April 5, 1955 L. L. JOHNSTON ET AL 2,705,352

CASTING AND HANDLING ELONGATED ARTICLES

Filed July 14, 1951 2 Sheets-Sheet 1

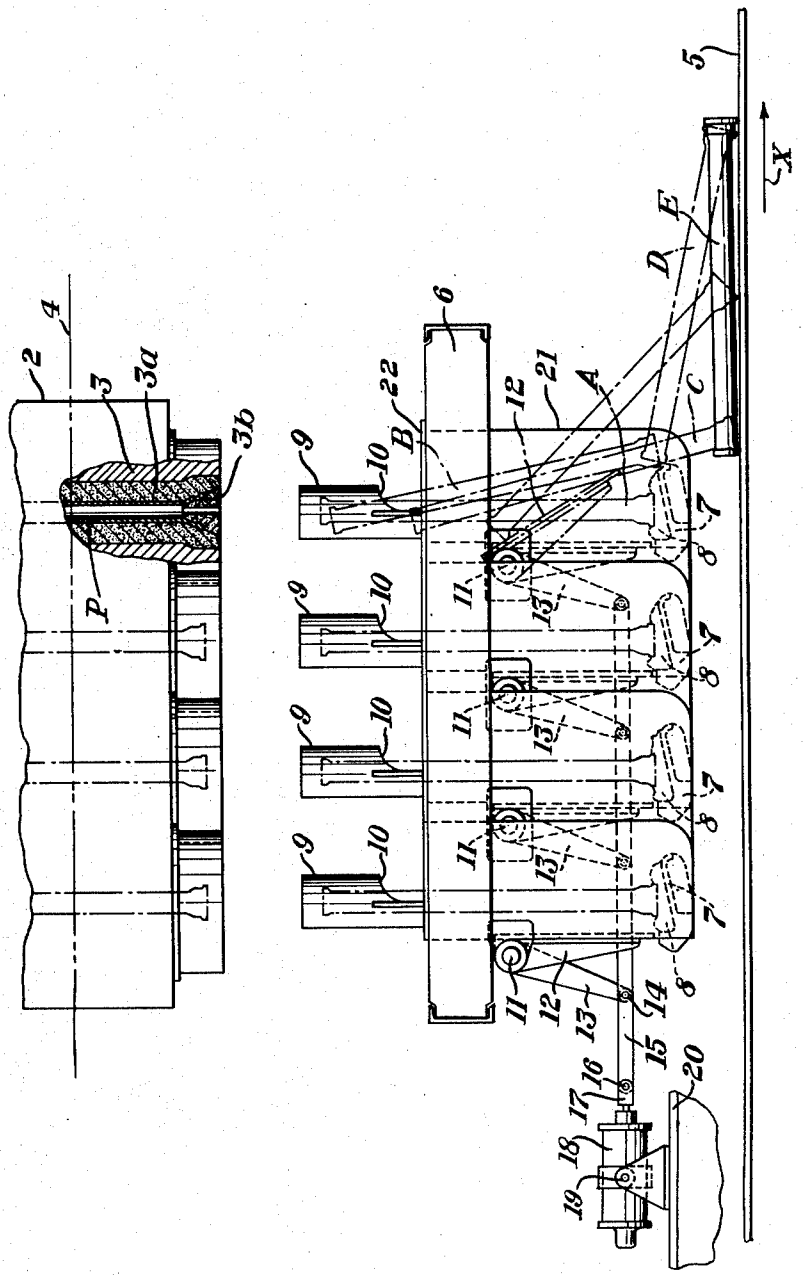

Fig. 1.

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2 Sheets-Sheet 2

Fig. 2.

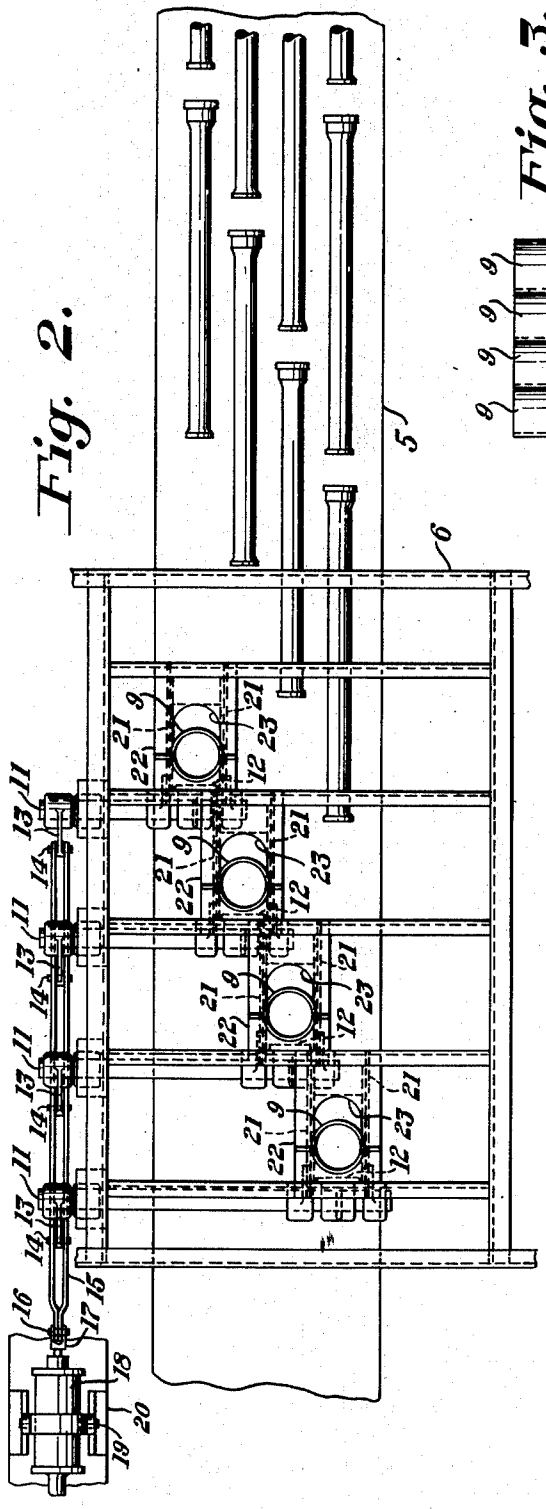


Fig. 3.

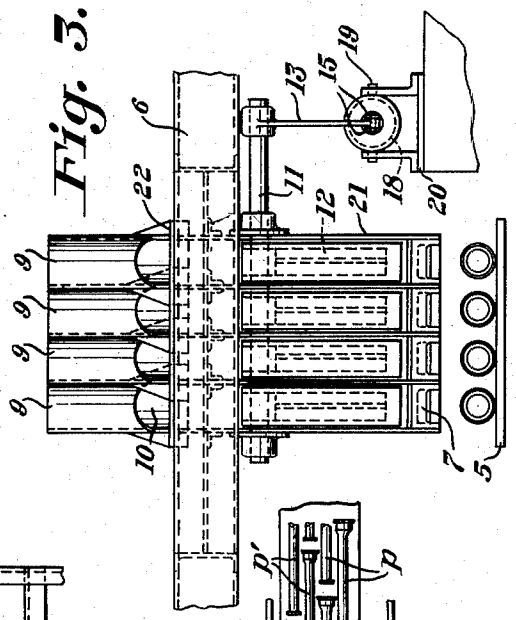
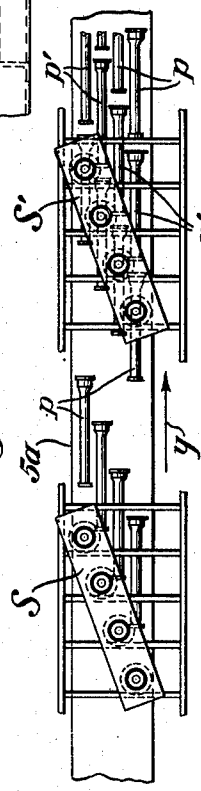


Fig. 4.



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2,705,352

CASTING AND HANDLING ELONGATED ARTICLES

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Application July 14, 1951, Serial No. 236,716

22 Claims. (Cl. 22—64)

This invention relates to casting and handling elongated articles. It has to do particularly with certain methods of and apparatus for casting and handling elongated articles whereby the processing of such articles is improved and facilitated with resultant increase in efficiency of operation and quality of product.

While the invention may be otherwise employed it will herein be described for purposes of explanation and illustration as employed in connection with the casting and handling of pipe. One field in which the invention has great utility is the manufacture of soil pipe and the following description, while in general it may also apply in the manufacture of pressure pipe, may for present purposes be deemed to describe the manufacture of soil pipe.

For many years soil pipe was cast almost entirely by hand. Recently the so-called "Rol-O-Cast" apparatus and method of Herman Pneumatic Machine Company have gone into increasingly extensive use and are now the accepted modern apparatus and method employed in the soil pipe field. The "Rol-O-Cast" apparatus and method are covered by Patents Nos. 2,449,900 and 2,559,161.

In the manufacture of soil pipe by employment of the "Rol-O-Cast" apparatus and method a mold of compacted mold forming material is formed within a flask, the pipe is centrifugally cast within the mold, the flask with the mold and pipe therein is positioned generally vertically and the pipe and mold material are ejected downwardly through the lower end of the flask. It is customary to provide the flasks in a battery consisting of a plurality of flasks arranged side by side with their axes coplanar. For example, four flasks may be employed as disclosed in Patent No. 2,613.410.

Prior to the present invention some difficulty was experienced in handling of the pipes ejected from the flasks. The pipes are delivered to a conveyor which may be a generally horizontally arranged endless type conveyor, which conveyor advances the pipes for further processing. When the pipes are ejected from the flasks and delivered to the conveyor they are very hot or in the early stages of solidification and consequently susceptible to damage in handling; if the pipes in such condition fall down on their sides they may crack or even break in two. The problem is accentuated when, say, four pipes are ejected from a battery of flasks at the same time. If the pipes are allowed to fall helter-skelter onto the conveyor they almost inevitably strike one another, frequently resulting in damage to the pipes, and some or all of the pipes may thus be forced off of the conveyor. In any event, the pipes are difficult to desirably orient upon the conveyor. If the pipes are arranged transversely of the conveyor they may project laterally from the conveyor with possible damage to the pipes by striking objects close to the conveyor and also with the creation of a source of potential injury to workmen. Also, if the pipes are arranged transversely of the conveyor they tend to roll along the conveyor and strike one another. The problem of damage to the pipes is further accentuated if a metal conveyor is used.

We have devised certain methods and apparatus which solve the problems above referred to. We provide for delivering the pipes onto the conveyor with the pipes arranged generally parallel to the direction of advance of the conveyor. We provide for delivering the pipes onto the conveyor comparatively gently so that the pipes are not damaged by severe impact against the conveyor. We provide for delivering a plurality of pipes to a conveyor in generally side-by-side relationship with little likelihood

of the pipes striking one another with enough force to damage them.

When the flasks are arranged in a battery in side-by-side relationship they must of necessity have their axes spaced apart a distance much greater than the necessary transverse axis-to-axis spacing of the pipes on the conveyor. We provide for arranging the conveyor so that it advances in a direction at an acute angle to the trace on the conveyor of a substantially straight line extending through the pipes as they are ready for ejection from the flasks. The result is that the pipes are delivered to the conveyor so as to lie in generally side-by-side relationship on the conveyor but with a transverse spacing on the conveyor much less than the axis-to-axis spacing between the flasks. This makes for greatly increased efficiency of operation and enables the width of the conveyor to be reduced to a minimum.

When the pipes are delivered to the conveyor they are ranged transversely of the conveyor and are arranged in relative progressive advancement on the conveyor considered in order across the conveyor. This is because when the pipes are delivered to the conveyor simultaneously they are respectively received by the conveyor at different zones longitudinally of the conveyor.

While the pipes are being conveyed on the conveyor away from the casting station they are cooling. They must cool to a certain extent before they are ready for further processing. Cooling is a function of time so the faster the conveyor moves the longer it must be to enable the pipes to be cooled predeterminedly while on the conveyor. It is desirable that the conveyor move relatively slowly, not only so that its length may be desirably limited but also to avoid jolting the pipes. The arrangement of the pipes as above described oriented lengthwise of the conveyor and in side-by-side relationship thereon contributes to most effiicient utilization of the conveyor as a cooling bed. We preferably drive the conveyor at such a speed relatively to the frequency of casting groups of pipe in the battery of flasks that the respective groups of pipe are deposited on the conveyor with the forward ends of the pipes of each group spaced only slightly rearwardly of the rearward ends of the pipes of the immediately preceding group. Desirably the conveyor is driven at such a speed that the forward ends of the pipes of each group as they are delivered to the conveyor are spaced rearwardly of the rearward ends of the pipes of the immediately preceding group a distance equal to a fraction of the length of the pipes. For example, if the pipes are of the order of five to six feet in length the space on the conveyor between the forward end of each pipe and the rearward end of the immediately preceding pipe may be of the order of one or two feet or even less. Thus we most effectively utilize the conveyor for cooling of the pipes and are able to drive it with optimum slowness. The pipes are arranged in staggered relationship on the conveyor which promotes uniform loading of the conveyor and uniform cooling of the pipes.

We provide for guiding each pipe as it passes from the flask in which it is formed to the conveyor so as to insure its orientation on the conveyor parallel to the direction of advance of the conveyor. We also avoid severe shocks to the pipes which might damage them and avoid the pipes striking one another with substantial force. We preferably discharge each pipe downwardly while in generally upright position and thereafter lay the pipe upon the conveyor. We preferably arrest the downward movement of each pipe after its ejection from the flask. This is done by interposing in the path of the ejected pipe a support or stop means constituting a portion of transfer means for transferring the pipe from the casting station to the conveyor. Desirably cushioning material is disposed upon the support or stop means to cushion the pipe as its lower extremity approaches the support. The cushioning material may, for example, be the mold forming material which is employed, e. g., sand. When mold forming material is ejected from each flask along with the pipe cast therein the support is automatically provided with cushioning material and no special provision for placing cushioning material thereon need be made.

We provide for maintaining each pipe in generally up-

right position against tipping over while it is in position on the support in the transfer means. This may be done by the provision of a generally tubular member through which the pipe passes when it is discharged downwardly from the flask, the generally tubular member being disposed above the support or stop member a distance such that when the lower extremity of the pipe is stopped by the stop member, which preferably has cushioning material thereon as above explained, the upper portion of the pipe is within the generally tubular member. Thus the pipe cannot tip over while it is so supported.

We provide for dislodging the lower extremity of the pipe from the support or stop member so that the pipe moves downwardly due to gravity until its lower extremity engages the conveyor whereafter through movement of the conveyor the pipe is brought to rest upon the conveyor with the pipe oriented generally parallel to the direction of movement of the conveyor. The distance from the support which arrests the downward movement of the pipe to the conveyor is not great so that the pipe is not subjected to severe shock when its lower extremity strikes the conveyor. Moreover, the pipe is in the later stages of solidification and hence less susceptible to damage when its lower extremity engages the conveyor than when arrested by the support or stop member. Some of the mold material may also be delivered to the conveyor to somewhat cushion the impact of the lower extremity of the pipe against the conveyor but it is not necessary to rely upon cushioning at the conveyor because the distance which the pipe drops from the support to the conveyor is not great.

The pipe may be dislodged from the support by being pushed off of the support in a direction parallel to the direction of advance of the conveyor. Thus as the conveyor advances it in effect drags the pipe downwardly against a portion of the transfer means disposed between the flask and the conveyor with the result that the pipe is laid rather gently upon the conveyor without substantial shock. The means for dislodging the lower extremity of the pipe from the support may take various forms, being shown as a pipe engaging member connected with a turnable shaft and pushing laterally against the pipe when the shaft is turned. When a plurality of pipes are cast in battery such a member is provided for each and all of the dislodging members are preferably operated simultaneously by a common operating member.

One of the advantages of the invention is that as soon as the pipes have been discharged from the flasks into the transfer means the next cycle of operations at the casting station may be commenced. It is not necessary to slow down the operations at the casting station to permit solidification of the pipes while in the flasks to the extent that they may be discharged therefrom to fall upon their sides. As soon as the pipes have been ejected from the flasks new mold forming material may be introduced into the flasks and the succeeding cycle of operations at the casting station may be proceeded with. The pipes may be held by the transfer means as long as desired until the pipes formed at the casting station in the succeeding cycle are ready to be ejected. Just before ejection of those pipes the pipes which were formed in the preceding cycle may be delivered from the transfer means to the conveyor as above described. This has the two-fold advantage of avoiding delay at the casting station while the pipes are solidifying while at the same time holding the pipes in generally upright position until they have solidified sufficiently to enable them to be disposed on the conveyor on their sides without likelihood of damage thereto.

The employment of the transfer means for receiving the pipes from the flasks before they are disposed on the conveyor also contributes to a further important advantage of the invention. It may be desired to provide a plant with a plurality of casting stations and a conveyor arranged to receive the pipes cast at the respective casting stations. This means that pipes from at least one casting station will be on the conveyor as the conveyor passes through the zone in which it is adapted to receive pipes from another casting station. Without the provision of the transfer means it would be necessary to synchronize the mechanism at the respective casting stations to discharge pipes onto the conveyor at such relative times that the pipes discharged from a casting station disposed in the direction of advance of the conveyor relatively to another casting station would not fall upon pipes previously delivered to the conveyor from the second

mentioned casting station. With the use of the transfer means there is no need to synchronize the operations at the respective casting stations, and each casting station may operate on its own schedule independently of each other casting station. At each casting station the pipes are discharged from the flasks at the normal time in each cycle and the succeeding cycle is immediately initiated and the pipes are held by the transfer means until an appropriate time when they may be delivered to the conveyor so as not to fall upon other pipes which have been delivered to the conveyor at another casting station. This provision further contributes to the ability to utilize the conveyor with optimum efficiency.

Other details, objects and advantages of the invention will become apparent as the following description of certain present preferred embodiments thereof and certain present preferred methods of practicing the same proceeds.

In the accompanying drawings we have shown certain present preferred embodiments of the invention and have illustrated certain present preferred methods of practicing the same in which:

Figure 1 is a somewhat diagrammatic elevational view of apparatus for centrifugally casting soil pipe disposed at a casting station, a conveyor for conveying the cast soil pipe from the casting station for further processing and transfer means for transferring the soil pipe from the casting station to the conveyor;

Figure 2 is a plan view of the transfer means and the conveyor showing the relative positioning thereof and the arrangement in which the pipes are disposed upon the conveyor;

Figure 3 is an end elevational view of the transfer means; and

Figure 4 is a diagrammatic plan view showing how pipes are delivered to a common conveyor from a plurality of casting stations.

Referring now more particularly to the drawings, the centrifugal casting apparatus is shown diagrammatically in Figure 1 and designated generally by reference numeral **2** and embodies in the form shown four flasks **3** arranged in battery, i. e., with their axes coplanar and arranged at substantially equal intervals. A generally straight generally horizontal line **4** intersects the flasks and also the pipes cast therein. The flasks are movable between generally horizontal and generally upright positions. Normally the pipes are cast with the flasks in generally horizontal position and after the metal has solidified the flasks are shifted to generally upright position when the pipes and the compacted mold material are ejected through the bottoms of the flasks. The line **4** may also indicate the axis about which the flasks are turned in being shifted between generally horizontal and generally upright positions. As the flasks **3** are diagrammatically shown in Figure 1 they are in generally upright position. When a plurality of pipes are formed in battery they are ejected simultaneously. When the pipes are ejected they are generally upright and arranged in a line spaced apart axis-to-axis the same as the axis-to-axis spacing of the flasks. Since the details of casting and ejecting the pipes do not constitute our invention we shall not further describe such details. We have shown diagrammatically in Figure 1 in the right-hand flask **3** appearing in that figure a mold **3***a* of compacted mold forming material formed in the flask, a core **3***b* also of compacted mold forming material cooperating with the mold **3***a* to form the bell or hub of the pipe and a pipe P centrifugally cast in the mold.

The casting apparatus just described is disposed at a casting station. Below the casting station is an endless conveyor **5** which travels toward the right or in the direction of the arrow *x* in Figure 1. The axis of the conveyor, i. e., a line on the effective pipe carrying surface of the conveyor at the center thereof and extending parallel to the direction of advance of the conveyor, makes an acute angle with the trace on the conveyor of the line **4**. Thus when the pipes are ejected downwardly through the flasks while the latter are arranged in upright position the pipes are adapted to assume positions on the conveyor in which the spacing between pipes in the direction at right angles to the direction of advance of the conveyor is much less than the spacing between pipes while they are being cast in the flasks or while they are being ejected from the flasks.

We provide pipe handling or transfer mechanism inter-

posed between the casting station and the conveyor 5 for handling the pipes ejected from the flasks and delivering them in desired arrangement upon the conveyor. The transfer mechanism is supported below the casting station and above the conveyor by suitable framework 6. Carried by the framework 6 are pipe supports or stop members 7, there being one such support for each flask disposed directly beneath the flask when the flask is in upright position. Each support 7 is of somewhat concave shape adapting it to receive and retain cushioning material such as sand 8. Supported by the framework 6 directly above each support 7 and coaxial with the corresponding flask 3 when the latter is in upright position is a generally tubular member 9 whose inside diameter is substantially greater than the greatest outside diameter of the pipe. The member 9 is cut away at the side thereof facing in the direction of advance of the conveyor 5 as shown at 10 for a purpose which will presently be described. Each member 9 is positioned a distance above the corresponding support 7 roughly equal to the length of the pipe so that when a pipe ejected from the flask passes downwardly through the member 9 until its lower end is arrested by the support 7 having thereon the cushioning material 8 the upper end of the pipe will be disposed within the member 9 above the cutout 10 thereof whereby the member 9 prevents the pipe from tilting or falling over. It may tilt slightly so as to rest against the inside of the member 9 but such slight tilting is inconsequential.

Journaled in the framework 6 are four shafts 11. All four of the shafts project laterally from the framework at one side thereof as shown in the drawings. Each shaft 11 is of such length as to extend inwardly to a position somewhat past one of the supports 7 and the corresponding member 9. Such shaft lies behind the axis of the member 9, i. e., somewhat in the upstream direction therefrom with reference to the movement of the conveyor. Connected with each shaft 11 in alignment longitudinally of the conveyor with the axis of the corresponding member 9 is a pusher or dislodger 12. The pusher 12 extends downwardly from its shaft 11 and is adapted when the shaft is turned in the counterclockwise direction viewing Figure 1 to push or dislodge the lowermost portion of the pipe from the support 7.

Fastened to each shaft 11 is a generally downwardly extending arm 13. Connected with the respective arms 13 by pins 14 is a generally horizontally arranged operating member 15 which is pivoted at 16 to a piston rod 17 connected with a piston in a cylinder 18 trunnioned at 19 to a support 20 which may be a portion of the supporting framework. Operation of the piston in the cylinder 18 moves the operating member 15 and operates all of the pushers 12 simultaneously.

A cycle of operations will now be described. Molds like the mold 3*a* of compacted mold forming material, e. g., sand, are first formed in the four flasks 3 in known manner. Cores like the cores 3*b* for forming the pipe hubs are applied to the flasks in known manner, the flasks are arranged with their axes generally horizontal and rotated at centrifugal speed and molten material for forming the pipes is introduced into the rotating flasks and molds. The pipes may be formed of iron or other suitable material which can be centrifugally cast. When the material of the pipes has solidified the rotation of the flasks is stopped and the flasks are arranged in upright position. The pipes, the mold material from within the flasks and the cores, which may be formed of similar mold material, are ejected downwardly. Each pipe passes through the corresponding member 9 and moves downwardly, retaining its generally upright position until the lower extremity of the pipe strikes the cushioning material 8 on the support 7. This is pipe position A indicated in chain lines in Figure 1. The pipe is thus arrested in generally upright position. With the four pipes thus positioned, and preferably after a suitable solidification period, the piston in the cylinder 18 is moved toward the right viewing Figure 1 swinging the four pushers 12 toward the right or in the counterclockwise direction about the axes of their respective shafts 11 and thus dislodging the lower ends of the pipes from the supports 7. The pipes pass through pipe position B of Figure 1 when their lower ends are dislodged from the supports. As soon as the lower ends of the pipes have been thus dislodged the pushers may be retracted to their inoperative generally vertical positions.

The dislodgment of the lower portions of the pipes from the supports 7 allows each pipe to move downwardly due to gravity a short distance until its lower extremity strikes the conveyor 5 (see pipe position C of Figure 1). Some of the cushioning material 8 will also fall upon the conveyor 5. The pipe will tilt with its lower end in the direction of advance of the conveyor and its rear end in the opposite direction. The cutout 10 in each of the members 9 is to permit tilting of the pipe. Prior to dislodgment of the lower end of the pipe from the support 7 the pipe is maintained generally upright by the member 9 as above explained but after dislodgment the pipe moves down out of the member 9 and the lower end is gradually advanced upon and by means of the conveyor 5. The upper end of the pipe gradually moves downwardly while leaning against the transfer mechanism until the upper end finally drops off of the edge of the support 7. Pipe position D of Figure 1 shows the pipe just before the upper end drops off of the edge of the support, while pipe position E shows it on the conveyor 5.

The pipes are arranged on the conveyor 5 as shown in Figure 2. The conveyor is driven at such a speed relatively to the frequency of casting the groups of pipe that the respective groups of pipe are disposed on the conveyor with the forward ends of the pipes of each group spaced rearwardly of the rearward ends of the pipes of the immediately preceding group a distance equal to a fraction of the length of the pipes. Thus the conveyor is most efficiently employed and can operate at optimum minimum speed.

Side plates 21 are provided at each side of each transfer mechanism so that if while a pipe is being dragged down by the conveyor the upper end of the pipe tends to move laterally it will be restrained against such movement by engagement with one or the other of the side plates. Generally horizontal plates 22 may be provided, each of such plates having a cutout 23 to permit the pipe to pass therethrough and to tilt during operation as shown in Figure 1.

Figure 4 is a diagram showing two casting stations designated, respectively, S and S′ with a conveyor designated 5*a* arranged to receive the pipes cast at the respective casting stations S and S′. The pipes are discharged from each of the casting stations downwardly toward the conveyor in the same manner and in the same relationship to the conveyor as above described. The conveyor moves toward the right or in the direction of the arrow *y* in Figure 4. Preferably transfer means such as the transfer means shown in Figures 1, 2 and 3 and described above are provided at each of the casting stations S and S′, although for accomplishment of the advantages presently under consideration it is only necessary that such transfer means be provided at the station S′.

The pipes cast at the station S are disposed upon the conveyor 5*a* at intervals, it being understood that the conveyor 5*a* moves continuously. The speed of movement of the conveyor 5*a* is preferably made approximately twice the speed of movement of the conveyor 5 of Figures 1, 2 and 3 since the conveyor 5*a* has to take care of double the number of pipes taken care of by the conveyor 5 in a given time (it being assured that the time cycle of each of the casting stations S and S′ is the same as the time cycle of the casting station 2). Thus the pipes delivered to the conveyor 5*a* at the station S are delivered in spaced apart groups, the spaces lengthwise of the conveyor between adjacent groups each being great enough to receive a similar group of pipes delivered at the station S′. The groups of pipes delivered to the conveyor 5*a* at the station S are designated *p*.

The transfer means at the station S′ is utilized as above explained and holds the pipes cast at the station S′ until such time as a space between groups of pipes *p* on the conveyor 5*a* is disposed at the zone in which the pipes cast at the station S′ are delivered to the conveyor by the transfer means at that station. Thus through the use of the transfer means at station S′ the pipes cast at that station can be delivered to the conveyor 5*a* in the spaces between the groups of pipes *p*. The pipes cast at the station S′ are designated *p*′. Thus we provide for optimum operating efficiency at each of the casting stations and at the same time utilize the conveyor at optimum efficiency.

While we have shown and described certain present preferred embodiments of the invention and have illustrated certain present preferred methods of practicing

the same it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

We claim:

1. A method of casting and handling elongated articles comprising casting at a casting station a plurality of elongated articles in generally side-by-side relationship, discharging downwardly from the casting station the cast elongated articles while in generally upright position, arresting the downward movement of the cast elongated articles, while supporting the cast elongated articles only at their upper ends substantially simultaneously moving the lower ends of the cast elongated articles into positions upon a conveyor moving in a generally horizontal direction with the cast elongated articles oriented generally in planes parallel to said direction and subsequently laying the cast elongated articles in side-by-side relationship upon the conveyor.

2. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position, arresting the downward movement of the cast elongated article, while supporting the cast elongated article only at its upper end moving its lower end into position upon a conveyor moving in a generally horizontal direction with the cast elongated article oriented generally in a plane parallel to said direction and subsequently laying the cast elongated article upon the conveyor.

3. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position, bringing the downwardly discharged cast elongated article substantially to rest upon a support underlying the article and with the article in generally upright position moving the lower end of the article off of the support to cause the article to fall upon a conveyor which delivers the article away from the casting station.

4. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position, bringing the downwardly discharged cast elongated article substantially to rest upon a support underlying the article and with the article in generally upright position moving the lower end of the article off of the support to cause the article to fall upon a conveyor which delivers the article away from the casting station, such movement of the lower end of the article off of the support being in a direction substantially parallel to the direction of advance of the conveyor so that when the article falls upon the conveyor it is oriented generally parallel to the direction of advance of the conveyor.

5. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position, bringing the downwardly discharged cast elongated article substantially to rest upon a support underlying the article and cushioning the article as it comes to rest upon the support and moving the lower end of the article in advance of the upper end of the article off of the support to cause the article to fall upon a conveyor which delivers the article away from the casting station.

6. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position, arresting the downward movement of the cast elongated article, when the downward movement of the cast elongated article is arrested substantially confining the upper portion of the cast elongated article to prevent it from tipping over and moving the cast elongated article with the lower end thereof leading from the position in which it is arrested into position lying upon a conveyor which delivers the article away from the casting station.

7. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position and while the cast elongated article is in a condition of strength occurring upon cooling subsequent to solidification such that if it were discharged to fall on its side it would be susceptible to damage, arresting the downward movement of the cast elongated article while it remains in generally upright position, maintaining the cast elongated article in generally upright position until the cast elongated article has cooled to such an extent that it can be disposed on its side without adversely affecting it and after the cast elongated article has thus further cooled disposing it on its side.

8. A method of casting and handling an elongated article comprising casting at a casting station an elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position and while the cast elongated article is in a condition of strength occurring upon cooling subsequent to solidification such that if it were discharged to fall on its side it would be susceptible to damage, arresting the downward movement of the cast elongated article while it remains in generally upright position, maintaining the cast elongated article in generally upright position until the cast elongated article has cooled to such an extent that it can be disposed on its side without adversely affecting it and after the cast elongated article has thus further cooled delivering it onto a conveyor on which the cast elongated article lies on its side.

9. A method of casting and handling an elongated article comprising casting at a casting station a complete self-contained elongated article, discharging downwardly from the casting station the cast elongated article while in generally upright position and while the cast elongated article is in the early stages of solidification so that if it were discharged to fall on its side it would be susceptible to damage, arresting the downward movement of the cast elongated article at a receiving station while it remains in generally upright position, maintaining the cast elongated article in such position for further solidification until shortly before the succeeding cast elongated article is ready to be discharged, after the cast elongated article has thus further solidified disposing it on its side and while the cast elongated article is disposed in generally upright position at the receiving station initiating the succeeding cycle of operations at the casting station.

10. Apparatus for casting and handling elongated articles comprising means at a casting station for casting an elongated article, a conveyor moving generally below the casting station and transfer means including fixedly mounted article arresting means adjacent the conveyor and means for moving the article out of arrested position on the fixedly mounted article arresting means operatively interposed between the casting station and the conveyor for transferring the cast elongated article from the casting station to a position on the conveyor in which the cast elongated article is oriented generally parallel to the direction of movement of the conveyor.

11. Apparatus for casting and handling elongated articles comprising means at a casting station for casting an elongated article and discharging the cast elongated article downwardly with the cast elongated article in generally upright position, a conveyor moving generally below the casting station, means operatively interposed between the casting station and the conveyor for receiving the cast elongated article thus discharged downwardly from the casting station and supporting the same in generally upright position and means disposed above the conveyor for dislodging the lower portion of the cast elongated article from the last mentioned means so that the cast elongated article moves downwardly until its lower portion engages the conveyor whereafter through movement of the conveyor the cast elongated article is brought to rest upon the conveyor with the cast elongated article oriented generally parallel to the direction of movement of the conveyor.

12. Apparatus for casting and handling elongated articles comprising means at a casting station for casting an elongated article and discharging the cast elongated article downwardly with the cast elongated article in generally upright position, a conveyor moving generally below the casting station, a generally tubular member

through which the cast elongated article passes when discharged downwardly from the casting station, a stop member disposed below the generally tubular member and positioned relatively to the generally tubular member so that when the lower extremity of the cast elongated article passing downwardly through the generally tubular member is stopped by the stop member the upper portion of said article is within the generally tubular member whereby said article is prevented from tipping over while its lower extremity is supported by the stop member and means disposed above the conveyor for dislodging the lower extremity of said article from the stop member so that the cast elongated article moves downwardly until its lower extremity engages the conveyor whereafter through movement of the conveyor the cast elongated article is brought to rest upon the conveyor with the cast elongated article oriented generally parallel to the direction of movement of the conveyor.

13. Apparatus for handling a cast elongated article delivered downwardly with the article disposed in generally upright position comprising a generally tubular member through which the cast elongated article passes, a stop member disposed below the generally tubular member and positioned relatively to the generally tubular member so that when the lower extremity of the cast elongated article passing downwardly through the generally tubular member is stopped by the stop member the upper portion of said article is within the generally tubular member whereby said article is prevented from tipping over while its lower extremity is supported by the stop member and means disposed above the stop member for moving laterally the lower extremity of said article to dislodge the same from the stop member to permit the cast elongated article to move downwardly therefrom.

14. Apparatus for handling a cast elongated article delivered downwardly with the article disposed in generally upright position comprising a stop member interposed in the path of downward movement of the cast elongated article to stop such movement thereof, means positioned relatively to the stop member so that when said article is supported upon the stop member said means is adapted to engage said article at a portion thereof above the lower extremity thereof to prevent the same from tipping over and means disposed above the stop member for moving laterally the lower extremity of said article to dislodge the same from the stop member to permit the cast elongated article to move downwardly therefrom.

15. Apparatus for handling a cast elongated article delivered downwardly with the article disposed in generally upright position comprising a stop member interposed in the path of downward movement of the cast elongated article to stop such movement thereof, cushioning material on the stop member to cushion the shock imparted to the cast elongated article when it is stopped by the stop member, means positioned relatively to the stop member so that when said article is supported upon the stop member said means is adapted to engage said article at a portion thereof above the lower extremity thereof to prevent the same from tipping over and means disposed above the stop member for moving laterally the lower extremity of said article to dislodge the same from the stop member to permit the cast elongated article to move downwardly therefrom.

16. Apparatus for handling a cast elongated article delivered downwardly with the article disposed in generally upright position comprising a stop member interposed in the path of downward movement of the cast elongated article to stop such movement thereof, means positioned relatively to the stop member so that when said article is supported upon the stop member said means is adapted to engage said article at a portion thereof above the lower extremity thereof to prevent the same from tipping over, a turnable shaft and a member connected with said shaft and operated thereby upon turning thereof to move laterally the lower extremity of said article to dislodge the same from the stop member to permit the cast elongated article to move downwardly therefrom, the dislodging portion of said member being disposed above the stop member.

17. Apparatus for handling cast elongated articles delivered downwardly in generally side-by-side relationship with the articles disposed in generally upright position comprising stop means interposed in the paths of downward movement of the cast elongated articles to stop such movement thereof, means positioned relatively to the stop means so that when said articles are supported upon the stop means said last mentioned means is adapted to engage said articles at portions thereof above the lower extremities thereof to prevent the same from tipping over, means for moving laterally the lower extremity of each article to dislodge the same from the stop means to permit the cast elongated articles to move downwardly therefrom and operating means for simultaneously operating said dislodging means, the dislodging portions of the dislodging means being disposed above the stop means.

18. Apparatus for handling cast elongated articles delivered downwardly in generally side-by-side relationship with the articles disposed in generally upright position comprising stop means interposed in the paths of downward movement of the cast elongated articles to stop such movement thereof, means positioned relatively to the stop means so that when said articles are supported upon the stop means said last mentioned means is adapted to engage said articles at portions thereof above the lower extremities thereof to prevent the same from tipping over, a pivoted pusher disposed above the stop means for pushing laterally the lower extremity of each article to dislodge the same from the stop means to permit the cast elongated articles to move downwardly therefrom and a common operating member for simultaneously operating all of said pivoted pushers to substantially simultaneously dislodge the cast elongated articles.

19. Apparatus for casting and handling elongated articles comprising means at each of a plurality of casting stations for casting an elongated article, a conveyor moving successively into receiving positions adjacent the respective casting stations to receive cast elongated articles therefrom and transfer means operatively interposed between at least a casting station disposed in the direction of travel of the conveyor relatively to another casting station and the conveyor for transferring the cast elongated article therefrom to a position on the conveyor, the transfer means having means adapted to hold the cast elongated article received from the first mentioned casting station until suitable space on the conveyor for delivery thereof becomes available while at the same time permitting initiating of the succeeding cycle of operations at the first mentioned casting station and means for discharging the cast elongated article from the holding means onto the conveyor.

20. Apparatus for casting and handling elongated articles comprising means at each of a plurality of casting stations for substantially simultaneously casting a plurality of elongated articles, a conveyor moving successively into receiving positions adjacent the respective casting stations to receive cast elongated articles therefrom with the cast elongated articles delivered from each station ranged transversely of the conveyor and transfer means operatively interposed between at least a casting station disposed in the direction of travel of the conveyor relatively to another casting station and the conveyor for transferring the cast elongated articles therefrom to positions ranged transversely of the conveyor, the transfer means having means adapted to hold the cast elongated articles received from the first mentioned casting station until suitable space on the conveyor for delivery thereof becomes available while at the same time permitting initiating of the succeeding cycle of operations at the first mentioned casting station and means for discharging the cast elongated articles from the holding means onto the conveyor.

21. Apparatus for casting and handling elongated articles comprising a conveyor and a plurality of casting devices for casting elongated articles arranged above the conveyor and in side-by-side relationship in alignment at an acute angle to the length of the conveyor so that elongated articles cast in the casting devices when discharged downwardly onto the conveyor lie closer together on the conveyor than the spacing between the casting devices.

22. Apparatus for casting and handling elongated articles comprising a conveyor, a plurality of casting devices for casting elongated articles arranged above the conveyor in side-by-side relationship in alignment at an acute angle to the length of the conveyor and transfer means interposed between the casting devices and the conveyor delivering cast elongated articles from the casting devices onto the conveyor oriented generally parallel to the length of the conveyor and in side-by-side rela-

tionship more closely spaced than the spacing between the casting devices.

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