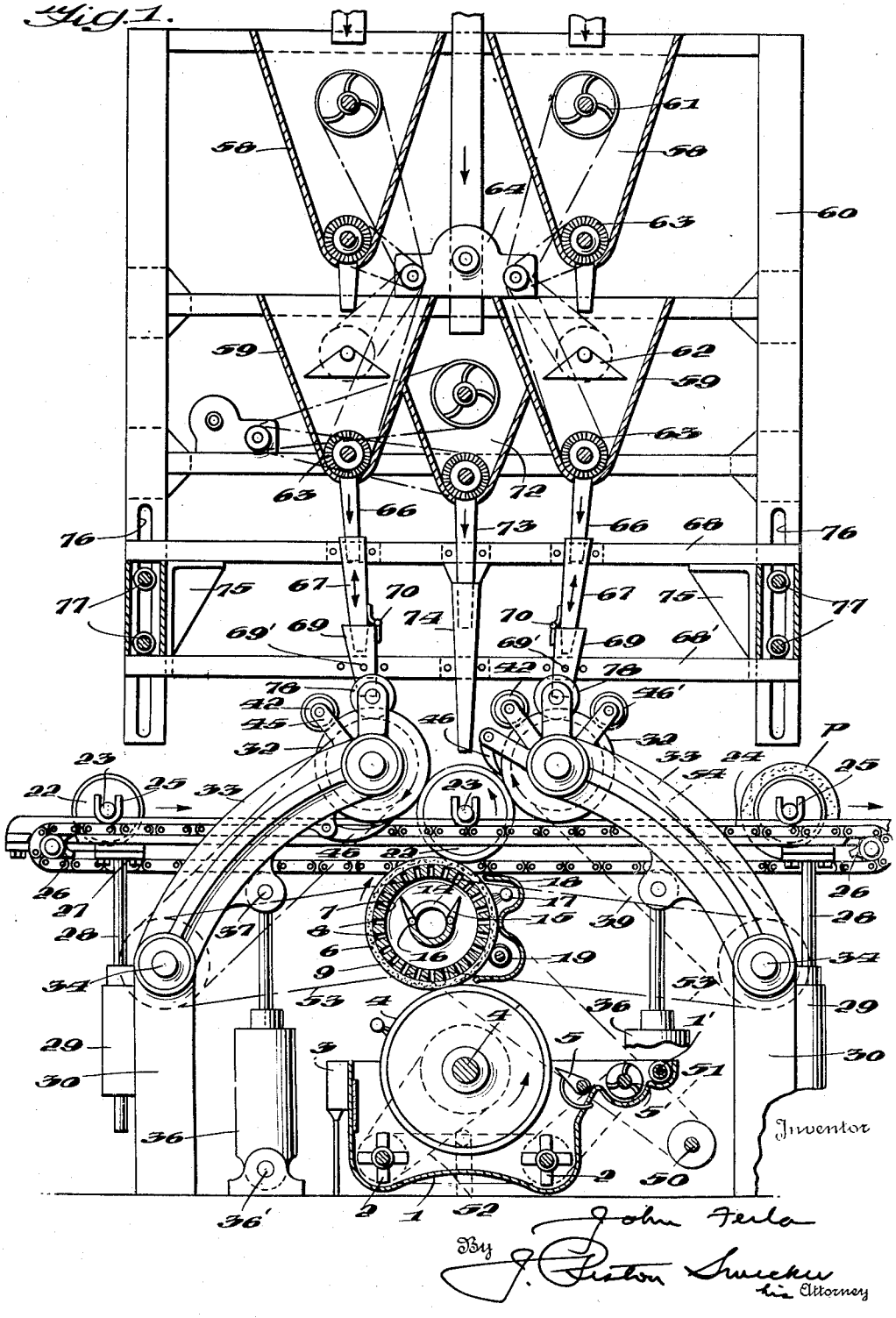
Oct. 31, 1950 J. FERLA 2,528,353

APPARATUS FOR PRODUCING PIPES

Filed Nov. 3, 1944 4 Sheets-Sheet 1

Fig. 1.



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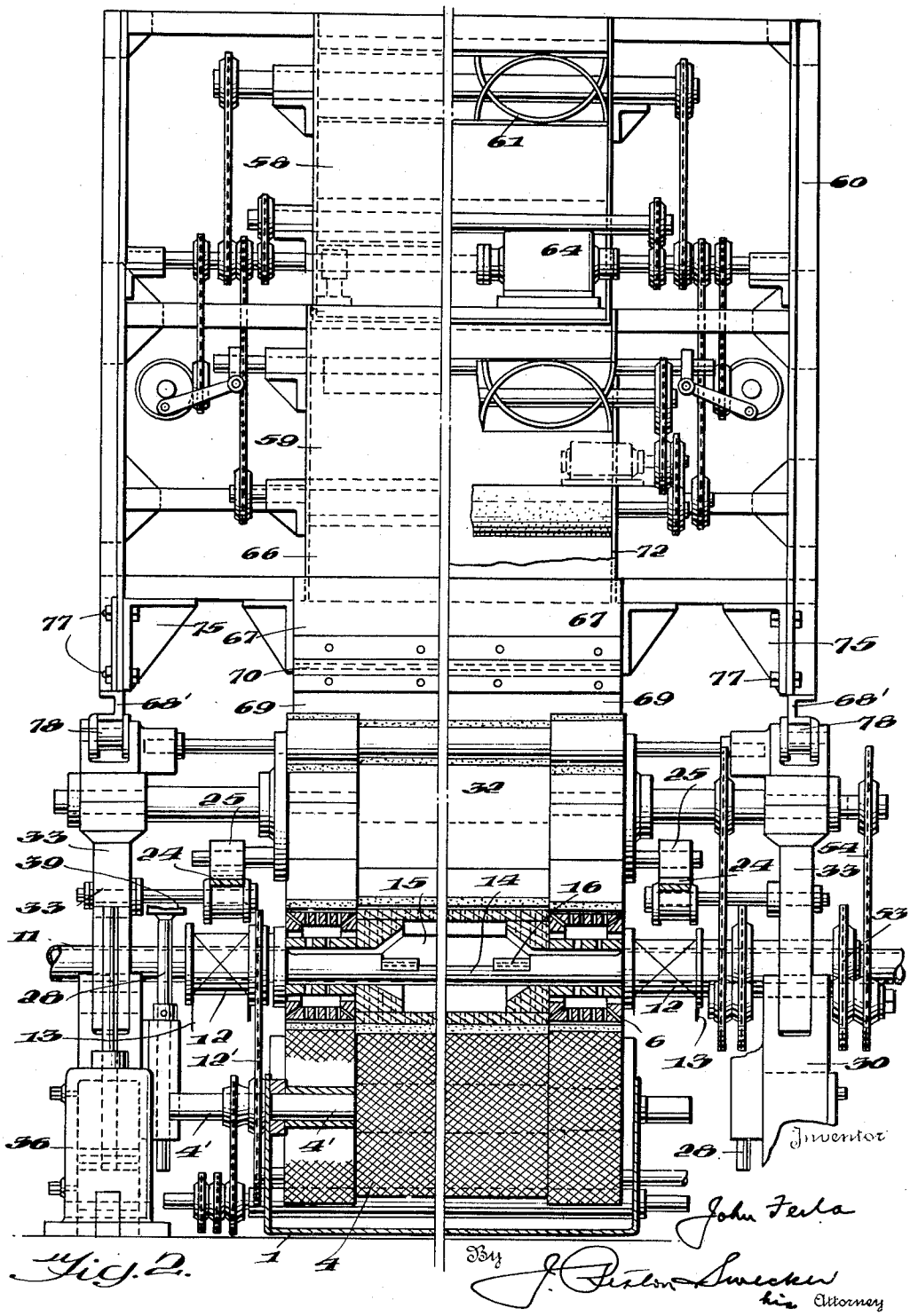
APPARATUS FOR PRODUCING PIPES

Filed Nov. 3, 1944 4 Sheets-Sheet 2



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APPARATUS FOR PRODUCING PIPES

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Fig. 4.

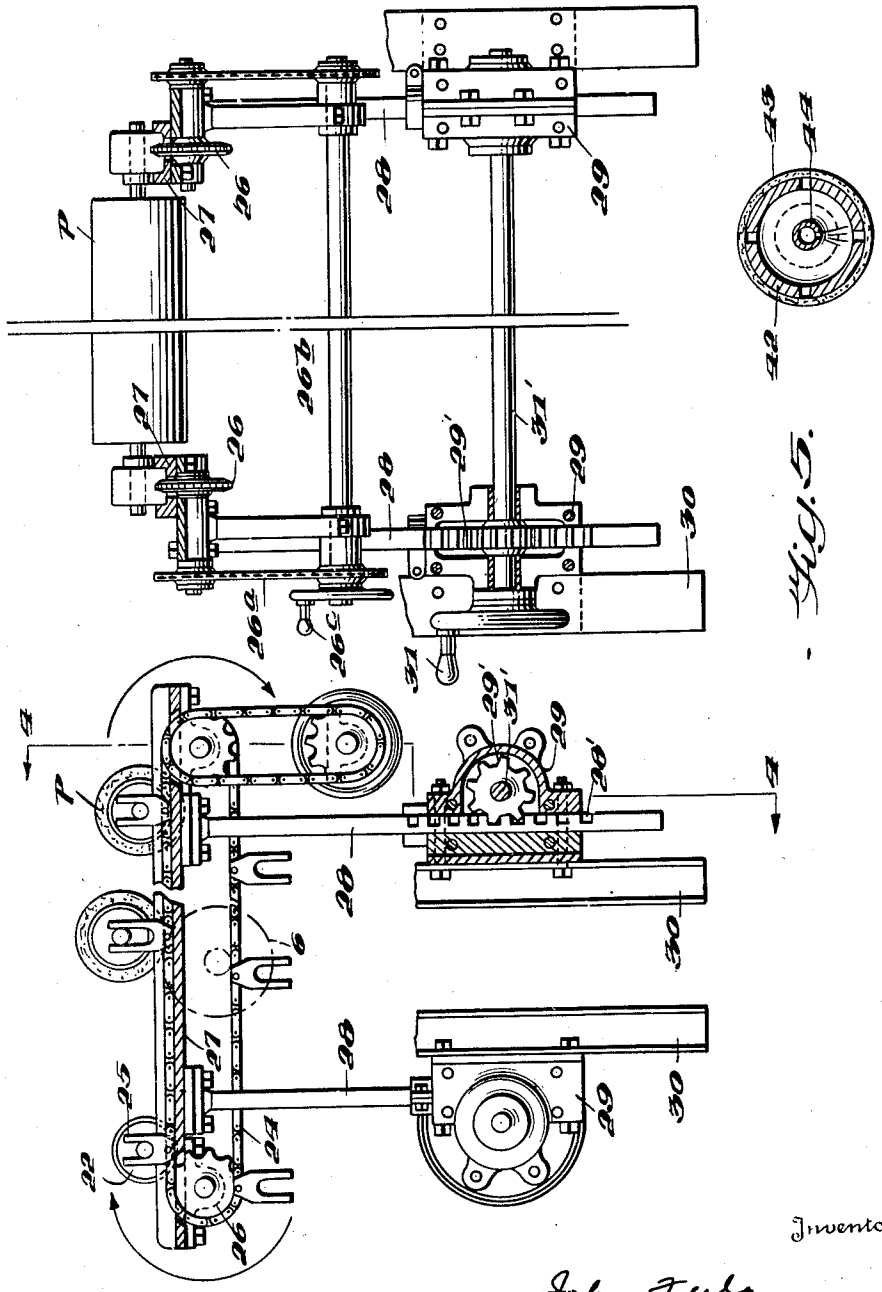

Fig. 5.

Fig. 3.

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Fig. 6.

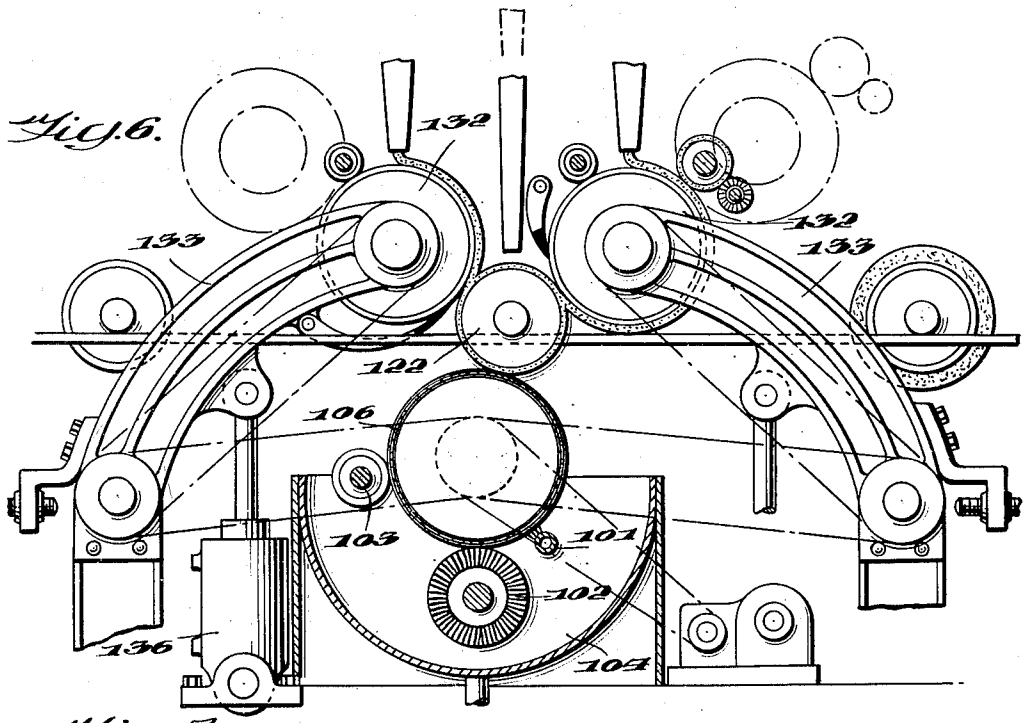

Fig. 7.

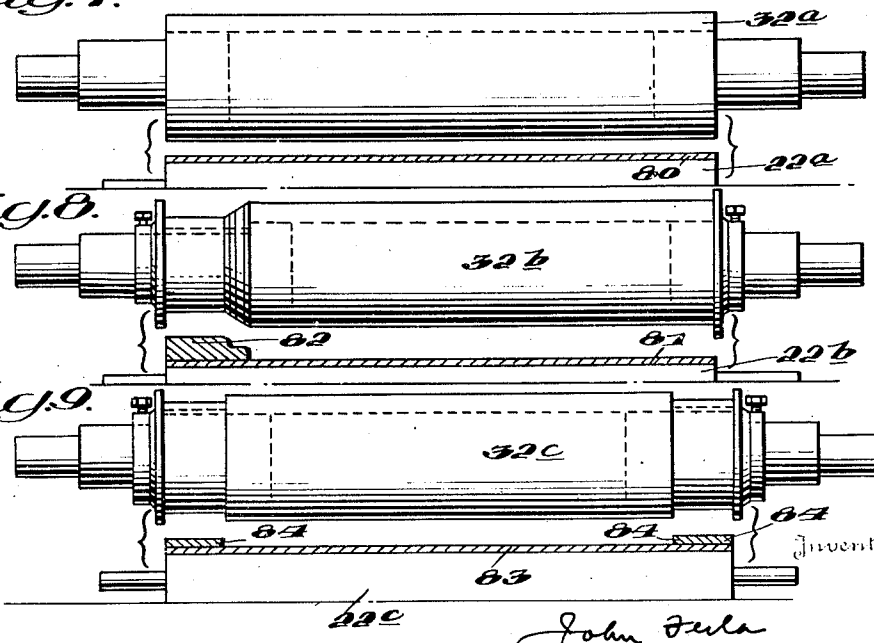

Fig. 8.

Fig. 9.

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Patented Oct. 31, 1950

2,528,353

UNITED STATES PATENT OFFICE

2,528,353

APPARATUS FOR PRODUCING PIPES

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Application November 3, 1944, Serial No. 561,727

13 Claims. (Cl. 25—30)

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This invention relates to improvements in Apparatus for Producing Pipes, particularly from a composition of asbestos and cement, either as a complete pipe or as a coating or covering on a shell or pipe, or to form a pipe which may be split longitudinally to form sheeting.

In the formation of asbestos cement pipe, either as a complete pipe or as a covering for a shell or pipe, it is customary to roll up successive layers of asbestos and cement mixtures, moistened or hydrated with water, about a mandrel, until sufficient thickness is built up, so as to form the complete pipe. To obtain proper compacting of the mixture about the mandrel, it is preferred that calender rolls bear in pressure relationship against opposite sides of the mandrel under substantial pressure applied to each succeeding layer until the required thickness is built up, compacting the layers as applied on the preceding layers on the mandrel.

In my prior patent, No. 2,283,921, granted May 26, 1942, I have set forth a process and apparatus for this purpose, including means for applying hydraulic pressure to the calendering rolls, and for retracting the calendering rolls and raising them away from the finished pipe when the latter is completed.

The object of this invention is to improve the construction and manner of operation of the machine, particularly in the raising and lowering of the calendering rolls and the means used in connection therewith for applying pressure to the formed pipe; improve the manner of moving the empty mandrels into the machine and removing the formed pipe therefrom; improve the manner of extracting the excess moisture from the applied layer and to prevent excessive saturation thereof; and to improve the mechanism for supplying mixtures of asbestos and cement to the mandrel under proper controlled conditions.

Other improved features will be set forth hereinafter in the specification and in the claims.

These improvements are effected by modifications of structure in the respective parts of the machine which enable the machine to function more readily in applying the successive layers of material to the mandrel or pipe, and to apply said material thereto under great pressure to produce a much improved product.

I have shown different embodiments of this invention in the accompanying drawings in which:

Fig. 1 is a partial vertical sectional view, with parts in elevation, of the principal features of a

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pipe forming machine embodying my improved features, and operating by the wet process;

Fig. 2 is a transverse vertical sectional view therethrough, with parts in elevation;

Fig. 3 is a detail sectional view lengthwise of the machine, with parts in section and other parts omitted for more readily disclosing the construction, showing the mechanism for moving the mandrels into the machine and simultaneously removing the formed pipe therefrom;

Fig. 4 is a transverse sectional view therethrough substantially on the line 4—4 of Fig. 3, and also with parts omitted for clarifying the disclosure;

Fig. 5 is a detail cros. section of a moistening roll for the calendering roll;

Fig. 6 is a view similar to Fig. 1, of a machine operating by the semi-dry process;

Fig. 7 is a side elevation of a calendering roll and mandrel, showing in section a steel shell on the mandrel;

Fig. 8 is a similar view with a collar on the shell to form a bell and spigot pipe; and

Fig. 9 is a similar view with collars on both ends of the liner or shell to form a pipe with a steel lining.

The machine set forth is designed primarily for use in forming pipes or linings or coverings for pipes from a composition of asbestos and cement properly hydrated, although it will be understood that it is not limited to such use, inasmuch as the invention may be utilized to form pipes or pipe coverings of any suitable composition or material that may be worked in similar manner. Likewise, the invention is applicable for use either with the wet process or with the semi-dry process, as will be set forth hereinafter more in detail.

The apparatus used in producing pipes or pipe coverings by the wet process is illustrated in Figs. 1 and 2, as an improvement on my prior patent, No. 2,283,921, granted May 26, 1942.

The liquid process utilizes a mixture of asbestos and cement with sufficient water to form a liquid suspension thereof. A suitable quantity of this liquid composition is contained in a vat 1, having agitators 2 operating therein to keep the material properly mixed and in solution. The height of the liquid mixture in the vat 1 may be regulated by an adjustable over-flow designated generally at 3. The composition is supplied by an inlet pipe 1', which admits the material at a point at one side of the vat 1.

Operatively mounted in the vat 1 is a molding screen 4 of the filter type customarily used for

this purpose, adapted to be rotated in the direction indicated by the arrow in Fig. 1. This molding screen 4 is of the usual type having a screen surface adapted to collect on the periphery thereof a layer of wet fibrous material and to carry this layer up out of the liquid suspension and to transfer this layer to superposed contacting rolls of the machine.

A blade 5 is adjustably mounted in one side of the vat 1, beside the molding screen 4 and arranged to regulate the formed layer on the molding screen and to remove surplus material. By adjusting this blade 5 toward and from the periphery of the molding screen the thickness of the layer thereon may be regulated, thereby varying the formed layers applied to the mandrel, and thereby the density of the pipe or pipe covering.

The blade 5 is adjacent the inlet 1' so that the incoming composition material flows directly onto the blade, and over the blade onto the molding screen. This arrangement makes it possible to maintain less water and composition material in the vat 1.

Where the composition material is brought in at one point laterally of the vat 1 to be caused to flow over the blade 5, it is desirable that the material be spread out lengthwise of the vat, so as to form a uniform layer on the molding screen 4. To effect this action, I have provided an agitator 5' extending lengthwise of the vat substantially throughout the length thereof to spread the material therealong and also to maintain the composition material thoroughly agitated and uniformly mixed in suspension in the water as it spreads out over the blade 5 for application thereby to the periphery of the molding screen 4.

Superposed above the molding screen 4 is a transfer roller, designated generally at 6, adapted to receive the wet fibrous layer from the periphery of the molding screen 4 and to transfer said layer onto a mandrel in peripheral bearing relation with said transfer roller. This transfer roller is constructed of a hollow roller body 7, having radial perforations 8 therein, and surrounded by a fabric or felt covering 9 fitted tightly upon the body 7 to turn therewith.

This transfer roller 6 should be complementary to the molding screen 4 and also to the mandrel or pipe that may be superimposed thereon. The shape thereof will depend upon the shape of the pipe or covering to be formed, whether it be made with plain ends or with a bell and spigot, or with collars at opposite ends to be welded or otherwise secured to an adjacent pipe section. The latter is the type of pipe to be made according to the form shown in Fig. 2. It will be understood, however, that the shape of this transfer roller 6 may be modified as found desirable according to the product to be made.

In the form here illustrated, the opposite ends of the body 7 of the transfer roller 6 are shown as provided with hub portions 10 journaled to turn freely upon a stationary tubular shaft 11 supported by bearings 12 in a portion of the frame structure designated generally 13. The bearings 12 are in the form of sleeves surrounding the tubular shaft 11, and extend to the body 7 with which they are joined, as shown in Fig. 2. The portions of the sleeve 12 within the perforated hub portions 10 are also perforated for the passage of water thereto to the tubular shaft 11 as hereinafter described. The rotation of the sleeves 12 by a power gearing designated generally at 12', operatively connected with the shaft 4' of the molding screen 4, serves to rotate these parts synchronously.

The hub portions 10 are perforated as shown to admit water to the interior thereof, thence to the shaft 11. These hub portions 10 are shown as of smaller diameter than the peripheral diameter of the body portion 7, and are similarly surrounded by a fabric or felt layer thereon. Complementary with the reduced hub portions 10 are enlarged screen portions at opposite ends of the molding screen 4, which are journaled free of the middle portion of the molding screen, so as to have a uniform circumferential speed with the peripheries of the hub portions 10 of the transfer roller 6.

The tubular shaft 11 extends axially through the radially perforated roller body 7, as shown in Fig. 2, and has its top portion provided with a slot 14 that extends throughout substantially the top half of the circumference of the shaft, as indicated in Fig. 1. This slotted shaft forms a trough within the hollow roller body 7 to collect liquid therefrom. The opposite sides of the trough are provided with wings 15 hinged at 16 to the opposite sides of the tubular shaft, so as to swing to open and closed positions relative thereto. When the machine is in operation, the wings are opened to the positions shown in Fig. 1, forming enlarged sides on the trough, so as to increase the area thereof adapted to receive water from the upper portion of the transfer roller, and thus tend to reduce the saturation of the fabric covering 9 on said roller, aiding in removing the surplus moisture from the layer transferred by this roller. The moisture may be drawn outward through one or both opposite ends of the tubular shaft 11 by suction means connected therewith.

By allowing the excess water to flow or be drawn by suction into the interior of the transfer roller 6, it is prevented from backing up at the bite between this transfer roller and the mandrel or pipe in contact therewith where it might have a tendency to disturb the layer on the periphery of the transfer roller, or wash the layer from the surface thereof. Moreover, it keeps the periphery of the transfer roller free from excess moisture at the bite thereof with the molding screen, so as to improve the pick-up action therebetween, inasmuch as it keeps the excess water from flowing through to the bottom of the transfer roller.

The wings 15 may be turned inward substantially within the circumferential confines of the tubular shaft 11 when it is desired to remove this shaft from the transfer roller for any purpose. This will allow the shaft, including wings thereon, to pass outward through the bearing sleeves 12 in disassembling the machine, or to be inserted therethrough when assembling the parts.

To aid in keeping the fabric 9 clean and free of an accumulation of fibers thereon, I have provided a water spray 17 directed against the periphery of the fabric covering 9 on the roller 6 on the downward moving side thereof to wash off the fibers from the fabric covering after the layer is transferred to the mandrel. The spray 17 is enclosed within a housing 18 substantially to confine the water. Also located within the housing 18 at a point below the spray is a rubber wringer roll 19 pressed against the fabric covering of the transfer roller 6 to remove surplus water therefrom and regulate the amount of moisture remaining in the fabric 9. The housing 18 may be connected with a source of suction or vacuum

to facilitate cleaning of the fabric layer on the transfer roller and to remove excess moisture therefrom, whereby it will be just damp enough to pick up the layer presented thereto by the molding screen.

Superposed upon the transfer roller 6 and bearing loosely thereupon is a mandrel 22, having journal pins 23 fixed at opposite ends thereof. The mandrel 22 is adapted to be moved into one side of the machine to a point above the transfer roller 6 for peripheral bearing relation therewith so as to build up the required layers thereon, after which the finished pipe is moved out of the machine at the opposite side of the latter, as indicated by the arrows in Figs. 1 and 3. The mandrel is guided in this movement by endless chain devices 24, one at each opposite end of the machine as shown in Figs. 2 and 4.

The sprocket chains 24 are provided with yokes 25 thereon spaced at suitable distances apart adapted to embrace and receive loosely the journal pins 23 so as to move the mandrel 22 along, while allowing freedom of vertical movement of the latter relative to the chains 24, while also allowing ready attachment and detachment of the mandrel with the chains. The chains 24 extend over sprockets 26 at opposite ends thereof (Figs. 3 and 4).

The upper run of each chain 24 extends over and is supported in a channel-shaped trackway 27 extending transversely of the machine, lengthwise of the chain, substantially throughout the length of said upper run. The sprockets 26 are mounted on stub shafts journaled on the under sides of the trackways 27, as shown more in detail in Figs. 3 and 4. The trackway 27 is formed by channel-shaped rails, one for each chain, supported on rods 28, adjustably mounted in guides 29 secured at a side of a supporting standard 30 which forms a part of the frame work. The rails or tracks 27 are adapted to be moved upward, carrying with them the chains and mandrels, as hereinafter described. Each of the rods 28 is provided with a rack 28' in mesh with a gear 29' operated by a hand crank 31 on a cross shaft 31' carrying both transverse aligned gears 29', so as to move the pair of rods 28 at the corresponding end of the trackways 27 up and down together, simultaneously, or alternately the opposite ends of the trackways may be raised or lowered as desired. Such an adjustment will not be required at frequent intervals.

At one end of the trackways 27 is provided a sprocket chain drive 26a connected with one of the sprockets 26 and depending therefrom to a cross shaft 26b, the opposite end of which is similarly connected with the opposite sprocket 26. The shaft 26b carries a hand wheel 26c for rotating said shaft and driving the sprockets 26 to effect longitudinal movement of the chains 24.

Arranged to bear against opposite sides of the mandrel 22 in its central position, or the pipe formed thereon, is a pair of calendering rolls 32, each of which is supported and journaled in the upper inner end of an inwardly inclined arm 33. The outer end of the arm 33 is pivotally supported at 34 at the upper end of the corresponding supporting standard 30. The arms 33 incline inward toward the mandrel 22 in its central position, as shown in Fig. 1, and are adapted to apply pressure against opposite sides of the mandrel.

To increase the pressure thereon, I have provided a hydraulic power device, designated generally at 36, connected with each of the arms 33 for raising and lowering the same and to apply downward pressure thereon sufficient to press the calendering roll 32, or the formed layer thereon, under a pressure of about 1500 pounds per linear inch, which pressure, nevertheless, can be varied to the extent desired as the wall thickness of the pipe increases. This hydraulic power device is of well-known construction, in which a cylinder encloses a piston having a piston rod projecting from the end of the cylinder and pivotally connected at 37 with the arm 33. The power device 36 is pivotally supported at 36' at its lower end, so as to swing laterally upon effecting swinging movement of the connecting arm 33.

Provision is made for controlling the movement of the piston in opposite directions under hydraulic pressure admitted to the cylinder on opposite sides of the piston. Thus the hydraulic power devices will be operated not only to apply pressure of the calendering rolls against opposite sides of the formed layers on the mandrel, but also to raise the calendering rolls to elevated positions sufficiently far removed from the mandrel to permit the latter to be elevated and removed.

Each calendering roll 32 may, if desired, be formed of steel or other metal having a smooth peripheral surface which may be moistened and will receive a dry layer thereon. However, I have found that improved results can be obtained by surrounding the calendering roll with a layer of felt or fabric which will allow greater speed of operation of the machine inasmuch as the rollers may be driven at greater speed and yet obtaining proper transfer of the material therefrom to the mandrel.

Each of the calendering rolls 32 is provided with means for applying moisture to the surface thereof. I have found that greater uniformity can be maintained by applying a uniform layer of moisture to the peripheral surface of the calendering roll. This may be done by utilizing a moistening roller of the character shown in Fig. 5. This roller comprises a sleeve 42 radially perforated and covered by a layer of felt or fabric 43. The latter may be kept moist or saturated by a wet spray 44 within the sleeve 42. The opposite ends of the sleeve 42 are journaled in arms 45 carried by the inner end of the arm 33, so as to hold the moistening roller in peripheral bearing relation with the calendering roll 32 to turn therewith. The spray pipe 44 may extend through one of the arms 45 and be connected flexibly with a suitable source of water supply.

The two calendering rolls 32 should be rotated in the same direction, inasmuch as they bear against opposite sides of the mandrel 22 therebetween. These calendering rolls are adapted to receive a supply of cementitious material on the moistened peripheral surfaces thereof which will form a layer thereon by the moisture, and be carried around into contact with the mandrel or the formed layers thereon. This moistened layer will travel through less than 180° on one of the calendering rolls, and approximately 270° on the other before being transferred to the mandrel. The latter calendering roll has a pressure roller 46' in peripheral bearing relation therewith, so as to press against the formed layer on the calendering roll and assure the contacting of said layer thereon sufficiently tightly so that it will be carried around to the bite between the calendering roll and the mandrel, thus preventing separation of the layer from the under side of the calendering roll.

Each calendering roll 32 is provided also with a scraper 46 to maintain the surface thereof free of fibers and other foreign matter that might otherwise accumulate. The scraper 46 is shown as pivotally supported on the arm 33 and preferably urged resiliently against the surface of the calendering roll.

The several rolls are power driven, as indicated in dotted lines in Fig. 1, from a variable speed driving shaft 50 which has a driving chain connection 51 with the transfer roller 6, which in turn drives the molding screen 4 through the driving connection 12' at the opposite end thereof, as described above. The agitators 2 and 5' are driven by a drive chain 52 from the molding screen 4. The transfer roller 6 has sprocket chains 53 leading therefrom to sprockets mounted coaxially of the pivots 34, which sprockets are connected through chains 54 extending lengthwise of the arms 33 to driving connections with the calendering rolls 32 rotating the latter in the direction indicated by the arrows in Fig. 1.

I have provided means for supplying a layer or layers of semi-dry asbestos and cement mixture, or other forming composition, to the peripheral surface of the mandrel 22 in its intermediate position, by forming such semi-dry or moistened layers on the peripheral surfaces of the calendering rolls 32. Since these surfaces will be moistened by the moistening rollers 42, it is necessary merely to apply a layer of dry composition to said moistened surface, to be hydrated by the moisture thereon, ready for transfer onto the mandrel.

For this purpose, I have provided a plurality of superposed hoppers 58 and 59 supported by a suitable frame structure 60 mounted in elevated position in any suitable manner. These hoppers are adapted to receive and mix the composition material and to discharge it downward in condition for use. Each of the hoppers 58 is provided with a spiral mixing device 61 operated so as to thoroughly agitate and mix the material therein. Each hopper 59 is provided therein with a shaker 62, reciprocated lengthwise of the hopper to provide for uniformity of feed of the material from the hopper 58 onto a revolving brush or corrugated roller 63 in the bottom of the hopper 58. The discharge from each set of hoppers 58 and 59 is regulated by the brush 63. The feed of the material is so proportioned that the hoppers 59 will be maintained approximately empty and the material fed therethrough only as it is discharged, whereas the hoppers 58 are maintained substantially full. The operating parts of the hoppers 58 and 59 are driven by means of a power unit 64, including a motor driven gear reducer.

Extending downwardly from the hoppers 59 are stationary chutes 66 which telescope in chutes 67 fixed to cross rails 68 of the frame. The chutes 67 extend loosely into supplemental chutes 69 pivotally connected with the chutes 67 at 70, so as to swing laterally relative thereto. The lower end of each chute 69 is arranged to discharge directly onto the upper surface of the calendering roll 32, so as to feed the material downward onto said surface from the hoppers 59.

The chutes 69 are supported by the pivots 70 from the chutes 67, but are capable of swinging movement relative thereto with the opening and closing movements of the arms 33, and are also adjustable by means of pins 69' to different lateral positions with respect to cross rails 68' so as to discharge properly as desired on the peripheries of the calendering rolls 32 in different operating positions of these rolls.

Another hopper is shown at 72 intermediate the hoppers 59 and having a discharge chute 73 which telescopes into a chute 74 carried by the cross rails 68 and 68'. The lower end of the chute 74 is in position to be disposed directly over the upper surface of the mandrel 22 in its intermediate position.

The hopper 72 is provided to receive and contain a quantity of cement which may be fed directly down onto the peripheral surface of the formed pipe or coating. This will provide a layer of cement on the outside of the completed pipe and give smoother surface thereon with a better finish.

The cross rails 68 and 68' are adjustably mounted on the frame 60 by being connected together through brackets 75 which in turn are adjustably connected with the frame 60 by means of slots 76 in the latter receiving guide pins 77 attached to the brackets 75. Thus the cross bar frame structure may be adjusted vertically to vary the positions of the hoppers with respect to the mandrel and calendering rolls, as may be desired.

The cross rails 68, 68' are freely movable vertically relative to the frame 60, and are supported loosely by bearing of the rails 68' upon rollers 78 journaled upon the upper ends of the respective arms 33. Thus the raising and lowering of the arms will cause the rails 68, 68' to move up and down therewith, and thus maintain the chute discharges in proper relation to the peripheries of the calendering rolls.

It is possible to form pipes, or to form coatings or coverings on pipes or shells, with this machine. The mandrel 22 will be varied according to the character of pipe to be formed, whether with or without a bell collar, and the calendering rolls which bear against the mandrel should be formed complementary thereto. Several examples of these are illustrated as representative of what may be used, in Figs. 7 to 9. I have already illustrated heretofore in my patent, No. 2,283,921, the manner of forming a pipe with a bell collar integral therewith.

In Fig. 7, the mandrel 22*a* is cylindrical from end to end thereof and coacts with a cylindrical calendering roll 32*a*. The mandrel 22*a* is surrounded by a steel shell 80 removably mounted thereon, which may be used merely for supporting the pipe during drying or to form a lining in the pipe. In the latter instance, the shell 80 would remain bonded to the pipe as used.

In Fig. 8, the mandrel 22*b* is provided with a surrounding shell 81 having an enlarged collar 82 at one end thereof adapted to form a pipe with a bell collar integral therewith. In this event the calendering collar 32*b* would be made complementary thereto, having a reduced end structure opposite the collar 82 which may be constructed substantially in the manner set forth in my prior application on Machine for Producing Pipes, Ser. No. 284,987, filed July 17, 1939, now Patent No. 2,364,061.

Still another example is shown in Fig. 9, in which the mandrel 22*c* is surrounded by a steel lining 83 adapted to remain in the formed pipe and having collars 84 welded or otherwise rigidly fixed to opposite ends of said lining to facilitate the connection of pipe sections together. The calendering roll 32*c* is formed with recessed opposite end portions complementary thereto.

In operation, the liquid mixture will be supplied to the vat 1 substantially as indicated above,

while a dry mixture of asbestos and cement or other material to be used will be supplied to the hoppers 58 as indicated in the drawings. With a mandrel in position as indicated at 22, and the calendering rolls 32 bearing against opposite sides thereof under the required pressure, the machine is ready for operation. When the power drive is started, the molding screen 4, transfer roller 6 and calendering rolls 32 will be driven in the directions indicated by the arrows in Fig. 1. The molding screen will collect on the surface thereof, a wet layer of asbestos and cement either from the vat 1 or from being flowed over the blade 5, or a combination of the two, the thickness of which layer may be varied by adjusting the position of the blade. The layer thus formed on the surface of the molding screen will be attracted by the fabric or felt covering 9 on the transfer roller, and this in turn will direct this layer around to the bite of the mandrel 22, onto which it will be transferred.

Some of the moisture will drain out of the layer on the transfer roller 6, and the excess moisture that might be absorbed by the fabric 9 thereof would drop into the trough formed by the hollow slotted shaft 11 with the wings 15 on opposite sides of the slot, through which shaft 11 the liquid can be drawn off by the usual suction applied thereto.

The rotation of the calendering rolls 32 in contact with the wet layer applied to the mandrel will serve not only to compress the layer thereon but to add also a moist layer or layers thereover and to compress these together so as to form substantially a homogeneous mass. The moistened surface of each calendering roll 32 will receive relatively dry material from the hopper 59 through the chutes 66—69, the moisture being sufficient to cause this dry material to adhere firmly to the periphery of the calendering roll 32. Such semi-dry layer is then impressed over the wet layer at the bite of the mandrel and calendering roll, under a substantial pressure of approximately 1500 pounds per linear inch. Such semi-dry layers can be applied by either or both of the calendering rolls 32 as may be desired.

This operation continues until the desired thickness of pipe or pipe covering is built up on the mandrel or the shell or lining applied thereover. As soon as this thickness is reached, the transfer roller 6 is lifted out of contact with the mold screen 4, and the feeding means of the hopper 72 may be operated to direct a sufficient quantity of cement downward through the chutes 73—74 onto the periphery of the formed pipe, without adding either a liquid layer or semi-dry layers, receiving moisture for hydration from the preceding layers, thus forming a smooth cement coating around the formed pipe.

Thereafter, by operation of the hydraulic power devices 36, the arms 33 may be swung upward, removing the calendering rolls 32 from pressure bearing relation against opposite sides of the mandrel 22, permitting the latter to be lifted out ready for removal from the machine. When the calendering rolls 32 are raised high enough to clear the mandrel and formed pipe, the sprocket chains 24 can be operated by the hand wheel 26c (Fig. 4) or otherwise mechanically driven. The chains 24 will be moved rectilinearly to convey an empty mandrel 22 to the intermediate position, while the formed pipe on the used mandrel will be moved off to the right, as indicated at P in Figs. 1 and 3. Then the parts may be returned to their operating positions and the operation resumed. It will be noted that the yokes 25 loosely receiving the journal pins of the mandrel will allow freedom of movement vertically of the mandrels, not only in moving into and out of the machine, but also as the pipe is built up on each mandrel, as will be evident by comparison in Fig. 3.

The pipe may be formed entirely by the semi-dry process if desired, either by separating the transfer roller 6 from the mold screen 4 or by dispensing with the latter, whereby the layers will be formed entirely on the calendering rolls and transferred therefrom onto the mandrel, as shown in Fig. 6.

In this form adapted for operation by what I designate as the semi-dry process, the mandrel 122 receives layers from calendering rolls 132 supported by arms 133. These arms bear against opposite sides of the mandrel 122 under substantial pressure as indicated above, caused by hydraulic power devices 136, which serve also to move the arms to their elevated positions, withdrawing the calendering rolls from bearing relation with the mandrel.

A roller 106 located in a position corresponding with that of the transfer roller 6, supports the mandrel 122 thereon and holds the mandrel as pressure is applied against opposite sides thereof by the calendering rolls 132. The roller 106 is preferably covered by fabric or felt which may be cleaned by an atomizer spray 101 and then subjected to the action of a brush 102 and finally by a wringer roll 103. This roller 106 is partly enclosed by a fixed casing 104.

Otherwise then as indicated, the semi-dry machine illustrated generally in Fig. 6 operates in a manner similar to that shown in Figs. 1 and 2, except that it omits the liquid layer thereof.

I claim:

1. In apparatus for producing pipes, the combination of means for mounting a mandrel to receive pipe forming material therearound and for movement of the mandrel into and out of its receiving position, said mounting means including tracks in position to underlie the mandrel in its receiving position, and conveyor means arranged along the tracks for holding and moving the mandrel therealong to and from its receiving position.

2. In apparatus for producing pipes, the combination of means for mounting a mandrel to receive pipe forming material therearound and for movement of the mandrel into and out of its receiving position, said mounting means including tracks in position to underlie the mandrel in its receiving position, and endless chain devices mounted on the tracks and movable thereon lengthwise relative thereto, said endless chain devices having means thereon in position to engage the mandrel and to move the mandrel along the tracks.

3. In apparatus for producing pipes, the combination of means for mounting a mandrel to receive pipe forming material therearound and for movement of the mandrel into and out of its receiving position, said mounting means including tracks in position to underlie the mandrel in its receiving position, and endless chain devices mounted on the tracks and movable thereon lengthwise relative thereto, said endless chain devices having yokes thereon in position to engage the mandrel and to move the mandrel lengthwise of the tracks.

4. In apparatus for producing pipes, a roller

adapted for pressure bearing relation against a mandrel, said roller having a hollow interior, means for admitting water through a side of the roller into the interior, and a trough within the roller in position to receive the water therein.

5. In apparatus for producing pipes, a roller adapted for pressure bearing relation against a mandrel, said roller having a hollow interior, means for admitting water through a side of the roller into the interior, and a trough mounted in fixed position within the roller in position to receive the water therein.

6. In apparatus for producing pipes, a calendering roller having a surrounding perforated body with a hollow interior, a fibrous covering surrounding said body, and a tubular pipe member extending into the hollow interior of the roller and having a slotted upper portion adapted to receive water therethrough and to direct the water from the roller.

7. In apparatus for producing pipes, a calendering roller having a surrounding perforated body with a hollow interior, a fibrous covering surrounding said body, a tubular pipe member extending into the hollow interior of the roller and having a slotted upper portion adapted to receive water therethrough and to direct the water from the roller, and wings hinged to opposite sides of the slotted portion of the pipe adapted for swinging movement to open positions to direct the water into the pipe and for closing movement substantially within the confines of the pipe for relative removal of the roller and pipe.

8. In apparatus for producing pipes, a calendering roll, and means for applying moisture to the peripheral surface of said calendering roll including a rotatable sleeve bearing against the periphery of the roll, and means within the sleeve for applying moisture to the interior of the sleeve for transfer thereby onto the periphery of the calendering roll.

9. In apparatus for producing pipes, a calendering roll, and means for applying moisture to the peripheral surface of said calendering roll including a rotatable sleeve bearing against the periphery of the roll, and spray means within the sleeve for applying moisture to the interior of the sleeve for transfer thereby onto the periphery of the calendering roll.

10. In apparatus for producing pipes, a calendering roll adapted for pressure bearing relation against a mandrel, and means for moistening the peripheral surface of the calendering roll including a rotatable perforated sleeve, a fibrous covering surrounding said sleeve, and means within the sleeve for directing a spray outwardly against

the interior of the perforated sleeve for moistening the fibrous covering.

11. In apparatus for producing pipes, the combination of a mandrel, a pair of calender rolls in positions to bear against opposite sides of the mandrel, means for applying material onto the surfaces of the rolls for transfer therefrom onto the mandrel, and means for impressing said layer against the outer side of at least one of said rolls for turning thereon through at least 180° and transfer onto the mandrel.

12. In apparatus for producing pipes, the combination of a mandrel, a pair of calender rolls in positions to bear against opposite sides of the mandrel, means for applying material onto the surfaces of the rolls for transfer therefrom onto the mandrel, and a roller mounted in pressure bearing relation against the outer side of at least one of the rolls in position for impressing said layer against said outer side for turning thereon through at least 180° and transfer onto the mandrel.

13. In apparatus for producing pipes, the combination of a roll, a hopper adapted to supply pipe forming material onto the periphery of said roll and having a depending spout, a second spout telescoped with the first-mentioned spout and slidable relative thereto for directing the material from the hopper onto the roll, a supporting frame carrying the hopper, an auxiliary frame supporting the second spout, means mounting said auxiliary frame on the first-mentioned frame for sliding movement relative thereto, means mounting said roll for swinging movement in an upward and outward direction relative to the frames, and means for supporting the auxiliary frame on the roll mounting means for movement thereby upon said swinging movement of the roll.

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