canal and an inclined framework connecting said portions, front and rear wheeled trucks supporting each of said portions, each truck having flanged wheels for supporting the trucks on rails, power means driving the wheels, a hopper trough at the front of said inclined framework, adapted to receive and distribute concrete on a canal wall over which the inclined framework is drawn, a slip form shoe extending rearwardly beneath and secured to said inclined framework, parallel blades secured to the bottom face of said shoe and extending rearwardly therefrom, an inclined blade suspended from said framework behind the shoe and extending substantially parallel to the inclined framework, and blade lowering and raising members mounted on said framework for forward and rearward movement with respect to the framework and carrying said inclined blade, the blade lowering and raising members operable to project the inclined blade into and out of the concrete.

3. In a canal lining machine, a main supporting frame comprising an upper wheel supported portion being positioned on the upper edge of a canal bank and a lower wheel supported portion being positioned on the bottom of the canal and an inclined framework connecting said portions and adapted to move over a sloping wall of a canal when the wheel supported portions are moved along a canal bank and the canal bottom respectively, a slip form shoe on the bottom of said framework, a hopper trough on the framework in front of the shoe for feeding concrete beneath the shoe, parallel blades secured to the bottom face of said shoe and extending rearwardly therefrom, an inclined blade suspended from said framework behind the shoe and extending substantially parallel to the inclined framework, and blade lowering and raising members mounted on said framework for forward and rearward movement with respect to the framework and carrying said inclined blade the blade lowering and raising members operable to project the inclined blade into and out of the concrete.

4. In a canal lining machine, a main supporting frame comprising an upper wheel supported portion being positioned on the upper edge of a canal bank and a lower wheel supported portion being positioned on the bottom of the canal and an inclined framework connecting said portions and adapted to move over a sloping wall of a canal when the wheel supported portions are moved along a canal bank and the canal bottom respectively, power driven means on the upper wheel supported portion operable to move it along the canal bank, power driven means on the lower wheel supported portion operable to move it along the canal bottom, a slip form shoe on the bottom of said framework, a hopper trough on the framework in front of the shoe for feeding concrete beneath the shoe, parallel blades secured to the bottom face of said shoe and extending rearwardly therefrom, an inclined blade suspended from said framework behind the shoe and extending substantially parallel to the inclined framework, and blade lowering and raising members mounted on said framework for forward and rearward movement with respect to the framework and carrying said inclined blade, the inclined blade lowering and raising members operable to project the blade into and out of the concrete.

5. In a canal lining machine, a main supporting frame comprising an upper wheel supported portion being positioned on the upper edge of a canal bank and a lower wheel supported portion being positioned on the bottom of the canal and an inclined framework connecting said portions and adapted to move over a sloping wall of a canal when the wheel supported portions are moved along a canal bank and the canal bottom respectively, a slip form shoe on the bottom of said framework, a hopper trough on the framework in front of the shoe for feeding concrete beneath the shoe, parallel blades secured to the bottom face of said shoe and extending rearwardly therefrom, an inclined blade suspended from said framework behind the shoe and extending substantially parallel to the inclined framework, and blade lowering and raising members mounted on said framework for forward and rearward movement with respect to the framework and carrying said inclined blade, the blade lowering and raising members operable to project the inclined blade into and out of the concrete, the inclined blade having notches therein vertically aligned with the blades secured to the bottom of the slip form shoe.

6. In a canal lining machine, a main supporting frame comprising an upper wheel supported portion being positioned on the upper edge of a canal bank and a lower wheel supported portion being positioned on the bottom of the canal and an inclined framework connecting said portions and adapted to move over a sloping wall of a canal when the wheel supported portions are moved along a canal bank and the canal bottom respectively, wheels supporting said portions, power driven means on each of the portions connected to the wheels for that portion to drive them independently of the wheels supporting the other portion, concrete spreading and packing means on said framework operable to spread and press down a layer of concrete on the sloping wall of the canal as the machine is moved along the canal, said means comprising a slip form shoe having a depending curb forming stop at its upper and lower ends, parallel blades on the bottom of the shoe operable to form expansion grooves in the concrete layer running lengthwise of the canal as the machine moves along the canal, blade means at the rear of the framework for forming transverse expansion grooves in the concrete layer, lowering and raising means for said blade means, and supports mounting said lowering and raising means for movement toward and away from the shoe whereby the blade means can be pressed into the concrete layer and lifted out while the machine is moving.

References Cited in the file of this patent

UNITED STATES PATENTS

1,982,387	Heltzel	Nov. 27, 1934
2,090,959	Jackson	Aug. 24, 1937
2,094,974	Wood	Oct. 5, 1937
2,187,080	Heltzel	Jan. 16, 1940
2,598,903	Gebhard	June 3, 1952