

May 5, 1931.

F. C. FANTZ

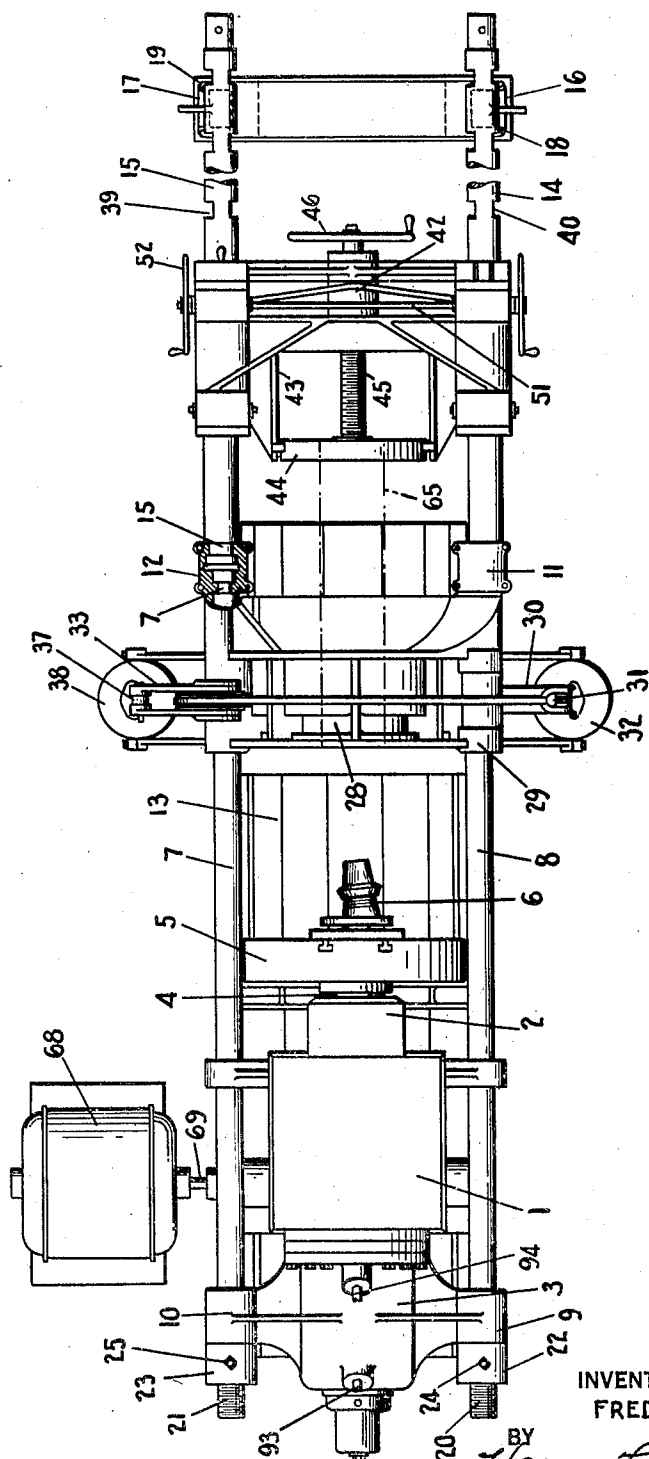
1,804,002

MACHINE FOR FLANGING PIPES

Filed Aug. 13, 1930

6 Sheets-Sheet 1

FIG. 1



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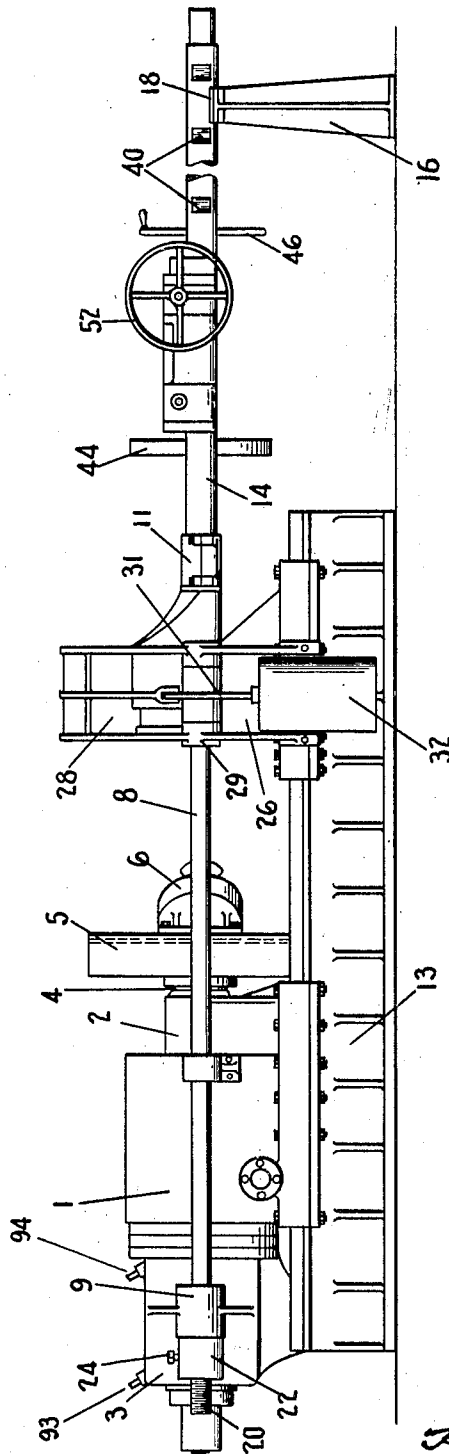
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FIG. 2



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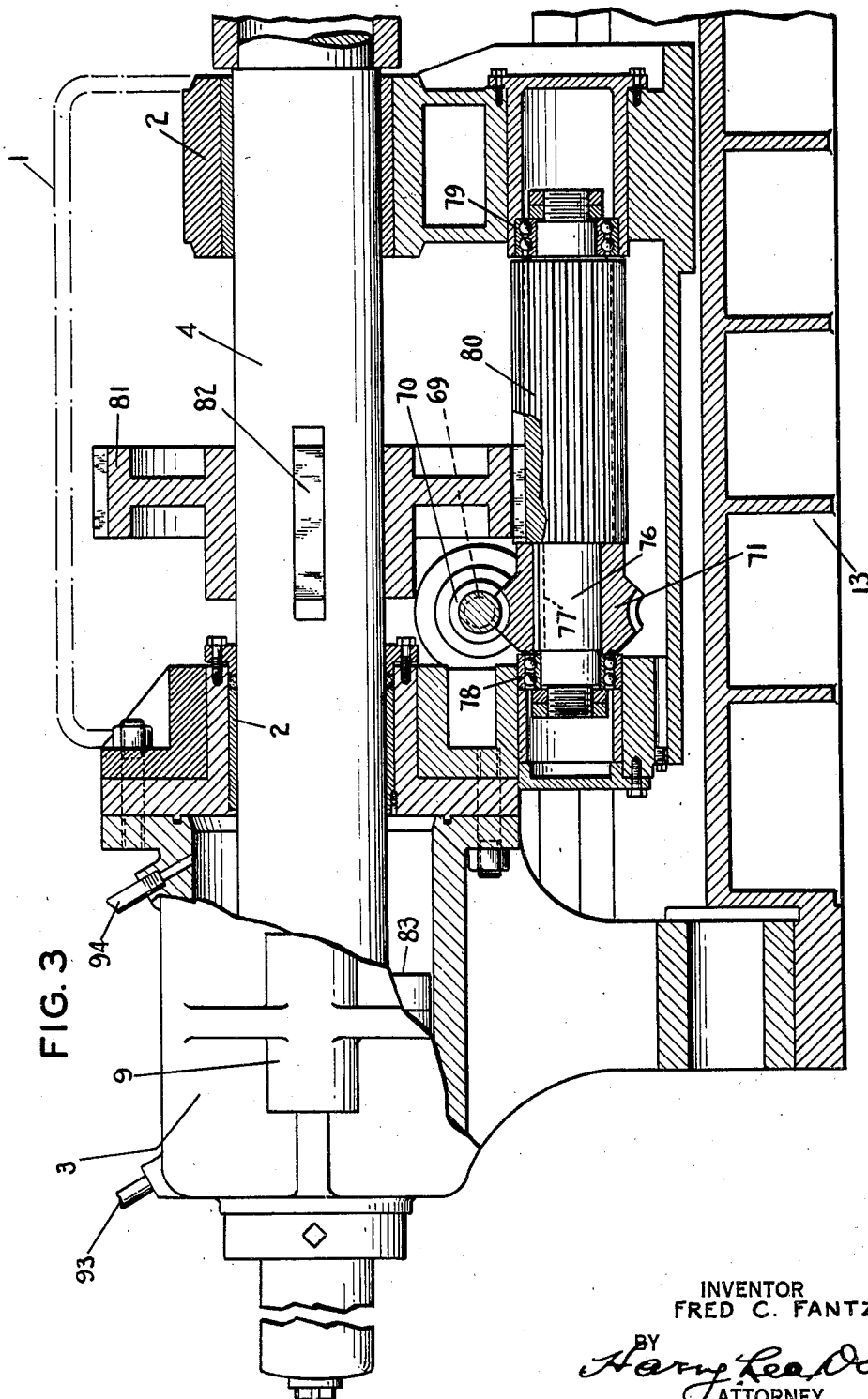
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MACHINE FOR FLANGING PIPES

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FIG. 4

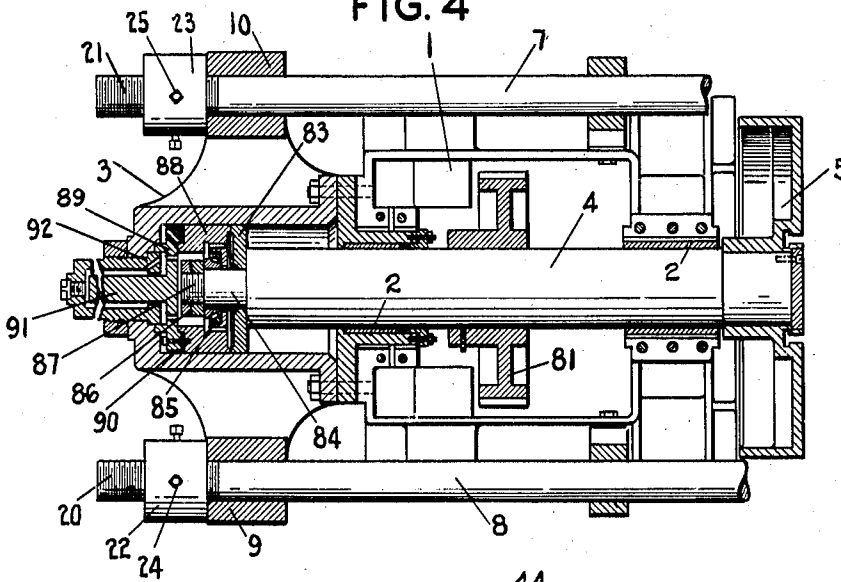


FIG. 7

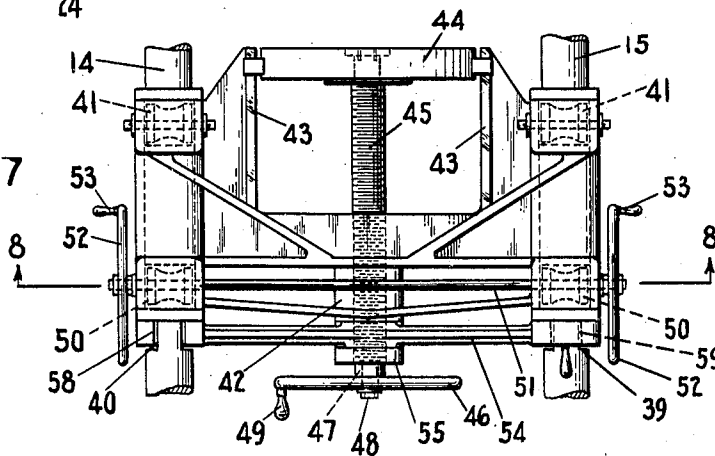
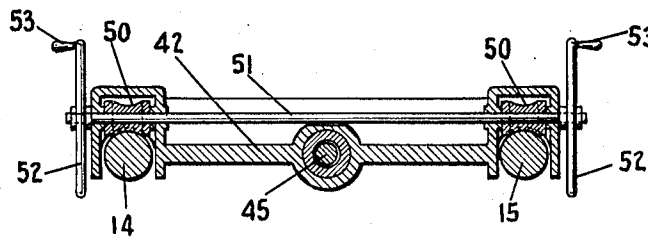


FIG. 8



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FIG. 5

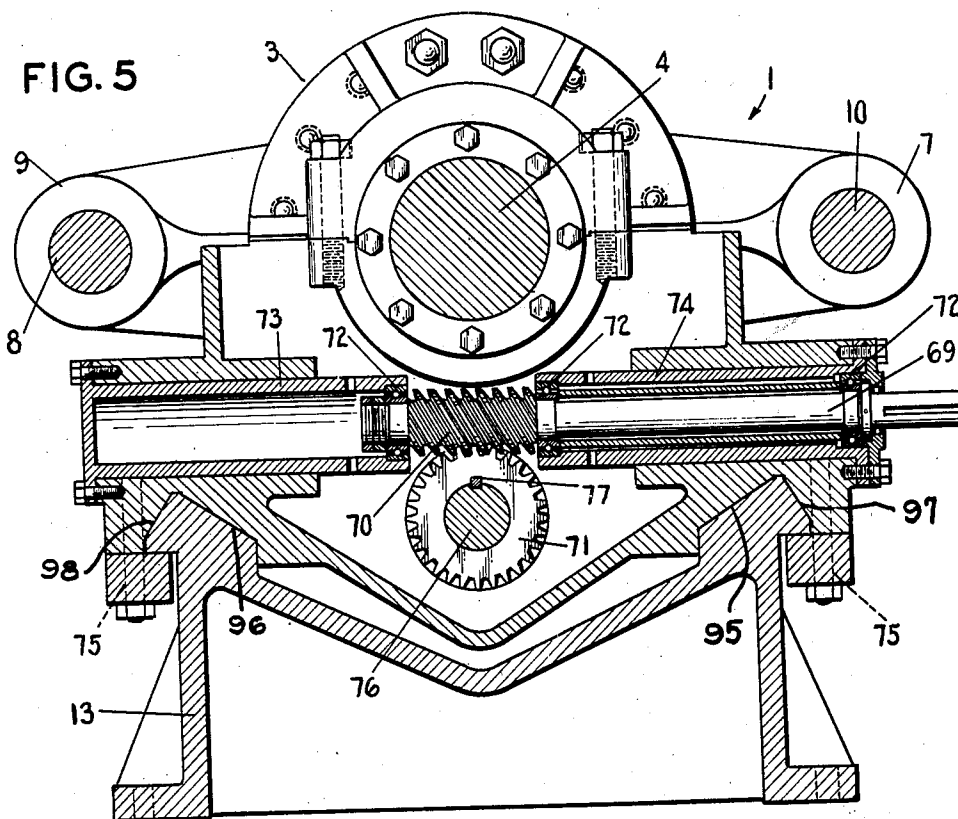
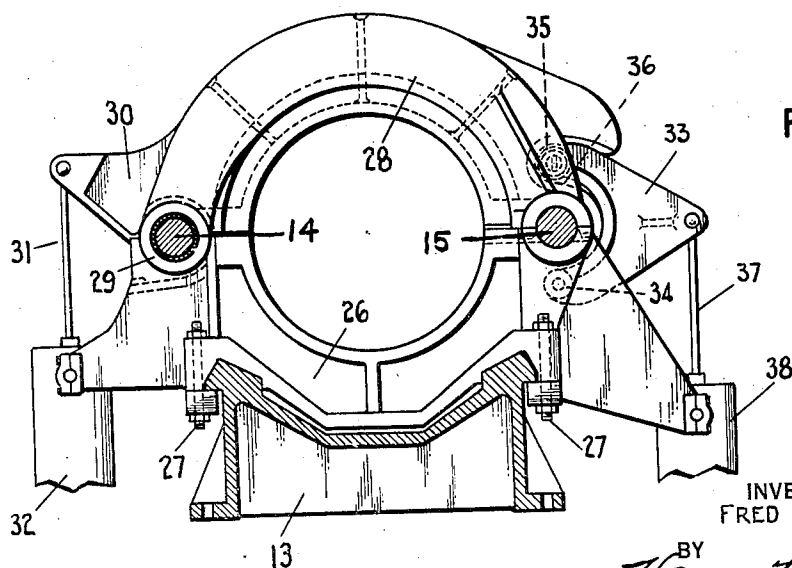


FIG. 6



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FIG. 9

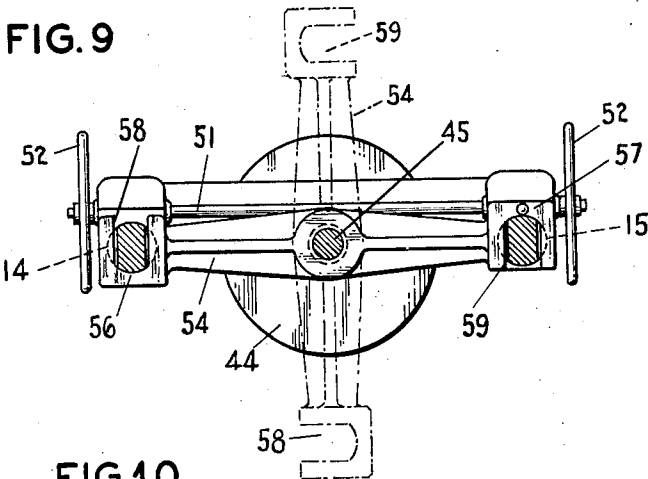


FIG. 10

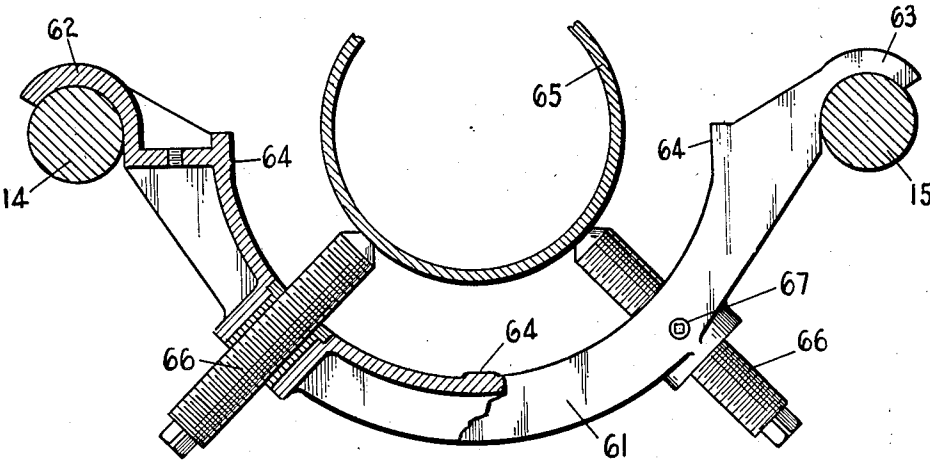


FIG. 12

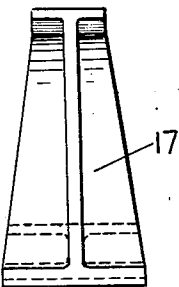
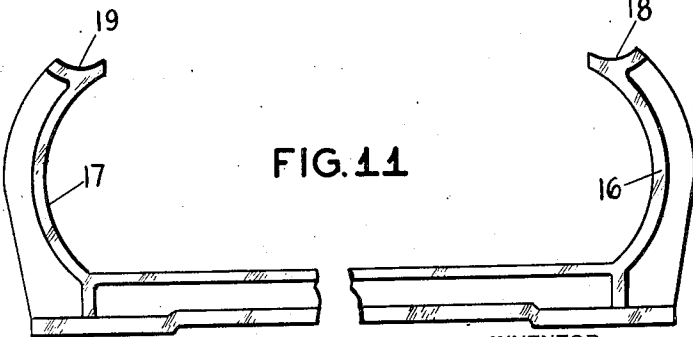


FIG. 11



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UNITED STATES PATENT OFFICE

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MACHINE FOR FLANGING PIPES

Application filed August 13, 1930. Serial No. 474,920.

My invention relates to that class of machines known to the trade as "Van Stone machines," and relates more particularly to a machine employing the method described in my United States Patent No. 1,696,229, issued December 25, 1928, although it will be apparent to persons skilled in the art, from the hereinafter-contained description, that it is not limited to that particular method, but will be found useful with any method for forming flanges on pipes.

In machines of this character it has been found extremely difficult to take care of the friction caused by the end thrust on the spindle, produced by the great hydraulic pressure on the spindle, when moving it against the heated pipe to produce the flange. It has also been found equally difficult to hold the spindle central.

My invention has for its object, to provide a construction in which I not only insure the spindle always being held in a central position, but which I not only overcome the friction, but actually provide an oil film under very heavy pressure, as anti-friction means. In other words, I float what is practically the end of the spindle in oil, and I have found in practice that after a long period of severe use, upon disassembling the machine, even the tool marks on the end of the spindle had not been eradicated.

My invention has for its further object, to provide a construction in which there is no strain at all upon the gear case, all of the end thrust being carried by the spindle, whereby I am enabled to produce an extremely light casting for the gear case.

A concrete embodiment of my invention is illustrated in the accompanying drawings, to be considered as part of this specification, in which—

Fig. 1 is a top or plan view of my improved machine;

Fig. 2 is a side elevation of the same;

Fig. 3 is an enlarged vertical sectional view through the headstock;

Fig. 4 is a horizontal section through the headstock;

Fig. 5 is a cross-section of the headstock;

Fig. 6 is an end elevation, partly in section, of the clamping device for holding the dies and the pipe to be flanged;

Fig. 7 is a detail view, in plan, of the tailstock face plate, including the device for clamping the tailstock to the tension rods;

Fig. 8 is a sectional view, taken on line 8—8 in Fig. 7, in the direction indicated by the arrows;

Fig. 9 is a detail view, partly in section, of the clamping device in Fig. 7, showing in dotted lines how it is freed from the tension rods;

Fig. 10 is an assembly view of the pipe support, partly in section;

Fig. 11 is a detail view, showing the support for the tension rods; and

Fig. 12 is an end elevation of the same.

Similar reference numerals refer to similar parts throughout the entire description.

As shown in the drawings, my device comprises a headstock, which consists of a gear case 1, (which, as seen, is of a very light casting, and carries no end thrust when the machine is working, contrary to the usual construction,) bearings 2 for a spindle 4 of the machine, a hydraulic cylinder 3, and face plate 5, which carries wabblers 6, which is a device constructed to utilize the method set forth in my before-mentioned patent.

The headstock is attached to a bed 13, by resting upon inclined surfaces 95 and 96, 97 and 98. It will be apparent, if a line is projected from the center of the work to the surfaces 95 and 96, that the angle is very much wider than would be the case in standard construction, where the headstock is bolted upon a horizontal flange (not shown) cast on the bed 13 adjacent its face; and the tendency of the machine to weave side-wise is resisted, not by the sheer of such bolts, but by the actual metal,—this due to the mounting as shown and described.

The entire strain produced by the work of this machine is taken care of by strain-bars or tension rods 7 and 8, and 14 and 15. The tension rods 7 and 8 are carried by the bed 13 of the machine, and are mounted in supports 9 and 10, and 11 and 12. The supports 11 and 12 also carry the ends of the

tension rods 14 and 15, and are provided with sockets to receive heads formed on the ends of the rods 7, 8, 14 and 15, respectively. These rods 14 and 15 are carried by supports, clearly seen in Figs. 11 and 12. These supports are formed with upwardly-extending arms 16 and 17, which terminate in arcuate sockets 18 and 19, in which the rods 14 and 15 rest. These arms 16 and 17 are tied together by a cross-member, the bottom of which is adapted to be bolted to the foundation.

The rods 7 and 8 are provided with threaded ends 20 and 21, which project beyond the supports 9 and 10, and have mounted thereon nuts 22 and 23, which are securely locked on the threads by means of set screws 24 and 25. It will thus be seen that the entire end thrust of the machine is sustained by these rods 7 and 8.

Suitable clamping means is provided for holding the dies, as clearly seen in Fig. 6. This consists of a lower half 28, which is secured to the bed 13 by means of bolts 27, in the usual and standard manner. The tension rods 14 and 15 pass through the clamp, and the upper half 28 of the clamp is pivotally secured to the lower half 26, by means of the rod 14. This upper half 28 has an outwardly-projecting lug 30, which is secured, by means of a rod 31, to a double-acting air-hoist 32. Means for holding the upper half 28 closed, consists of a lock 33, pivotally mounted upon a pivot 34, which is mounted in the lower half 26. The upper portion of the lock 33 carries a roller 35, which is fitted to a slot 36 formed in the end of the upper half 28 of the clamp. The lock 33 is secured, by means of a link 37, to a second double-acting air-hoist 38.

The tension rods 14 and 15 are provided with a plurality of registering slots 39 and 40. The tail stock of the machine is mounted upon rollers 41 and 50, which roll upon the tension rods 14 and 15. On the cross-member 42 are forwardly-extending guides 43, to which is slidably secured a face plate 44. This face plate 44 is actuated by a central revolvable screw 45, which extends through a threaded portion formed in the cross-member 42, and has a wheel 46 secured to its end 47 by means of a nut 48, or in any other suitable or convenient manner. A handle 49 is provided for convenient rotation of the wheel 46 and the screw 45, for the longitudinal movement of the face plate 44 on the guides 43.

The rollers 50 are fixedly secured to a shaft 51, which is rotatably mounted in the cross-member 42. This shaft 51 has hand-wheels 52 at each end, which are provided with suitable handles 53, for convenient manipulation thereof. It will be obvious that the rotation of these wheels 52, through the shaft 51, will advance or retract the tail

stock or carriage upon the rods 14 and 15, so as to accommodate the varying lengths of pipe upon which the machine is working.

My improved stop consists of a bar 54, rotatably secured intermediate the cross-member 42 and a collar 55, which takes up the end thrust on the screw 45. The ends 56 and 57 of the bar 54 are provided with U-shaped slots 58 and 59, the slot 58 opening upwardly and the slot 59 opening downwardly. These U-shaped slots 58 and 59 are adapted to engage the registering slots 39 and 40 formed in the tension rods 14 and 15. By swinging the bar 54 as indicated by the dotted lines in Fig. 9, the U-shaped slots 58 and 59 will be drawn out of engagement with the tension rods 14 and 15, and the tail stock or carriage is then free to move longitudinally upon the tension rods 14 and 15. When it has been moved up to the proper position in which to engage the work, the bar 54 is swung upon its support, and the sides of the U-shaped slot 58 will enter the slot 40 and the sides of the U-shaped slot 59 will enter the slot 39. When the ends 56 and 57 of the bar 54 are in the slots 39 and 40, the face plate 44 can then be advanced or retracted, so as to take care of any slight discrepancy between the face plate 44 and the end of the pipe to be flanged, as obviously there is considerable distance between the slots 39 on the tension rods 14 and 15.

The machine is driven by means of an electric motor 68, the shaft 69 of which carries a worm 70, which meshes with a worm gear 71. The shaft 69 is carried by anti-friction bearings 72, which are mounted in sleeves 73 and 74, formed in the lower half of the head stock, the head stock being suitably secured to the bed 13 by means of bolts 75, as clearly shown in Fig. 5. The worm gear 71 is secured to a shaft 76, by means of a key 77, also shown in Fig. 5. This shaft 76 is mounted in anti-friction bearings 78 and 79, which are suitably mounted in the lower part of the gear case 1, as clearly shown in Fig. 3. On the shaft 76 I mount an elongated spur gear pinion 80, which meshes with a spur gear 81, which is fixedly secured to the spindle 4 by means of a key 82, or in any other suitable or convenient manner, this construction being clearly shown in Fig. 3. By constructing the pinion 80 in elongated form as shown, instead of splining it upon a shaft, it is apparent that I overcome all tendency of the gears to cut, or to twist out of proper mesh; for as the spindle 4 moves forward or backward, the teeth of the gear 81 and the teeth of the pinion 80 being continually in mesh, there is not the slightest tendency to twist either the gear 81 or the pinion 80, as might be the case if they were splined upon either the shaft 76 or the spindle 4.

As shown in Fig. 4, the spindle 4 is provided with a thrust collar 83, which is reciprocal within the cylinder 3, and rotates with the spindle 4. Hydraulic pressure is used to reciprocate the spindle in the cylinder 3, ports or passages 93 and 94 being provided for the admission of the hydraulic fluid. The spindle 4 has a neck or stem 84, which projects longitudinally therefrom, and which is provided with a tapered roller bearing 85, mounted in a non-reciprocating block 88 this bearing 85 being held in place by suitable lock nuts 86, which are mounted upon the threaded end 87 of the spindle 4 and secure the non-reciprocating block 88 to the thrust collar 83. It will be obvious, from this description and an inspection of Fig. 4, that the device is held central at all times.

The bearings 85 is mounted in a piston or block 88, which is slidable in the cylinder 3, but does not rotate therein. This piston or block 88 has a head 89, against which the hydraulic fluid acts. The fluid is prevented from escaping along the walls of the cylinder 3, preferably by means of a leather cup packing 90, though any suitable or convenient means for such purpose may be employed. A very small amount of the fluid is allowed to leak through the bearing 85 in the slidable piston or block 88, and is forced outwardly between the rotating thrust collar 83 and the non-rotating piston or block 88. The distance between the piston or block and the thrust collar is limited by the adjustment of the nuts 86 on the end of the stem 87. The fluid escaping through provides sufficient lubrication to prevent excess wear on the faces of the thrust collar 83 and the side of the piston or block 88. The fluid thus used as an anti-friction means is allowed to escape between the edge of the thrust collar 83 and the walls of the cylinder 3 without hindrance. I have found it desirable to set up the nuts 86 so tightly that it is barely possible to rotate the thrust collar on the stem against the non-rotating block 88. The space between the block 88 and the face of the thrust collar 83 is very much less than the space provided for this leakage. I have found in practice that two thousandths is the proper clearance so that considerable pressure is built up between the two members, with the result that I am able to provide an oil film under heavy pressure as anti-friction means, or, as I have previously pointed out, I actually float the thrust collar 83 of the spindle 4 in oil, as is clearly shown by an inspection of Fig. 4.

The head 89 of the block 88 is provided with an extension 91, which is slidable in a bearing 92, formed in the tailstock. This extension 91 is preferably square, to prevent its rotation, though obviously any

standard means to accomplish this result may be employed. The thrust collar 83 is provided as a wearing block being mounted on spindle 4 in order to get sufficient bearing surface to take care of the pressure set up during the operation of the machine and also to provide a removable thrust member, it being obvious that the end of the spindle from the neck or stem 84 to the periphery of the spindle itself would be insufficient for this purpose and also that it would not be easily removable.

In Fig. 10 I have shown a detail view of my improved pipe support, or steady rest for my machine, which comprises an arcuate casting 61, the ends 62 and 63 of which are curved to conform to the tension rods 14 and 15. Finished pads 64 are provided, to furnish satisfactory measuring means to center the pipe 65. Set screws 66 are suitably mounted in the casting 61, to locate the pipe 65 accurately, lock-screws 67 being provided to hold the set screws 66 in position after the pipe 65 is correctly centered.

The operation of the device is as follows: One end of the tube or pipe 65 to be flanged is placed in a furnace (not shown) until the proper heat is reached. The clamp is then opened by turning the air first into the air-hoist cylinder 38, which moves the rod 39 downwardly, drawing the lock 33 out of the slot 36 formed in the end of the upper half 28 of the clamp. The air is then turned into the air-hoist cylinder 32, and that, through the medium of the rod 31, swings the upper half 28 of the clamp upon the pivot 29, until it is opened sufficiently wide to permit the placement of the pipe or tube 65 to be flanged, in proper position in the dies. The bar 54 is then swung so that its ends 56 and 57 are disengaged from the slots 39 and 40 in the tension rods 14 and 15, and the tail stock is advanced or retracted to the correct position to cause the face plate 44 to engage the end of the pipe 65. The bar 54 is then swung back so that the U-shaped slots 58 and 59 are brought into engagement with the slots 39 and 40. The face plate 44 is then positioned so that it abuts the end of the pipe or tube 65. The reverse of the operation just described for the air-hoists 38 and 32 is then carried out, and the dies are securely locked upon the heated end of the pipe 65.

The motor 68 is then started, and this, through the medium of the shaft 69, rotates the worm 70, which drives the worm gear 71 and rotates the shaft 76. This rotates the pinion 80, which in turn drives the spur gear 81, and rotates the spindle 4, carrying with it the face plate 5 and the wabblers 6. The hydraulic fluid is then turned into the cylinder 3, and this advances the piston or block 88 and in turn the spindle 4, and in

turn the wabblers 6, so that the heated end of the pipe 65 is upset into the dies (not shown) held in the clamp.

In some cases a single operation may be sufficient; but where a very large amount of metal is wanted in the flange, it may be necessary to repeat the operation a number of times, in which event obviously the pipe 65 has to be reheated.

It will be apparent from the foregoing description that the immense strain set up by the resistance of the pipe 65 to its flanging by the wabblers 6, is taken up not by the bed 13 of the machine, but principally by the strain-bars or tension rods 7 and 8, and 14 and 15, and as these extend entirely through the machine, it is apparent that all tendency to variation or distortion of the machine is overcome; that by the provision of the tapered roller bearing 85 on the rear end of the spindle 4, notwithstanding the severe work performed on the other end of the spindle 4, I am able to hold it central at all times, and by the introduction of the oil film under heavy pressure, I overcome all tendency to wear on the thrust collar 83.

Having described my invention, what I regard as new, and desire to secure by Letters Patent of the United States, is:

1. In combination with a machine for flanging pipes having a headstock carrying tie rods, a die clamp, a tailstock slidable on said rods, and having quick engaging means thereon to engage slots formed in the tie rods, of a cylinder in said head stock, a spindle, a stem on said spindle, a non-rotating, reciprocating block in said cylinder secured to said spindle, a thrust collar on said stem transmitting the thrust from the spindle to said block, antifriction means in said block to hold said stem central in said cylinder for rotation in said block, a non-rotating piston secured to said block, packing means intermediate said piston and the wall of the cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages of reduced area to carry the hydraulic fluid intermediate the non-rotating block and the thrust collar.

2. In combination in a machine for flanging pipes, having a headstock carrying tie rods, a die clamp, a tailstock slidable on said rods and having quick engaging means thereon to engage slots formed in the tie rods, of a cylinder in said head stock, a spindle, a non-rotating reciprocating block in said cylinder secured to said spindle, a thrust collar on said spindle transmitting the thrust from the spindle to said block, antifriction means in said block to hold said spindle central in said cylinder for rotation in said block, a non-rotating piston secured to said block, packing means intermediate said piston and the walls of the cylinder, means to introduce hydraulic fluid

into said cylinder, there being ports or passages of reduced area to carry the hydraulic fluid intermediate the non-rotating block and the thrust collar.

3. In combination with a machine for flanging pipes having a headstock carrying tie rods, a die clamp, a tailstock slidable on said rods, and having quick engaging means thereon to engage slots formed in the tie rods, of a cylinder in said headstock, a spindle, a stem on said spindle, a non-rotating, reciprocating block in said cylinder, means to hold said block tightly against said thrust collar, a thrust collar on said stem transmitting the thrust from the spindle to said block, antifriction means in said block to hold said stem central in said cylinder for rotation in said block, a non-rotating piston secured to said block, packing means intermediate said piston and the wall of the cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages of reduced area to carry the hydraulic fluid intermediate the non-rotating block and the thrust collar.

4. In combination with a machine for flanging pipes having a headstock carrying tie rods, a die clamp, a tailstock slidable on said rods, and having quick engaging means thereon to engage slots formed in the tie rods, of a cylinder in said head stock, a spindle, a stem on said spindle, a non-rotating, reciprocating block in said cylinder secured to said spindle, a thrust collar on said stem transmitting the thrust from the spindle to said block, antifriction means in said block to hold said stem central in said cylinder for rotation in said block, a non-rotating piston secured to said block, packing means intermediate said piston and the wall of the cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages of reduced area to carry the hydraulic fluid intermediate the non-rotating block and the thrust collar, a square extension on said piston, and a square bearing in which said extension slides.

5. In combination with a machine for flanging pipes having a headstock carrying tie rods, a die clamp, a tailstock slidable on said rods, and having quick engaging means thereon to engage slots formed in the tie rods, of a cylinder in said headstock, a spindle, a non-rotating block in said cylinder, antifriction means in said block to hold said spindle central in said cylinder and for rotation in said block, a thrust collar on said spindle transmitting the thrust from the spindle to said block, packing means intermediate said non-rotating block and the wall of said cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages to carry a portion of the hydraulic fluid intermediate the thrust collar and the non-rotating block.

6. In combination with a machine for flanging pipes having a headstock carrying tie rods, a tie clamp, a tailstock slidable on said rods, and having quick engaging means thereon to engage slots formed in the tie rods, of a cylinder in said headstock, a spindle, a stem on said spindle, a non-rotating, reciprocating block in said cylinder secured to said spindle, a detachable thrust collar on said stem transmitting the thrust from the spindle to said block, antifriction means in said block to hold said stem central in said cylinder for rotation in said block, a non-rotating piston secured to said block, packing means intermediate said piston and the wall of the cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages of reduced area to carry the hydraulic fluid intermediate the non-rotating block and the thrust collar.

7. In combination with a machine for flanging pipes having a headstock, a spindle in said headstock carrying an upsetting tool, of a cylinder in said headstock, a non-rotating block in said cylinder, antifriction means in said block to hold said spindle central in said cylinder and for rotation in said block, a thrust collar on said spindle transmitting the thrust from the spindle to said block, packing means intermediate said non-rotating block and the wall of said cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages to carry a portion of the hydraulic fluid intermediate the thrust collar and the non-rotating block.

8. In combination with a machine for flanging pipes having a headstock, a spindle in said headstock carrying an upsetting tool, of a cylinder in said headstock, a stem on said spindle, a non-rotating, reciprocating block in said cylinder secured to said spindle, a detachable thrust collar on said stem transmitting the thrust from the spindle to said block, antifriction means in said block to hold said stem central in said cylinder for rotation in said block, a non-rotating piston secured to said block, packing means intermediate said piston and the wall of the cylinder, means to introduce hydraulic fluid into said cylinder, there being ports or passages of reduced area to carry the hydraulic fluid intermediate the non-rotating block and the thrust collar.

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