

June 24, 1930.

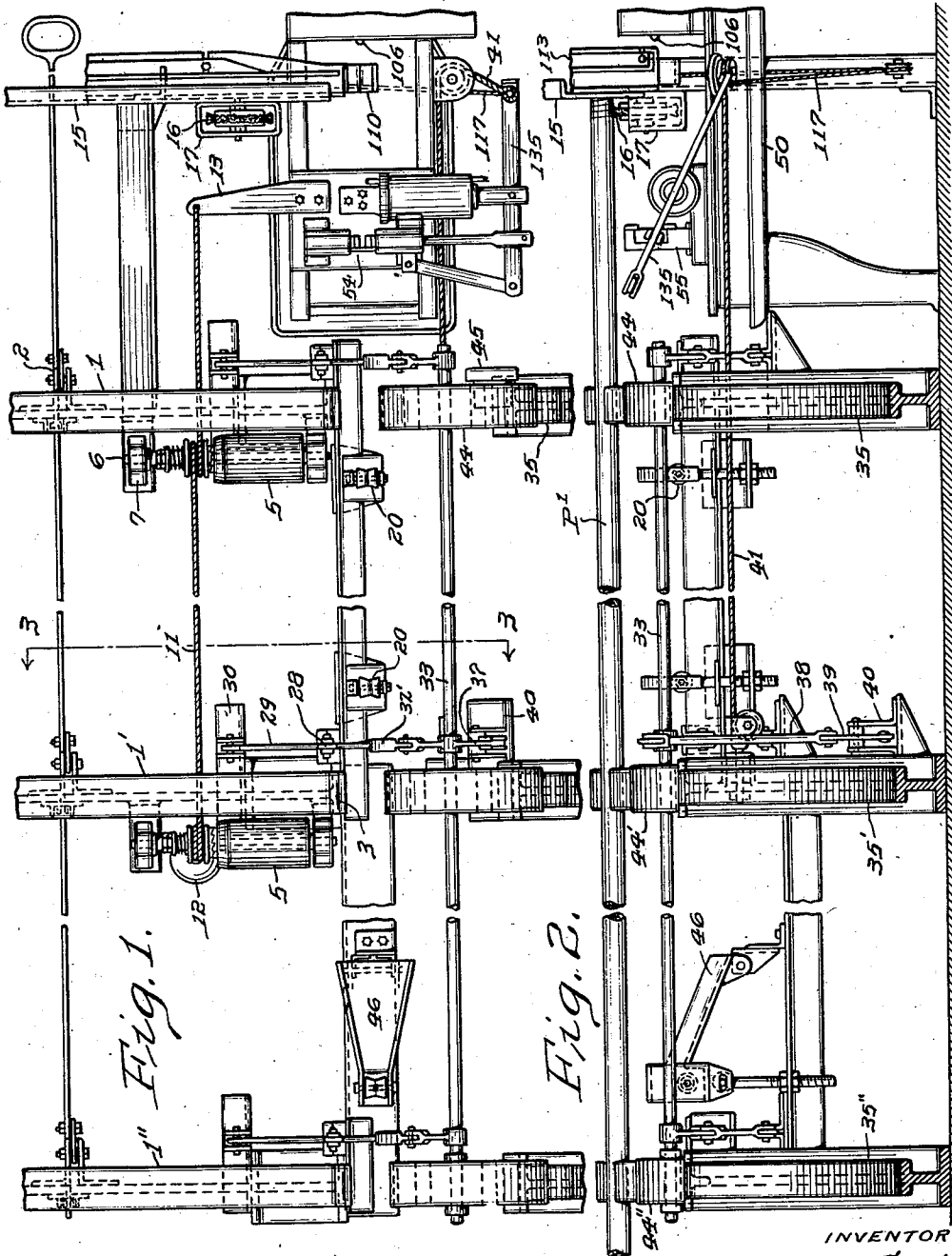
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1,765,825

MACHINE FOR SCREWING COUPLINGS ON PIPE

Filed Sept. 24, 1928

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

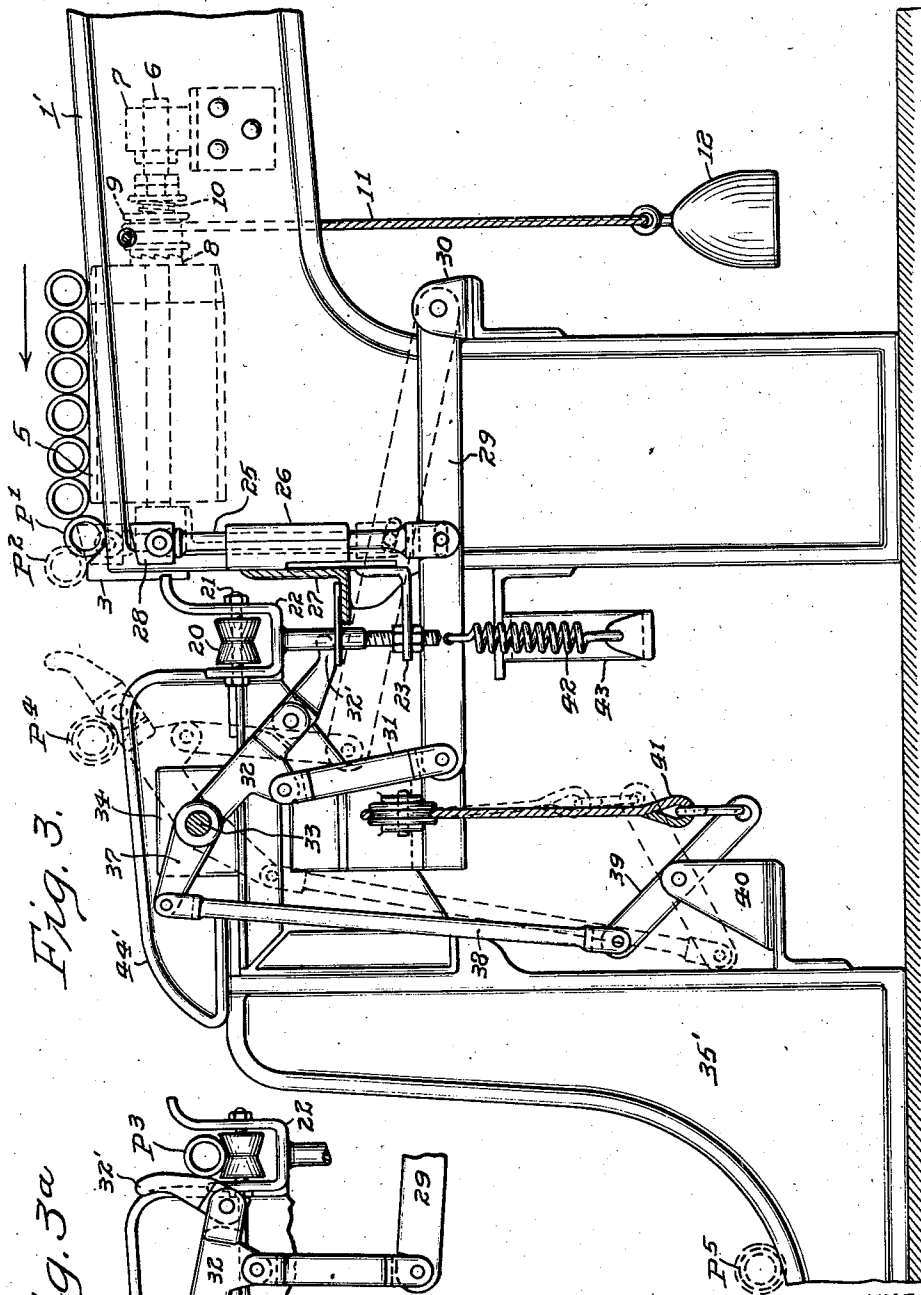


Fig. 3.

Fig. 3a

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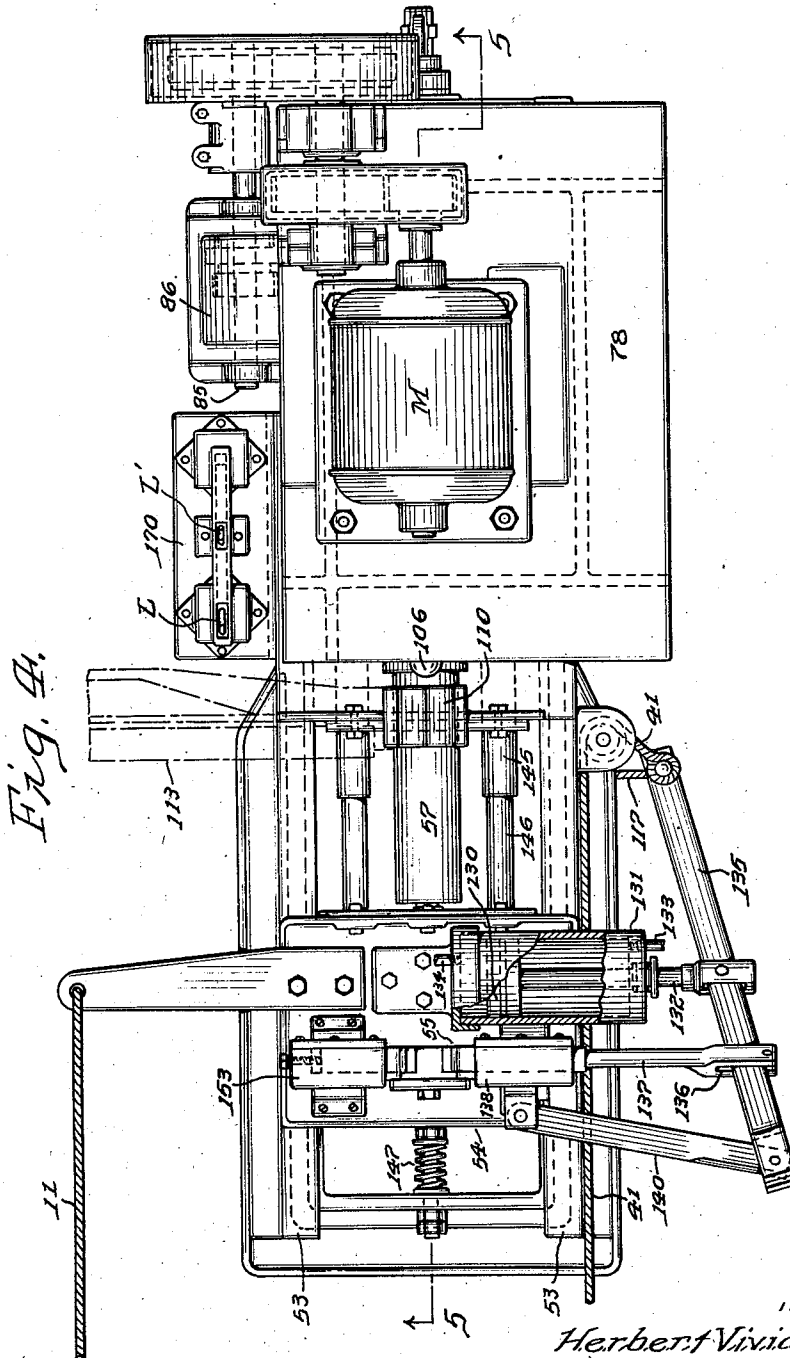
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MACHINE FOR SCREWING COUPLINGS ON PIPE

Filed Sept. 24, 1928

6 Sheets-Sheet 3



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Filed Sept. 24, 1928

6 Sheets-Sheet 4

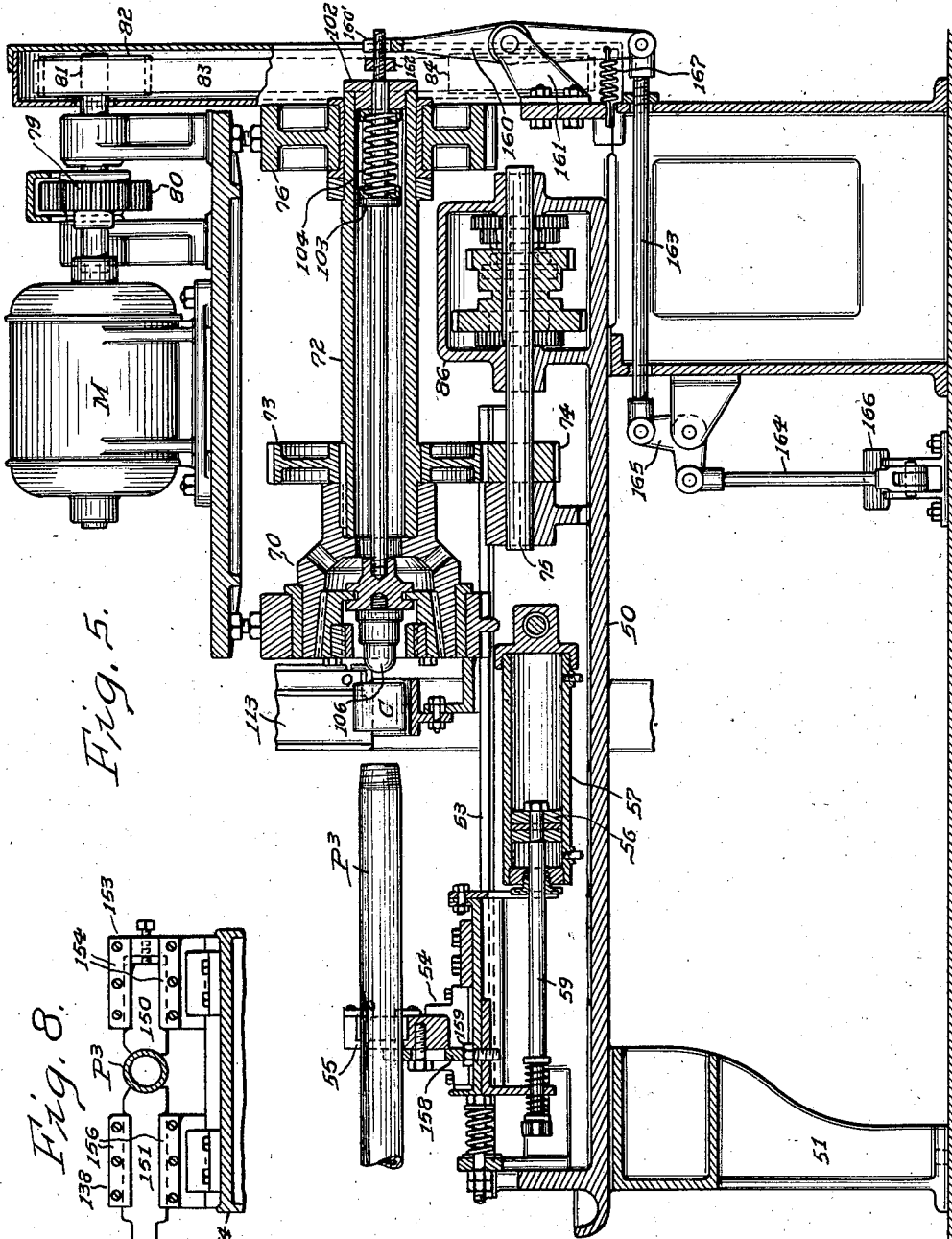


Fig. 5.

Fig. 8.

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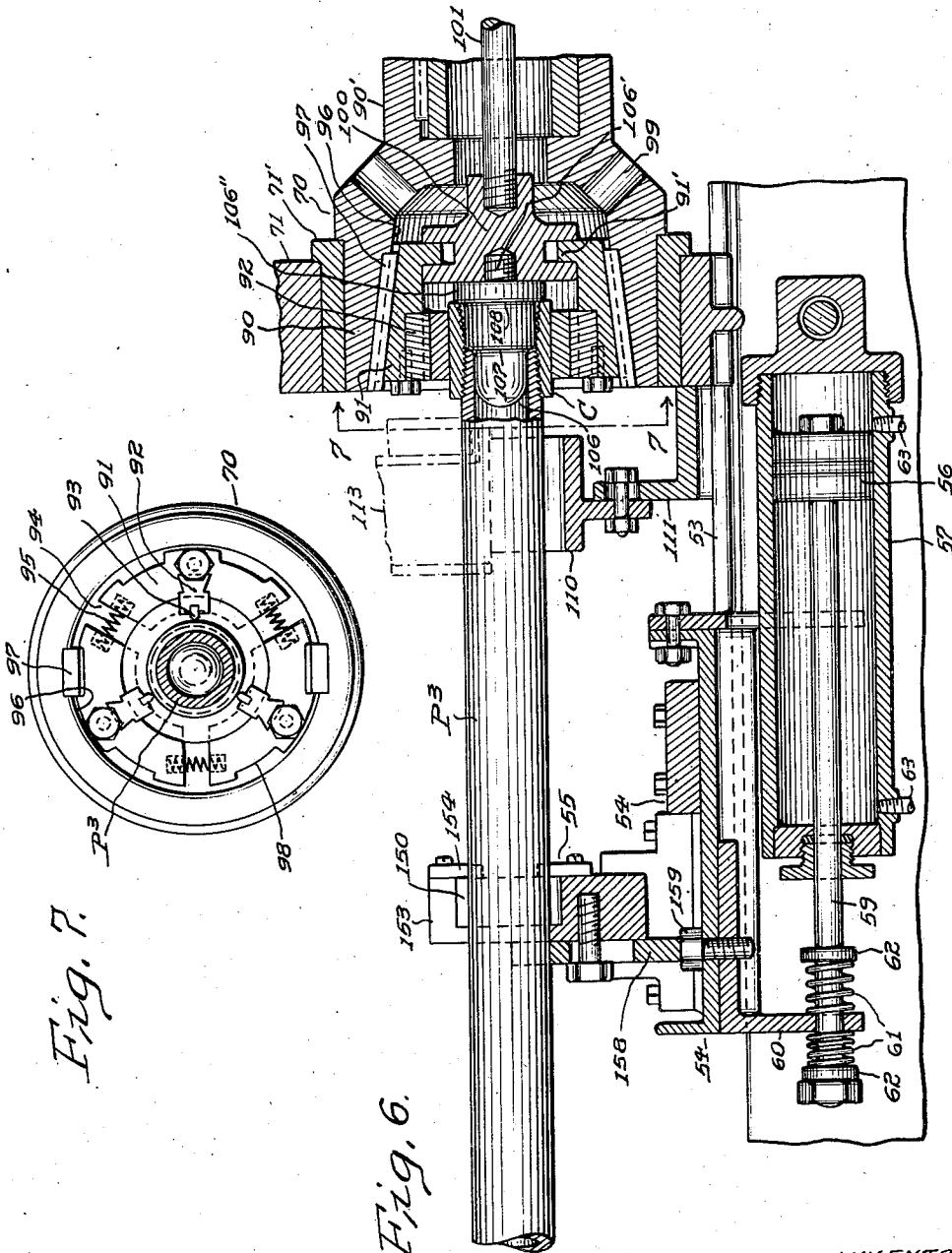
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MACHINE FOR SCREWING COUPLINGS ON PIPE

Filed Sept. 24, 1928

6 Sheets-Sheet 5



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MACHINE FOR SCREWING COUPLINGS ON PIPE

Filed Sept. 24, 1928

6 Sheets-Sheet 6

Fig. 9.

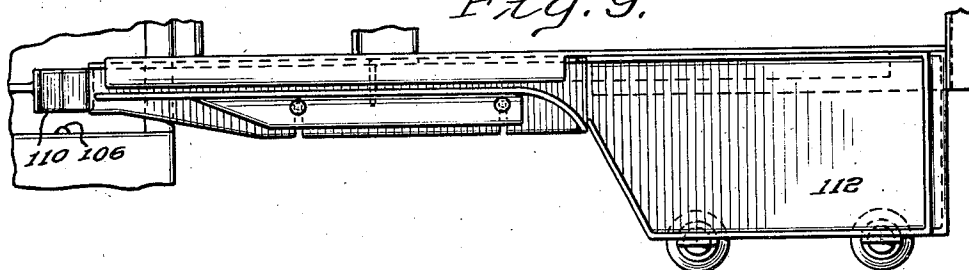


Fig. 10.

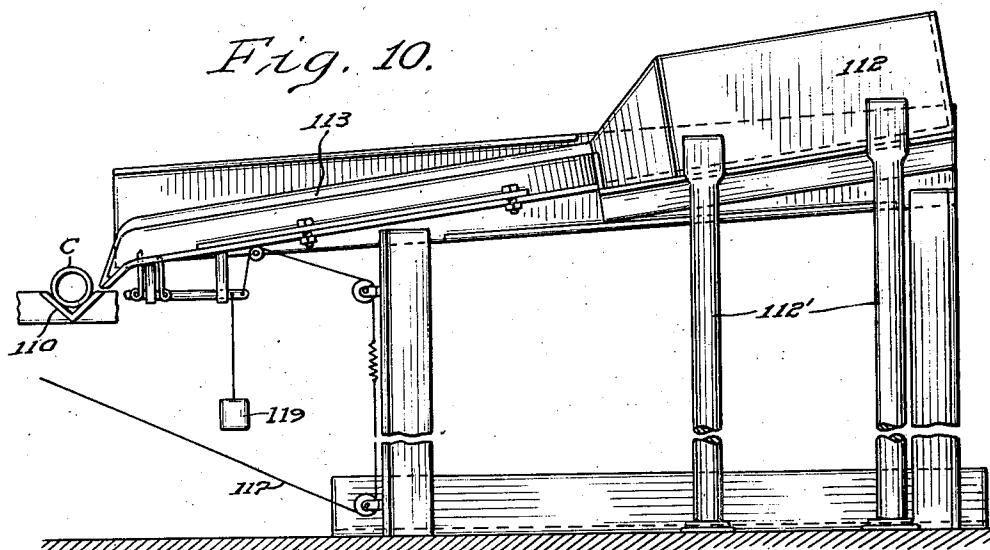
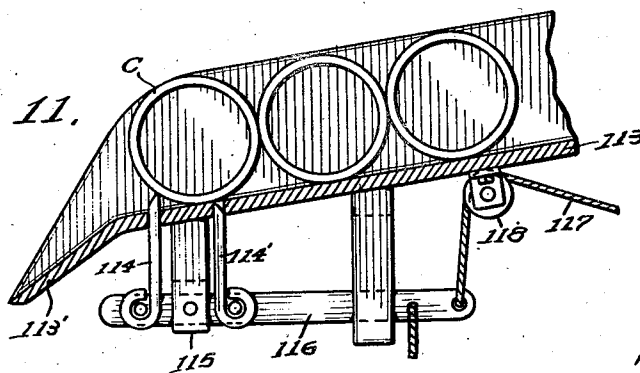


Fig. 11.



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MACHINE FOR SCREWING COUPLINGS ON PIPE

Application filed September 24, 1928. Serial No. 307,858.

The principal object of the present invention is to provide a machine for screwing couplings onto the ends of pipe substantially automatically and with great rapidity and economy.

Further objects, advantages and novel features of design, construction and arrangement comprehended by the invention are hereinafter more particularly mentioned or will be apparent from the following description of a machine constructed in accordance therewith and illustrated in the accompanying drawings.

A brief reference, as follows, to the general arrangement and principles of operation of the machine will first be made as the same will be of assistance in facilitating a proper comprehension of the invention as hereinafter more fully explained: Viewed in its broader aspects the function of the machine is to receive pipes which have been threaded on at least one end from a suitable source of supply; to consecutively bring each pipe to a predetermined position in alignment with an internally threaded coupling delivered to a predetermined position from another source of supply; to then move the pipe longitudinally into engagement with the coupling so as to push the latter into a rotating chuck which automatically grips the coupling and then screws it onto the nonrotating pipe; to then move the pipe with the coupling positioned thereon in the opposite direction so as to withdraw the coupling from the chuck and to finally eject the pipe and coupling as a unit from the machine. To this end the machine embodies, among other things, means for receiving the pipes from the source of supply, means for bringing them to a predetermined position, means for then consecutively positioning each pipe in substantial axial alignment with a coupling, means for then advancing the aligned pipe longitudinally toward the coupling chuck so as to slide the coupling thereinto and for thereafter retracting the pipe and coupling when united so as to clear the coupling from the chuck, and means for discharging from the machine the united pipe and coupling.

For accomplishing these ends any suitable means or instrumentalities may be employed although ordinarily I prefer to utilize means of substantially the character hereinafter described as the same are well adapted for the accomplishment of their respective functions. It will thus be understood that essentially the machine comprises two more or less separate and distinct but operatively interconnected and conjointly acting mechanisms, namely, the means or mechanism for moving the pipe both before and after the application of the coupling thereto and the means or mechanism for effecting the actual application of the coupling to the pipe after the latter has been brought to proper position for that operation.

In the accompanying drawings, Fig. 1 is a fragmentary top plan view of the skids and associated mechanism, the primary function of which is to effect the movement of the pipe, and Fig. 2 is a rear elevation thereof. Fig. 3 is an enlarged fragmentary transverse section substantially on line 3—3 in Fig. 1 looking in the direction of the arrows and Fig. 3^a is a fragmentary detail view showing certain of the parts illustrated in Fig. 3 but in a different position from that shown in said figure. Fig. 4 is a fragmentary top plan view of that portion of the machine, the primary function of which is to effect the application of the coupling to the pipe, the coupling magazine and feeding mechanism being omitted for the sake of clearness but their general position being indicated by broken lines, and Fig. 5 is a vertical central section substantially on line 5—5 of Fig. 4 looking in the direction of the arrows. Fig. 6 is an enlarged fragmentary vertical section showing certain of the parts illustrated in Fig. 5 but in a different position from that shown in said figure, the purpose of this view being to more particularly illustrate the actual application of the coupling to the end of the pipe. Fig. 7 is an end view of the coupling chuck removed from the machine and Fig. 8 is a detail view illustrating the construction of the pipe grip. Fig. 9 is a top plan

view of the coupling feed mechanism and Fig. 10 is a side elevation thereof, the coupling rest and certain other parts more particularly illustrated in Figs. 4, 5 and 6 being also fragmentarily shown to indicate the relation of the feed mechanism to the other parts of the machine as a whole. Fig. 11 is an enlarged fragmentary view, partially in side elevation and partially in vertical section, of the gate mechanism and adjacent parts of the coupling feed mechanism. The same symbols are used to designate the same parts in the several figures and all sections are to be understood as taken in the directions indicated by the arrows on the section lines.

As shown, the machine comprises a plurality of skids 1, 1', 1'' arranged at longitudinally spaced intervals, tied together by longitudinally extending members, and adapted to support the pipe when delivered thereto from the source of supply. Ordinarily a plurality of lifts of pipe are placed on the front ends of the skids at one time and a manually operable gate, generally designated as 2, may be provided for controlling the passage of the pipes toward the rear of the machine; that is, in the direction indicated by the arrow in Fig. 3. The upper faces of the skids are downwardly inclined from front to rear so the pipes will gradually roll therealong until the leading pipe P¹ encounters an inclined stop 3 arranged at the rear end of each skid to thereby temporarily arrest its further progress. For the purpose of clearness, no pipes are shown in Fig. 1 and only the leading pipe P¹ in Fig. 2 but in Fig. 3 a plurality of pipes are shown with the leading pipe P¹ against the stops 3 and a plurality of other pipes behind the leading pipe and resting on the positioning rolls now to be described.

Conveniently two of these rolls 5, 5 are employed and as they are of similar construction a description of one of them will suffice. Thus each roll is disposed on a shaft 6 mounted for revolution in a bracket 7 carried by the adjacent skid, the roll being so arranged as to project a little above the surface of the latter, and as the roll shaft is horizontal or substantially so it will be apparent that as the pipes pass down the skid and onto the roll they will be lifted off of the skid and supported solely by the roll so long as they remain thereon; as the pipes consecutively reach the rear end of the roll, however, which terminates somewhat short of the inclined face of the stop 3 they will drop off of the roll onto the skid and again move therealong until further progress is arrested by the stops. Each roll carries at its forward end one half of an overrunning clutch, generally designated as 8, the other half of which is carried by a pulley 9 slidably mounted on the roll shaft and con-

stantly urged towards the roll by a spring 10. A cable 11 is carried about the pulleys 9 and provided at one end with a counterweight 12 and the other end of the cable is attached to an arm 13 movable with the pipe carriage hereinafter described, the arrangement being such that when the carriage is moved to the left when viewed as in Fig. 1, the counterweight will pull the cable in a similar direction so as to keep it taut but the rolls 5 will remain stationary due to overrunning of the clutches 8, but when the arm 13 is moved to the right, the cable will be pulled in a similar direction and cause the rollers to rotate so as to shift the pipes disposed thereon to the right until their leading ends are ultimately brought into engagement with a stop rail 15 extending transversely of the machine. In consequence, each pipe before it reaches the rear end of the rolls is automatically brought to a predetermined longitudinally aligned position with respect to the machine so that a correct and proper relation is established between the pipe and the pipe carriage and grip by which it is subsequently received as hereinafter described.

For lubricating the threads on the ends of the pipes to which the couplings are to be applied, a rotary lubricating brush 16 is mounted in a lubricant container 17 secured to the stop rail 15 in such position that as the pipes pass over the rolls 5 their ends will engage the brush so as to receive a coating of lubricant therefrom.

The leading pipe P¹ having thus reached the stops 3 is in position to be introduced to the pipe trough which is formed by a plurality of small rollers 20 mounted on horizontal shafts 21 supported in generally U-shaped brackets 22 conveniently adjacent the skids; these brackets in turn are supported on a longitudinally extending shelf 23 which also serves as one of the members which tie the skids together, and are desirably arranged for vertical adjustment.

To enable the leading pipe to pass the stops 3 and fall into the pipe trough it must be lifted and moved up on the inclined faces of the stops and for this purpose means in the form of lifting jacks in association with means for operating them at the proper time in the cycle are provided. Preferably a pair of these jacks are employed and arranged respectively adjacent the skids 1 and 1'. As best shown in Fig. 3, each jack comprises a vertically extending rod 25 slidably disposed in a guide 26 secured to a shelf 27 carried by the skids, extending horizontally between them and also serving to tie them together; at its upper end the rod is provided with a head 28 having a rearwardly inclined upper surface so disposed that when the skid is raised from full line to dotted line position as shown in said figure the head

will cooperate with the superjacent pipe so as to carry it over the stops 3 to a position in which it is free to fall into the pipe trough. The lower end of each rod 25 is connected to a normally horizontally extending lever 29 substantially midway between its ends and that end of this lever nearest the front of the machine is pivoted to a fixed bracket 30 secured to the adjacent skid while its opposite or rear end has connected to it a generally upwardly extending link 31 which, in turn, is connected to a superjacent lifting arm 32; preferably three of these arms are employed, respectively located adjacent the several skids and secured on a horizontally extending shaft 33 so as to turn therewith. This shaft is journaled in brackets 34 respectively carried by U-shaped members 35, 35', 35'' disposed in alignment with the skids and forming a receptacle for the pipe after it is ejected from the machine as hereinafter described. While, as stated, three of the lifting arms are preferably employed, only the arms adjacent skids 1, 1' are connected through the medium of links 31 and levers 29 with the jacks while a single crank 37 is extended rearwardly from shaft 33 and connected through the medium of a link 38 with one end of a short lever 39 pivoted at its center on a bracket 40 carried by the member 35', the other end of this lever 39 being connected with a cable 41 in such manner that a pull on the cable, effected as hereinafter described, is operative to swing lever 39 from its normal or full line position to dotted line position (Fig. 3) and thus rock shaft 33 in a counterclockwise direction so as to correspondingly swing the lifting arms 32 upwardly from normal or full line to dotted line position; during this movement of the lifting arms the motion thereof is communicated through links 31 and levers 29 to the rods 25 of the lifting jacks so as to likewise raise the same from full to dotted line position. Preferably each lifting arm is provided at its free end with a pivoted finger 32' so arranged that it can swing upwardly from its normal position in which it is aligned with the arm (Fig. 3) to a position substantially at right angles thereto (Fig. 3^a) for a purpose to be hereinafter described; desirably, the connection between the finger and the arm is such as to prevent the finger from moving downwardly, that is, in the opposite direction, with respect to the arm beyond its normal position.

Brief reference will now be made as follows to the operation of those parts of the machine which have hitherto been described: As the pipes are deposited on the front end of the skids they roll down toward the rear ends thereof, their movement being controllable by the manually operable gate 2. As the pipes consecutively pass onto rolls 5 the latter are intermittently rotated, as herein-

after described, through the medium of cable 11, thus carrying the pipes longitudinally toward stop rail 15 until they engage the same, after which the rolls during any further rotation merely slip relatively to those pipes which abut the rail. As the series of pipes continuously move down the inclined skids in front of the rollers, the leading pipes are gradually forced rearwardly along the rolls and as they move thereover their threaded ends adjacent stop rail 15 are lubricated by their passage over the lubricating brush 16, and when the foremost pipe P¹ has passed over the rear ends of the rolls and dropped onto the skids, it is then in position to be lifted by the jacks to the position P² at the proper time in the cycle of operations so as to pass over the stops 3 and drop into the pipe trough on the rollers 20.

As the upward movement of the jacks requisite for raising the pipe has been effected near the end of the preceding cycle through the movement of the lifting arms 32 in turn effected by movement of cable 41, the lifting arms, when pipe passes into the trough are in raised position, that is, dotted line position as shown in Fig. 3, but as soon as the pipe is seated in the trough, as at P³, the lifting arms are returned to normal position through release of cable 41 assisted by coil springs 42 connected with levers 29 and with brackets 43 carried by the skids 1, 1'. During this return movement of the lifting arms the hinged fingers 32' thereof swing upwardly about their pivotal connections with the arms (see Fig. 3^a) so as to clear the pipe which is now positioned in the pipe trough ready for the application of the coupling in the manner and by the means soon to be described. The lifting arm fingers are thus now disposed below the pipe, and after the coupling has been applied thereto they, together with arms 32, are again elevated through actuation of cable 41 so as to lift the pipe upwardly from the trough and discharge it onto auxiliary skids 44, 44', 44'' (as at P⁴, Fig. 3) carried by and aligned with the U-shaped members 35, 35', 35'' and which provide an inclined surface down which the pipes may roll into the U-shaped portion of the members from which, when a sufficient quantity of the pipes have accumulated therein, they may be removed by any suitable means. If desired an indicating device or counter, generally indicated at 45, may be positioned adjacent one of the auxiliary skids so as to register the number of pipes passing thereover.

It will thus be apparent that when each pipe reaches the rollers 20 it occupies a predetermined longitudinal position with respect to the machine due to the fact that the threaded end of the pipe to which the coupling is to be applied has previously been automatically brought against the fixed stop

rail 15. From this position on the rollers the pipe is now ready to be advanced to the right when viewed as in Fig. 5 for a substantially predetermined distance and in order to properly support the pipe throughout its length, the skids and more particularly the rollers 20 are ordinarily so disposed that the rear end of the pipe, that is, its left hand end when viewed as in Figs. 1 and 2, will overhang the last or left hand roller even after the pipe is advanced to the right to the maximum extent and will thus derive support from the said roller. However as it frequently happens that some of the pipes in a given lot are slightly shorter than the average, the left hand ends of these shorter pipes might clear the last roller during their longitudinal advance and on the return movement being thus unsupported by the last roller might strike the skid 1" or other portion of the apparatus. To guard against this contingency I preferably provide an inclined trough 46 adjacent the last roller 20 so arranged that it will receive and guide upwardly over the roller the ends of any short lengths of pipe during their return movement after the couplings have been applied to their opposite ends.

The mechanism by which the coupling is actually applied to the pipe is best illustrated in Figs. 5, 6, 7 and 8, and consists essentially of means for gripping and advancing the pipe longitudinally, means for supporting the coupling in longitudinal alignment with the pipe and means for gripping the coupling and screwing it onto the end of the pipe. More particularly, this portion of the machine may comprise a table 50 supported on pedestals or legs 51 and aligned with the pipe trough heretofore described. The table is provided with longitudinally extending laterally spaced ways 53 adapted to slidably support a carriage, generally designated as 54, for reciprocal movement thereon. This carriage in turn is arranged to support mechanism, generally designated as 55, adapted to grip the pipe and hold it sufficiently tightly so as to cause it to reciprocate with the carriage and prevent it from rotating under normal conditions. The reciprocating movement of the carriage is effected from a piston 56 disposed in a fluid cylinder 57, the fluid employed desirably being air, and carrying a piston rod 59 connected through a depending fork 60 with the carriage; desirably this connection between the fork and piston rod is not a rigid one but effected through the medium of cushioning springs 61 disposed on opposite sides of the fork between collars 62 on the rod. The fluid for actuating the piston in the fluid cylinder is admitted and exhausted through pipes 63 connected into the cylinder near its opposite ends and is con-

trolled as hereinafter described. That end of the table 50 which supports the carriage 54 is disposed adjacent the skid 1 so that as each pipe drops into the pipe trough it will be received between the pipe grips of the pipe gripping mechanism 55; near the center of the table is disposed the coupling chuck, generally designated as 70, and adjacent the opposite or outer end of the table, the mechanism for driving the chuck as well as other parts now to be described.

The coupling chuck 70 is rotatable in a housing 71 carried by and fixed with respect to the table, and is supported on and in turn rotatable with a hollow driving shaft 72 carrying a gear 73 meshing with a pinion 74 on a shaft 75 journaled below the driving shaft in brackets carried by the table. The opposite or outer end of the hollow drive shaft is journaled in a housing 76, also fixed with respect to the table, and any suitable means are provided for driving shaft 75 and pinion 74 so as to cause rotation of the chuck. For this purpose I prefer to utilize an electric motor M which may be mounted on a plate-like support 78 disposed above the housings 71 and 76 and supported therefrom; this motor is arranged to drive a pinion 79 and in turn a gear 80 disposed on a shaft 81 which, at its outer end, is provided with a sprocket 82 adapted for the reception of a suitable chain 83 leading downwardly to another sprocket 84 on the outer end of a shaft 85 journaled in suitable brackets or housings on the front side of the machine, this shaft being desirably in the same horizontal plane as shaft 75. As the speed of shaft 85 is normally constant and as it is desirable to provide for variation of the rotational speed of the coupling chuck 70 as well as for reversing the direction of its rotation so that it can be used for applying left hand thread couplings as well as right hand ones, I may interpose between the shaft 85 and the shaft 75 a set of sliding gears, generally designated as 86, or any other form of variable speed transmission suitable for controlling the speed of shaft 75 and/or reversing its direction of rotation, but as the construction and operation of such gear sets are well understood and specifically form no part of the present invention, I have not illustrated the gear set in detail nor shown the shifting fork or other means for operating it; it will, however, of course be understood that suitable means are provided for shifting the sliding gears or otherwise operating, when and as desired, whatever other form of variable speed transmission may be employed.

The coupling chuck 70 comprises a substantially cup-shaped externally cylindrical head 90 providing a bearing surface adapted to be received in the bushing 71' of the housing 71 and a hollow neck 90' for the

reception of the end of the shaft 72 to which it is keyed or otherwise secured. Within the head 90 are disposed segmental jaws 91, three being preferably employed and respectively provided with removable inserts 92 carrying sharp points 93 adapted to engage the coupling. When assembled in the head, the jaws do not completely fill the same but are of such length as to leave clearances 94 between their adjacent ends and small coil springs 95 are disposed therebetween so as to continuously urge them apart.

The inner peripheral surface 96 of the head 90 is inclined or conical and against this surface the jaws are arranged to seat and slide longitudinally but are prevented from relative rotation with respect to the head by one or more keys 97. In practice, two keys respectively cooperative with two of the jaws as shown in Fig. 7 have been found sufficient for this purpose, the third jaw being thus allowed to "float" with consequent reduction of friction during the closing of the jaws on the coupling; under certain circumstances, however, it may be deemed preferable to utilize a key for each jaw or but a single key. The jaws are also desirably provided with longitudinal slots or depressions 98 in their outer surfaces thus reducing the bearing area of each jaw on the surface 96 with consequent reduction of friction during the sliding movement of the jaws, as well as providing spaces through which any scale, chips, dirt or the like which may be shaken off the pipe or coupling can pass into the cavity in the head behind the jaws and from thence escape through holes 99 extending outwardly through the wall of the head.

Each of the jaws 91 is provided at its inner end with a radially inwardly directed lug 91' which extends into an annular groove formed in a block 100 disposed within the head and from which, through the hollow shaft 72, a jaw retainer shaft 101 extends outwardly beyond the end of the shaft through a plug 102 in the end thereof and in which the jaw retainer shaft is slidable. Between this plug and a collar 103 disposed on the shaft is seated a compression coil spring 104 which constantly tends to urge the shaft to the left (Figs. 5 and 6) and thus tends to move the jaws radially outward by sliding them along the conical surface 96 of the chuck head.

For centering and supporting the coupling C while it is being applied to the pipe, a mandrel 106 is provided and is detachably secured to the block in any convenient way as by providing the mandrel with a threaded extension 106' adapted to be screwed into a correspondingly internally threaded bore at the center of the block, the mandrel of course being substantially coaxial with the chuck.

The operative portion of the mandrel is formed in two diameters, that nearest the free end of the mandrel being substantially that of the interior of the pipe and that nearer the base 106'' of the mandrel being substantially similar to that of the interior of the coupling while the base itself is of still larger diameter; two shoulders 107 and 108 are thus provided on the mandrel, the former between those portions thereof which are respectively of the diameters of the interior of the pipe and of the coupling, and the latter between the last mentioned portion and the base which seats against the block 100. Preferably the mandrel is of sufficient length to project somewhat beyond the outer face of the chuck and is rounded at its free end and it will, of course, be appreciated that mandrels of different sizes are employed for different sized couplings, being interchanged as required.

For initially holding the couplings in proper position between the pipe and the mandrel I provide a coupling rest 110 desirably of V-shape and supported on a bracket 111 secured to the table, provision for adjusting the rest vertically and also transversely with respect to the bracket being preferably provided so that the rest may be readily brought to a position to properly support the coupling. The couplings may be manually supplied to the rest one at a time but are preferably automatically and consecutively supplied thereto by suitable feeding mechanism which may be of any construction suitable for the accomplishment of its intended function although I prefer to employ mechanism of the character best illustrated in Figs. 9, 10 and 11 and which comprises a sheet metal hopper 112 disposed in front of the machine and supported on legs 112'. This hopper is of sufficient size to contain a considerable number of couplings at a time and communicates at its rear end with a chute 113, one side of which is preferably arranged for adjustment so that the width of the chute may be accommodated to different lengths of couplings. The bottoms of the hopper and chute are correspondingly downwardly inclined towards the coupling rest at a sufficient angle to cause the couplings to roll theretowards while adjacent the coupling rest the bottom of the chute is still more sharply downwardly inclined to form a lip or extension 113' terminating close to the rest, the chute and hopper being desirably made of sheet metal. Adjacent and slightly behind the lip 113' is arranged a gate mechanism adapted to permit the couplings to consecutively pass to the lip and to hold the succeeding couplings in check; this gate comprises a pair of vertically disposed stops 114 and 114' which slidably project through openings in the bottom of the chute, spaced apart for a distance approximating the ex-

ternal diameter of the largest coupling which the machine is capable of applying. A bracket 115 is extended downwardly from the bottom of the hopper and to it is pivoted a substantially horizontally extending lever 116 so that it can move vertically about the pivot, and to this lever on opposite sides of its pivot the lower ends of the stops 114 and 114' are respectively pivoted so that as the lever is oscillated on its pivot the stops will be correspondingly raised and lowered a sufficient distance to cause one stop to be projected above the bottom of the chute and the other retracted therebelow. Thus when a supply of the couplings is disposed in the chute and the stops are in the position shown in Fig. 11, the leading coupling is prevented by stop 114 from passing to the lip 113' and thence to the coupling rest, but when the lever 116 is swung upwardly from the position shown in said Fig. 11 stop 114 will be lowered so as to release the leading coupling and stop 114' moved to a position to hold back the succeeding couplings with the result that as the lever is oscillated about its pivot, the couplings will be consecutively fed to the coupling rest; desirably the upper ends of the stops are beveled in opposite directions to facilitate the performance of their respective functions. For actuating lever 116 at the proper time in the cycle of operations of the machine, suitable means are provided conveniently comprising a cable 117 attached at one end to the lever and thence carried over a sheave 118 on the chute for connection as hereinafter described, so that when the cable is pulled the lever will be raised from lowered position in which it is normally maintained by a weight 119 to thereby permit one coupling to pass to the coupling rest 110 and thus to a position between and in substantial alignment with the pipe to which it is to be applied and the mandrel 106.

Suitable means are provided for actuating the gripping jaws of the pipe grip 55 and also for pulling the cable 41 to actuate the jacks and lifting arms, said means preferably comprising a piston 130 disposed in a cylinder 131 mounted on the carriage 54 and carrying a piston rod 132 extending horizontally through the rear end of the cylinder. While the actuation of the piston in the cylinder may be effected by any suitable fluid, I prefer to employ air for that purpose which is introduced to the cylinder through pipes 133, 134. As best shown in Fig. 4, the outer end of the piston rod 132 is connected to a lever 135 approximately midway between its ends, this lever being arranged in an inclined position and extending through a closed fork 136 at the end of a plunger 137 slidable transversely of the machine in a housing 138 and operative to actuate one of the gripping jaws of the

pipe grip 55. That extremity of the lever extending beyond fork 136 is pivotally connected to an arm 140 in turn pivoted to a lug on the carriage while the other end of the lever is connected to the end of cable 41 opposite to that which is connected to the oscillating lever 39. It will thus be apparent that when piston 130 is moved outwardly in cylinder 131 from the position shown in Fig. 4, plunger 137 will be correspondingly moved outwardly for a short distance so as to open the pipe grip jaws while a pull of considerable magnitude will be exerted on the cable 41 so as to swing lever 39 from full line or normal position to dotted line position as shown in Fig. 3. Equally so, when the piston is moved in toward the center line of the machine to the position shown in Fig. 4, plunger 137 will be correspondingly moved inward and the pull on the cable relieved to thereby enable oscillating lever 39 to return to normal position under the influence of springs 42 and the weight of the parts interconnected therewith.

To cushion and slow up the movement of the carriage 54 toward the end of its forward stroke, a pair of air cylinders or dash pots 145 may be disposed on opposite sides of cylinder 57 to respectively cooperate with pistons 146 secured to the carriage and a spring buffer 147 arranged to cushion the carriage at the end of its reverse movement.

As best shown in Fig. 8 the pipe grip 55 may comprise a pair of horizontally extending jaws 150 and 151 disposed on opposite sides of and in substantially the same horizontal plane as the axis of the pipe when in the pipe trough, the inner opposed ends of the jaws being curved out in substantial correspondence to the surface of the pipe. The jaw 150 lying in front of said axis is fixedly, yet removably, secured in a supporting housing 153 which may be of any suitable construction and is mounted on the carriage, the jaw being conveniently held in position in the housing which is suitably recessed for its reception by a keeper-plate 154. The other jaw 151, however, in the rear of the axis of the pipe is slidably mounted in housing 138 supported on the carriage and removably retained in the housing by a keeper-plate 156 or in any other suitable manner; this jaw is connected at its rear end to the plunger 137 so that it will move in and out in the housing in correspondence with the movements of lever 135. For affording vertical support to and centering the pipe when it drops into the pipe trough, a vertically adjustable centering plate 158 is mounted on the carriage adjacent housing 153 and 138 in such manner that it may be raised and lowered as by an adjusting nut 159, the upper end of the plate being desirably hollowed out so as to more readily receive, support and center the pipe. The jaws 150, 151 are

made in cooperative pairs of different sizes for use with the different sizes of pipe which the machine is adapted to handle and are interchanged when and as required.

While the spring 104 is normally effective to release the jaws 91 from the coupling after its application to the pipe, I preferably provide means by which the operator can release the jaws in case a coupling gets jammed in the chuck or under any other conditions when the strength of the spring is insufficient to open the jaws, said means conveniently comprising a vertically extending lever 160 horizontally pivoted on a bracket 161 supported on the end of the table 50. At its upper end this lever is provided with a yoke 160' which receives the end of the jaw retainer shaft 101 projecting beyond the plug 102 and which is threaded to carry an adjustable stop nut 162. At its lower end lever 160 is connected through the medium of links 163, 164 and a bell-crank 165 with a foot pedal 166 extending toward the front of the machine to a position for convenient actuation by the operator; a spring 167 is arranged to normally draw the lower end of lever 160 toward the base of the machine. The stop nut 162 may thus be so adjusted on shaft 101 that when the coupling jaws 91 are closed on a coupling in the chuck the stop nut will lie adjacent yoke 160' so that if at the proper time in the cycle of operations the spring 104 is ineffective to move the jaw retainer shaft longitudinally to open the jaws and free the coupling, the operator may supplement the force of the spring by stepping on pedal 166 thereby moving yoke 160' against the stop nut and thereafter positively forcing the shaft in a direction to open the jaws.

As hitherto stated I prefer to utilize air for the actuation of the pistons 66 and 130 and to suitably manually control the flow thereof to and from the cylinders in which the pistons are respectively disposed. For this purpose I may arrange on a bracket 170 disposed on the front side of the machine in a position convenient for the operator two control levers L, L' respectively arranged to actuate suitable valves (not shown) disposed in the air piping leading to the cylinders and to a source of air supply. As the arrangement of these valves and piping is a matter of choice and specifically forms no part of the present invention, no attempt has been made to illustrate the same in the drawings nor will any extended description thereof be given, for as numerous methods of arranging the piping and control valves for effecting actuation of various elements of machines of different sorts are in common use and well understood by those familiar with the art, the same would be superfluous herein so long as it is understood that the levers L, L' may be operated so as to admit

air or other fluid to the cylinders 57 and 131 as may be desired to bring about the requisite movement of the pistons therein at the proper times in the cycle of operations of the machine.

Operation

While the operation of the machine will probably be fairly apparent from the foregoing description, brief reference may be made thereto as follows: For convenience it will be assumed that a pipe having passed down the skids, during which movement as previously explained it has received a coating of lubricant on its threaded end and has been brought into engagement with the stop rail 15, has been lifted by the jacks over the stops 3 and has dropped upon the rollers 20 to assume its position in the pipe trough. At this time the lifting arms 32 are in raised position, the piston 130 at the outer end of its stroke and the pipe carriage at the left hand end of its path of movement when viewed as in Fig. 4 so that the gripping jaws of the pipe grip are open and disposed on opposite sides of the pipe a short distance from its leading end, that is, the end to which the coupling is to be applied and adjacent which the centering plate 158 supports the pipe at the proper height. Air is now admitted to cylinder 131 through suitable manipulation of one of the operating levers, for example lever L, so as to first move piston 130 inwardly, thus closing the gripping jaws on the pipe and simultaneously releasing the tension or pull on cable 41, thus permitting lifting arms 32 and the lifting jacks to return to normal or full line position; during the downward movement of the lifting arms the fingers 32' move relatively thereto so as to pass over the pipe in the pipe trough and assume a position therebelow. The pipe being thus firmly gripped and operatively secured to the carriage so as to move therewith, further movement of lever L is operative to admit air to cylinder 57 so as to cause the carriage to move the pipe longitudinally forward toward the chuck and thus engage its leading end with a coupling which is now resting in the coupling rest, to which it has been supplied by the coupling feeding mechanism. As the pipe is thus moved forwardly, it successively pushes the coupling over the end of mandrel 106 and then along the larger portion of the mandrel on which the coupling forms a snug fit until the leading end of the coupling is brought up against the shoulder 108 adjacent the base 106' of the mandrel. As the coupling is brought to that position the movement of the carriage is gradually slowed down through the coaction of pistons 146 and air cylinders 145 but does not entirely cease so that, through the coupling, a longitudinal thrust is next effect-

ed on block 100 so as to move the block inwardly to draw the jaws 91 along the conical surface of the chuck head and thereby close them upon the coupling. It will of course be understood that as a preliminary to putting the machine in operation the motor M has been started and the gear set or transmission 86 so adjusted as to bring about continuous rotation of the hollow driving shaft 72 and chuck 70 at a predetermined speed and in an anti-clockwise direction when looking towards the face of the chuck assuming that the pipe and coupling are provided with right hand threads; the chuck is thus continuously rotating throughout the operation of the machine. As the chuck jaws close on the coupling the latter is caused to rotate synchronously with the chuck and mandrel and is thus screwed onto the pipe which, of course, is prevented from rotation through the action of the pipe grips so long as the friction between the threads on the coupling and on the pipe is not greater than the frictional engagement of the pipe grips with the latter which is gradually drawn forward along with the carriage since the coupling, once it is gripped by the chuck jaws, is incapable of longitudinal movement; as soon, however, as the coupling is screwed fully into place on the pipe, the resistance between the cooperating threads becomes greater than that exerted by the pipe grips so that the pipe is caused to turn relatively to the latter, the faces of which are desirably made smooth so as not to mar the pipe when slipping over the surface thereof unless it be desired to screw the coupling very tightly in place in which case the jaws 150, 151 may have roughened faces or be provided with sharp points adapted to cut into the pipe and thus afford great resistance to its axial rotation. It will be apparent that the greater the longitudinal forward thrust of the pipe and coupling upon the mandrel, the greater will be the inward radial pressure exerted by the jaws 91 on the coupling, thus preventing any slippage between the coupling and the chuck throughout the operation.

As soon as the coupling is properly screwed into place the operator by suitable manipulation of the operating levers L, L' admits air to the cylinder 57 so as to reverse the motion of the piston therein and thereby move carriage 54 together with the pipe and coupling longitudinally away from the chuck, and as the thrust on the block 100 is thus relieved, jaws 91 are normally constrained by spring 104 to open outwardly and immediately release the coupling; however, should the jaws stick or otherwise retain their hold upon the coupling, the operator by depressing pedal 166 can positively force block 100 outwardly for a sufficient distance to release them. The reverse movement of the carriage is continued until the end

of the latter comes into contact with the spring buffer 145 and is thereby brought to rest, the air of course being cut off from cylinder 57 substantially simultaneously therewith and air is then admitted to cylinder 131 in such manner as to move piston 130 outwardly, thereby releasing jaws 150, 151 from their hold upon the pipe and exerting on cable 41 the pull requisite to raise the lifting arms and thus carry the pipe with the coupling applied thereto onto the skids 44, that is, to position P⁴, from which it rolls by gravity to P⁵ in the trough formed by members 35, 35', 35''. This movement of lever 135 effected by piston 130 is also operative to pull the cable 117, which is attached to the same end of the lever as cable 41, sufficiently to depress stop 114 and allow another coupling to pass to the coupling rest in position for engagement by the next pipe, while through the operation of lever 29 induced by the upward movement of the lifting arms 32 that pipe is lifted by the jacks over the stops 3 so it can drop into the pipe trough to position P³, thus completing the cycle of operations.

The machine, as hitherto mentioned, may be readily adapted to pipe of different diameters by merely inserting a mandrel and pipe grip jaws of proper size and adjusting the height of the rollers 20 so that the pipe when in the pipe trough will be in substantial axial alignment with the mandrel. Ordinarily these are the only adjustments required when changing from one size of pipe to another since the coupling chuck is desirably so constructed that the jaws thereof will open widely enough to receive the largest size coupling which is customarily employed for the largest pipe which the machine is intended to handle; under certain circumstances, however, and particularly if extra thick couplings are to be used on very large sizes of pipe, it may be found desirable to substitute shorter inserts 92 in the chuck jaws 91 so as to increase the distance between the opposed faces of the inserts when the chuck is open so as to accommodate such couplings.

It will thus be apparent that I have provided a machine satisfactorily operative for its intended function and be means of which couplings can be rapidly and substantially automatically screwed upon the previously threaded ends of pipes or tubes of varying diameters within the limits which the machine is capable of handling, and further, that by suitable regulation of the grip or pressure exerted on the pipe by the pipe grip jaws to restrain it from axial rotation while the coupling is being applied, the machine may be caused to screw the couplings upon the pipes either relatively loosely or very firmly as may be desired.

While I have herein illustrated and de-

scribed with considerable particularity a machine constructed in accordance with a preferred embodiment of my invention, I do not thereby desire or intend to specifically limit myself thereto as numerous changes and modifications may be made in the design, construction and arrangement of the various parts without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. A machine for screwing couplings on pipes comprising means for conveying the threaded pipe consecutively to a predetermined position, a rotatable chuck adapted to receive and hold a coupling, means for supporting a coupling adjacent the chuck, means for moving the pipe longitudinally toward the coupling to engage the pipe therewith and thereafter push the coupling into the chuck, and means operable through the longitudinal movement of the pipe and coupling after the coupling is received in the chuck to cause the chuck to close on the coupling and thereby rotate the same relatively to the pipe to screw the coupling onto the end thereof.

2. A machine substantially as specified in claim 1 and comprising means operable to move the pipe longitudinally away from the chuck after the coupling has been applied thereto and means operative to cause the chuck to open and release the coupling following the initiation of said movement of the pipe.

3. A machine substantially as specified in claim 1 and comprising a mandrel disposed at the center of the chuck and rotatable therewith and adapted to receive the coupling when it is moved into the chuck.

4. A machine substantially as specified in claim 1 and comprising a mandrel disposed at the center of the chuck and rotatable therewith and provided with zones of different diameters respectively substantially corresponding to the internal diameter of the pipe and of the coupling.

5. In a machine for screwing couplings on pipes, the combination of means for gripping the pipe, means for moving the pipe longitudinally after it is gripped by the gripping means, a rotatable chuck, means for rotating the chuck, means for supporting a coupling in the longitudinal path of movement of the pipe between the pipe and the chuck and in substantial axial alignment therewith, a mandrel disposed at the center of the chuck, rotatable therewith and provided with a zone adapted to receive and support the coupling and a shoulder at the inner end of the zone, and means operative to cause the chuck to close on the coupling after the latter has been seated on the mandrel

and is pressed against said shoulder by the longitudinal movement of the pipe.

6. In a machine for screwing couplings on pipes, the combination of a reciprocal carriage, means for gripping the pipe carried by and movable with the carriage, a rotatable chuck having radially movable jaws, a mandrel disposed at the center of the chuck, means for supporting the mandrel and rotatable with the chuck, said mandrel having an inner zone adapted to receive and support a coupling and a shoulder at the inner end of said zone and an outer zone adapted to receive the end of the pipe, means for supporting a coupling between the end of the pipe and the chuck when the carriage is at one end of its path of movement and retracted from the chuck whereby when the carriage is moved toward the chuck the coupling will be pushed by the pipe over the mandrel onto said inner zone and against said shoulder and the pipe will be pushed over said outer zone, and means whereby the longitudinal thrust exerted on the shoulder by the coupling under the influence of the moving pipe is operative to move the chuck jaws inwardly against the coupling so as to grip the same.

7. In a machine for screwing couplings on pipes, a reciprocal carriage, pipe gripping means supported by and movable with the carriage, a rotatable chuck having radially movable jaws, means for rotating the chuck, a mandrel disposed at the center of the chuck and having a zone adapted to receive and support a coupling and a shoulder adjacent the inner end of the zone, means for supporting the mandrel and rotatable with the chuck, means for supporting a coupling between and in substantial axial alignment with the pipe and the chuck when the pipe is gripped by the pipe gripping means, means for moving the carriage and the pipe toward the chuck so as to carry the coupling from the coupling supporting means onto the mandrel and press it against said shoulder, and means operative when said mandrel supporting means are moved longitudinally by the thrust of the coupling against the shoulder to cause the chuck jaws to close on and grip the coupling.

8. In a machine for screwing couplings on pipes, a reciprocal carriage, pipe gripping means supported by and movable with the carriage, a rotatable chuck having radially movable jaws, means for rotating the chuck, a mandrel disposed at the center of the chuck and having a zone adapted to receive and support a coupling and a shoulder adjacent the inner end of the zone, means for supporting the mandrel and rotatable with the chuck, means for supporting a coupling between and in substantial axial alignment with the pipe and the chuck when the pipe is gripped by the pipe gripping means,

means for moving the carriage and the pipe toward the chuck so as to carry the coupling from the coupling supporting means onto the mandrel and press it against said shoulder, means operative when said mandrel supporting means are moved longitudinally by the thrust of the coupling against the shoulder to cause the chuck jaws to close on and grip the coupling, and means operative to cause outward radial movement of said jaws to release the coupling therefrom when the pressure on the shoulder is relieved by movement of the pipe carriage in the opposite direction away from the chuck.

9. A machine for screwing couplings on pipes comprising means for consecutively conveying a series of pipes to a predetermined position, means for positioning the pipes longitudinally during their passage to said predetermined position, means for transferring the pipes consecutively from said position to another predetermined position, a reciprocal carriage, gripping means carried by said carriage adapted to grip each pipe after it reaches said second position, means for reciprocating the carriage, a rotatable chuck adjacent one end of the path of movement of the carriage, means for rotating the chuck, means for positioning a coupling between and in substantial axial alignment with the chuck and the pipe when in said second predetermined position, means operable to cause said carriage moving means to move the carriage and the pipe longitudinally toward the coupling to cause the end of the pipe to engage the coupling and thereafter carry it into the chuck, means for centering the coupling in the chuck, means operable by the longitudinal movement of the pipe and coupling to cause the chuck to close on the coupling after it is centered therein so as to turn the coupling relatively to the pipe, means operable to cause said carriage moving means to move the carriage in the opposite direction after the coupling has been screwed on the pipe by rotation of the chuck, means operative to release the chuck from the coupling upon said movement of the carriage, means operable to release said pipe gripping means as the carriage returns to initial position, and means operative to discharge the pipe from the machine after the carriage has attained said position.

10. A machine for screwing couplings on pipes comprising means for consecutively conveying a series of pipes to a predetermined position, means for positioning the pipes longitudinally during their passage to said predetermined position, means for transferring the pipes consecutively from said position to another predetermined position, a reciprocal carriage, gripping means carried by said carriage adapted to grip each pipe after it reaches said second position,

means for reciprocating the carriage, a rotatable chuck adjacent one end of the path of movement of the carriage, means for rotating the chuck, means for positioning a coupling between and in substantial axial alignment with the chuck and the pipe when in said second predetermined position, means operable to cause said carriage moving means to move the carriage and the pipe longitudinally toward the coupling to cause the end of the pipe to engage the coupling and thereafter carry it into the chuck, means for centering the coupling in the chuck, means operable by the longitudinal movement of the pipe and coupling to cause the chuck to close on the coupling after it is centered therein so as to turn the coupling relatively to the pipe, means operable to cause said carriage moving means to move the carriage in the opposite direction after the coupling has been screwed on the pipe by rotation of the chuck, means operative to release the chuck from the coupling upon said movement of the carriage, means operable to release said pipe gripping means as the carriage returns to initial position, and means operative to discharge the pipe from the machine after the carriage has attained said position, said discharging means being interconnected with said pipe gripping means and operable in timed relation therewith.

11. A machine for screwing couplings on pipe, comprising means for consecutively conveying pipes to a predetermined position, means for supporting a coupling in axial alignment with each pipe when in said position, rotatable coupling gripping means, means for moving the pipe axially to advance the coupling into said gripping means, and means for causing the gripping means while rotating to grip the coupling and rotate it relatively to the pipe to screw it thereonto.

12. A machine for screwing couplings on pipe, comprising means for consecutively conveying pipes to a predetermined position, means for supporting a coupling in axial alignment with each pipe when in said position, rotatable coupling gripping means, means for rotating said means, means for moving the pipe axially to advance the coupling into said gripping means, means for causing the gripping means while rotating to grip the coupling and rotate it relative to the pipe to screw it thereunto, and means for releasing the gripping means and for retracting the pipe and coupling therefrom after the coupling has been screwed into position.

13. In a machine for screwing couplings on pipe, means for supporting a coupling in a predetermined position, means for supporting a pipe in substantial axial alignment

therewith, coupling gripping means and means for advancing the pipe longitudinally against the coupling to thereby carry the coupling into said gripping means.

14. In a machine for screwing couplings on pipe, means for supporting a coupling in a predetermined position, means for supporting a pipe in substantial axial alignment therewith, coupling gripping means, means for advancing the pipe longitudinally against the coupling to thereby carry the coupling into said gripping means, and means operative to cause the gripping means to grip the coupling after it is positioned therein with a force proportional to the longitudinal thrust exerted by the pipe upon the coupling.

15. In a machine for screwing couplings on pipe, means for supporting a coupling in a predetermined position, means for supporting a pipe in substantial axial alignment therewith, coupling gripping means, means for advancing the pipe longitudinally against the coupling to thereby carry the coupling into said gripping means, and means operable by the thrust of the pipe on the coupling after it has entered the gripping means to close said means upon the coupling.

16. In a machine for screwing couplings on pipe, means for supporting a coupling in a predetermined position, means for supporting a pipe in substantial axial alignment therewith, coupling gripping means, means for advancing the pipe longitudinally against the coupling to thereby carry the coupling into said gripping means, means operative to cause the gripping means to grip the coupling after it is positioned therein with a force proportional to the longitudinal thrust exerted by the pipe upon the coupling, and means operative to release the grip of the gripping means upon the coupling when said longitudinal thrust is relieved.

17. In a method of screwing a coupling on the previously threaded end of a pipe, the steps of bringing the coupling to a predetermined position, bringing the pipe into substantial axial alignment with the coupling, advancing the pipe axially against one end of the coupling so as to shift the coupling axially to another predetermined position, and then rotating the coupling relatively to the pipe when in said second position so as to screw it onto the end thereof.

18. In a method of screwing a coupling on the previously threaded end of a pipe, the steps of bringing the coupling to a predetermined position, bringing the pipe into substantial axial alignment with the coupling, advancing the pipe axially against one end of the coupling so as to shift the coupling longitudinally to another pre-

terminated position, and then rotating the coupling relatively to the pipe when in said second position so as to screw it onto the end of the pipe while restraining the pipe from axial rotation until the frictional engagement between the threads and the pipe and coupling approximate the force exerted to effect said restraint.

19. In a method of screwing a coupling on the previously threaded end of a pipe, the steps of bringing the coupling to a predetermined position, bringing the pipe into substantial axial alignment with the coupling, advancing the pipe axially against one end of the coupling so as to shift the coupling longitudinally to another predetermined position, rotating the coupling relatively to the pipe when in said second position so as to screw it onto the end of the pipe while restraining the pipe from axial rotation until the frictional engagement between the threads and the pipe and coupling approximate the force exerted to effect said restraint and then retracting the pipe and coupling axially to substantially the position initially occupied by the pipe.

20. In a method of screwing a coupling onto the previously threaded end of a pipe, the steps of bringing the coupling to a predetermined position, bringing the pipe into substantial axial alignment with the coupling, moving the pipe axially against the end of the coupling so as to shift the coupling laterally to a second predetermined position, gripping the coupling and rotating it relatively to the pipe until screwed into position thereon, and then substantially simultaneously releasing the grip on the coupling and retracting the pipe and coupling to substantially the position initially occupied by the pipe.

In witness whereof, I have hereunto set my hand this 19 day of September, 1928.

HERBERT VIVIAN CORK.