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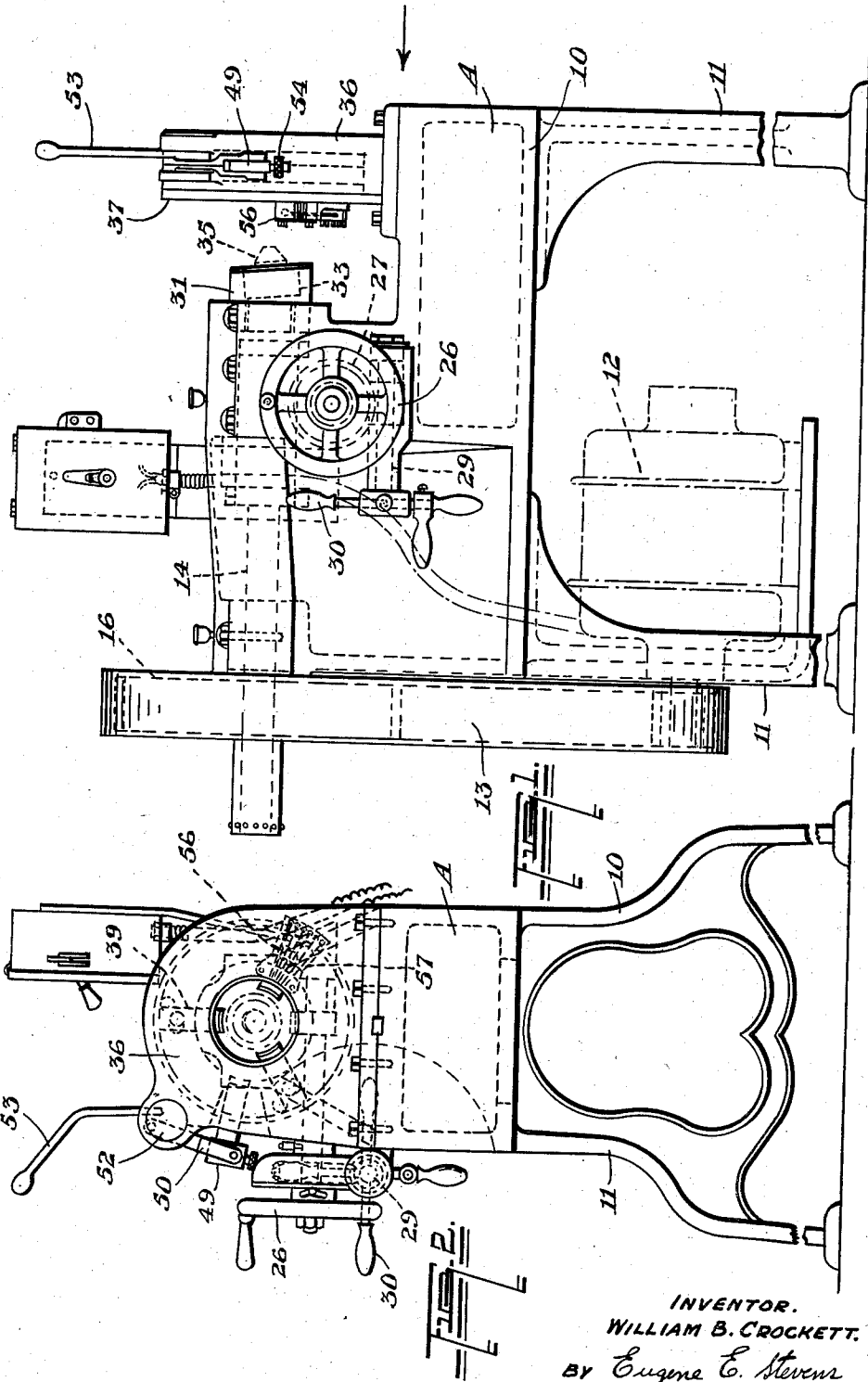
W. B. CROCKETT

2,004,313

PIPE FLANGING MACHINE

Filed Sept. 13, 1933

3 Sheets-Sheet 1



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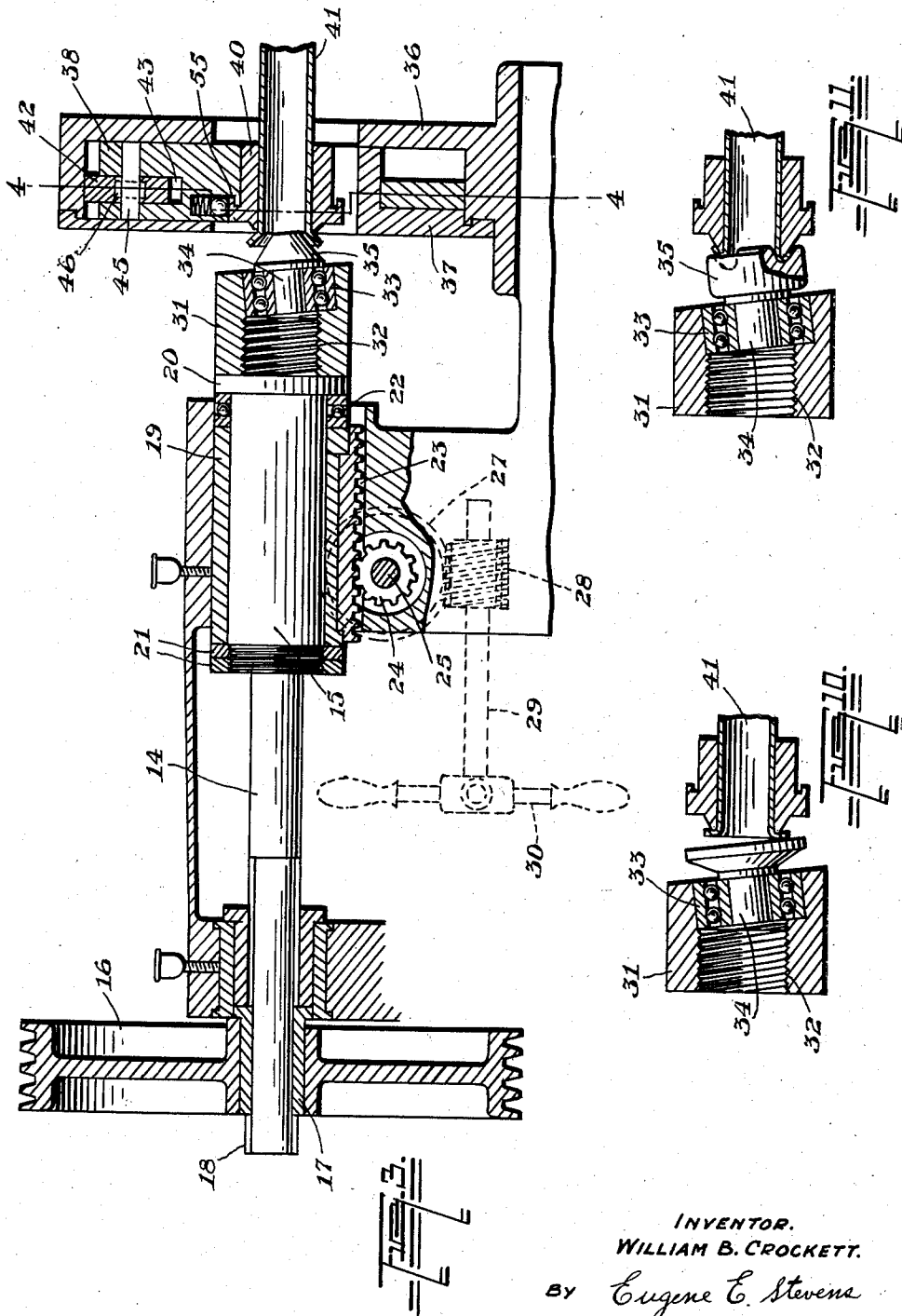
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3 Sheets-Sheet 2



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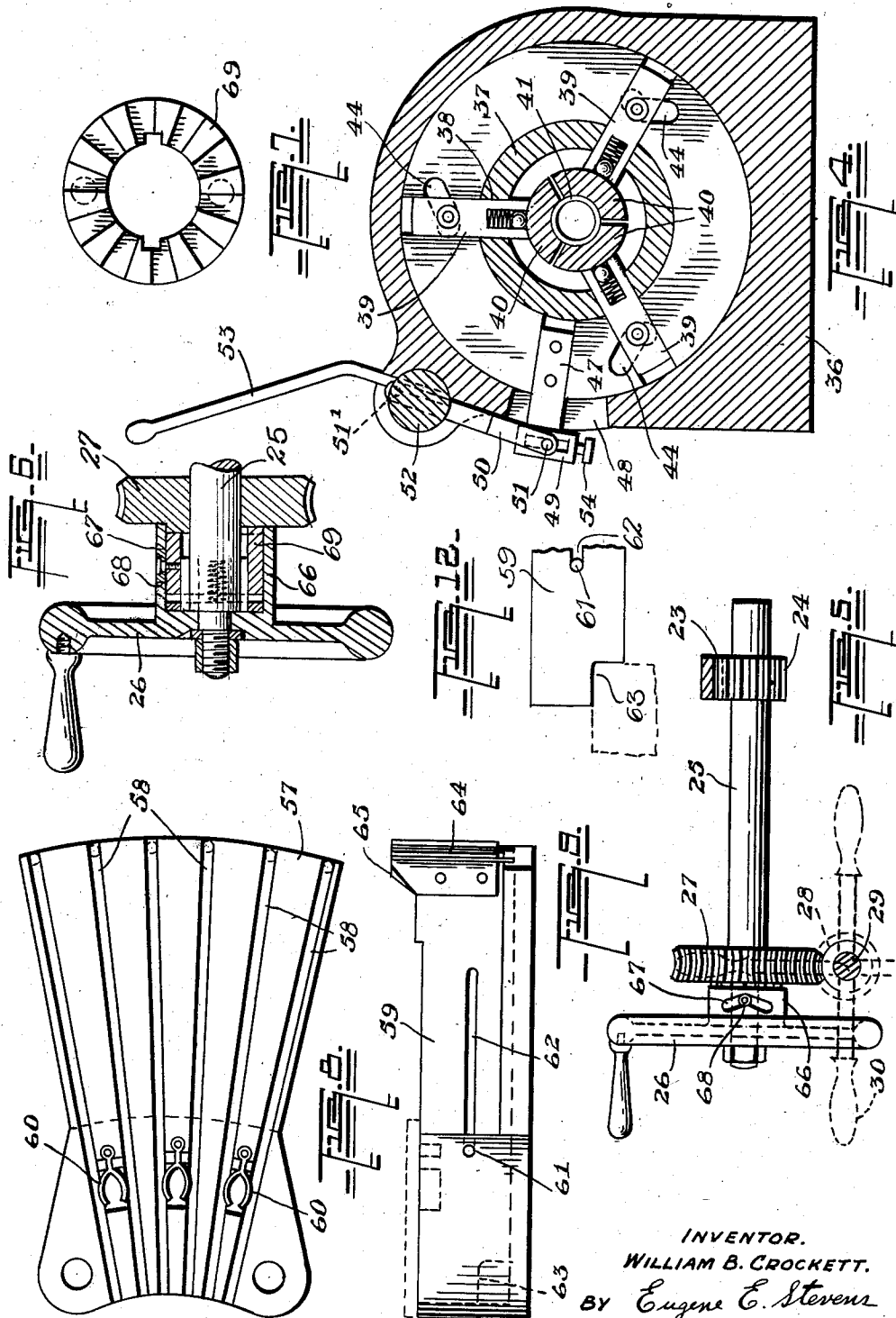
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UNITED STATES PATENT OFFICE

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PIPE FLANGING MACHINE

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4 Claims. (Cl. 153—81)

This invention relates to pipe flanging machines, and an object of the invention is to provide a machine for forming any required flange formation on piping, in a quick and efficient manner.

A further object of the invention is to provide a machine of this character which in flanging will eliminate severe or undue strain injurious to a flanged product.

10 A further object of the invention is to provide a machine of this character including a movable flange forming member and cooperating holding chuck for securing the piping, with the provision of means for applying the flange forming member to the tube under a heavy pressure.

15 A still further object of the invention is to provide for a plurality of different flange forming members, and a simple means of mounting said members for ready removal and replacement.

20 A still further object of the invention is to provide quick and efficient means for operating slidable parts of the structure.

25 With these and other objects in view, the invention consists essentially in the novel construction and arrangement of parts as described in the following specification and illustrated in the accompanying drawings.

Referring to the drawings:

30 Figure 1 illustrates a side elevation of the machine.

Figure 2 indicates an end elevation of Figure 1 as seen from the directional arrow.

35 Figure 3 is an enlarged fragmentary longitudinal section taken through the upper part of the machine, illustrating the drive, the mounting of the flange forming member and the pipe holding chuck.

Figure 4 is a section on the line 4—4 of Figure 3.

40 Figure 5 is an enlarged detail elevation of the hand wheel and shaft for moving the forming member towards and away from the chuck.

45 Figure 6 is an enlarged section taken through the hand wheel showing the cam slot for actuating the clutch also the clutch and the roller mounted on the clutch projecting into the cam slot.

Figure 7 is an enlarged plan view of the face of the clutch.

50 Figure 8 is a plan view of the pipe gauge body which is fitted on the chuck.

Figure 9 is a side elevation of the pipe gauge assembly showing the blades mounted in position.

55 Figure 10 is an enlarged sectional detail of the head carrying the flange forming member em-

ployed in the second flanging operation and illustrating the pipe held in the chuck grips in the process of being flanged, and

Figure 11 is a view similar to Figure 10 showing the third flange forming member finishing the flanging of the pipe.

Figure 12 is an enlarged fragmentary view of one end of the gauge blades showing the cut out portion with a portion of a pipe illustrated in dotted lines projecting into the cut out portion.

Referring more particularly to the drawings, A indicates the flange forming machine as a whole including the frame 10 which is mounted on suitable legs 11 and carrying a suitable motor 12. 15 The framework also includes casing 13 enclosing the drive pulleys and belting. In the upper part of the frame, main shaft or drive spindle 14 is mounted, this spindle constituting a slidable member, as hereinafter referred to. The spindle 20 is of reduced cross section at its rearward end and enlarged as at 15 at its opposite end.

Drive pulley 16 is designed to rotate the spindle 14, the pulley being mounted on the spindle by means of the hub structure 17, the spindle being 25 the driving connection with the pulley by means of the splined keys 18, while the extended end of the hub 17 forms a bearing for the reduced portion of the spindle in the framework. The enlarged portion 15 of the spindle is carried in a 30 sliding bush or bearing 19 which is held between the flanged end 20 and the rings 21 on the enlarged portion 15 of the shaft, a ball race 22 being provided between the flanged end of the spindle and the sliding bush. The bearing bush is 35 mounted in a channel formed in the upper part of the framework with which it slidably fits.

In order to move the spindle longitudinally, a rack 23 is mounted on the lower side of the sliding bush 19 which is designed to engage with a pinion 40 24 mounted on the transverse shaft 25 (see Figs. 3 and 5 particularly). The shaft 25 is designed to be rotated through the hand wheel 26 for moving the spindle longitudinally in either direction and in addition is fitted with a worm wheel 27 45 designed to be placed in driving connection with the shaft through suitable clutch mechanism hereinafter referred to. The worm wheel 27 is operated through a suitable worm 28 carried on the shaft 29 which is rotated by a second hand 50 wheel 30, the purpose of which will be hereinafter described.

On the enlarged end of the spindle 15 beyond the flange 20 is mounted a head 31 designed to be 55 screwed to the spindle, the head being internally

threaded as at 32. The outer end of the head is bored at an angle, eccentric with the axis of the spindle 14. Within this bore is forced a ball bearing race 33, the race being designed to carry the shank 34 of the flange forming member 35 in an easy fit so that it may be readily removed. On the bed of the machine frame beyond the enlarged end of the spindle 14, a chuck body 36 is mounted. This includes the chuck cover plate 37 operated by suitable means to be described, and passing through slots 38 in the cover plate 37 (see Fig. 4) are the sliding jaws 39 carrying on their inner ends the grips 40, three of these jaws preferably being provided as shown, arranged to be brought into engagement with a pipe 41 to be flanged.

The mounting of the jaws in the chuck and the arrangement of the chuck is such that the pipe will be positioned with its longitudinal axis in direct alignment with the axis of the spindle 14, as shown particularly in Figure 3. Thus, when the pipe is gripped and the flanging head is brought into engagement with the end of the pipe to be flanged, through the sliding movement of the shaft 14, as shown in Figure 3, due to the fact that the flange forming member is placed at an angle in the head 32, a portion only of its forming surface will engage the pipe, and therefore when the shaft or spindle 14 is rotated the forming surface of the flange forming member will gradually engage with the edge of the pipe until it has engaged the entire circumference thereof, so that the flange may be formed gradually in a natural manner which will eliminate any strain injurious to a flanged product. This is a salient feature of the invention.

Mounted within the chuck body 36 between the body and the cover plate 37, is a cam ring 42. This cam ring is adapted to extend through the slots 43 in the jaws 38, (see Fig. 3). The cam ring at a point coinciding with the positioning of the jaws 38 is provided with the cam slots 44 of a character to be described, and extending through the jaws 38. Traversing the slots 43 and the cam slots 44 of the cam ring 42, are pins 45 carrying the rollers 46 (see Fig. 3), the rollers being of a diameter to coincide with the size of the cam slots 44, thus upon rotary movement of the cam ring in either direction, the jaws will be moved radially towards or away from the pipe positioned in the chuck to engage or disengage the grips 40.

Control of the cam ring 42 is effected by the arm 47 which extends into a slot of the cam ring and projects through a recess 48 in the chuck body terminating in a slotted head 49. The head 49 connects with a link 50 by means of a pin 51 which extends into the slot of the head, the link being connected by means of the crank pin 51' to an operating shaft 52 which carries a hand lever 53. Thus through the hand lever, the shaft 52 may be rotated one half revolution and upon rotation of the shaft 52 in either direction the arm 47 is pulled upwardly or downwardly to rotate the ring 42 in a clockwise or anti-clockwise direction. In the head 49 an adjusting screw 54 is provided for the adjustment of pressure on the grips of the sliding jaws.

The cam slots 44 in the cam ring 42 are of two pitches, as clearly shown in Figure 4. The quick pitch part of the cam is required for accelerating or rapidly moving the jaws towards and away from the pipe and provides for opening the jaws fairly wide so that the flanged part of the pipe may pass without impedence from between the jaws. When the hand lever 53 has been moved to turn

the cam ring in a clockwise direction, the jaws 38 are moved radially inward so that the grips carried thereby grip a pipe inserted in the chuck, at which point the rollers have reached a position as shown in Figure 4 having passed through the high pitched portion of the cam slot. Further movement will cause the low pitched portion of the cam slot to engage with the rollers. This low pitched portion of the cam slots is used in the gripping action on the pipe and as the crank pin 51 on shaft 52 just passes over the centre, it locks itself and the rollers have just passed into the low pitched portion of the cam slots, so that a very powerful grip on the pipe is obtained and the grip members and sliding jaws are locked in this position. Thus the low pitched portion of the cam slots in combination with the toggle operating connections of the cam rings provide for the exertion of a sufficiently heavy pressure required to hold the pipe for the flanging operation.

The grips 40 of the sliding jaws 38 are constructed so that they may be removed readily and applied quickly. This is provided for by forming the jaws and grips with mating portions, as illustrated at 55 in Figure 3, and through the provision of a spring and ball member or the like which may be mounted in the jaw, the grip may be securely fastened. In this way it is only necessary to exert a slight pressure to slide the grips from contact with the jaws or to similarly slide them into engagement.

On the cover plate 37 of the chuck, a pipe gauge 56 is mounted. This pipe gauge is provided to enable the operator when flanging a pipe to place the right length of pipe beyond the nose of the pipe grips 40. The gauge is made up of a gauge body 57 which is provided with a plurality of radial grooves 58 which are designed to run towards the longitudinal axial centre of the chuck. These slots are designed to receive a number of gauging blades 59 illustrated in Figure 9. The blades, when placed in the grooves 58, are tensioned by the spring members 60 which will bear against the side of the blades, the latter being held in the grooves of the gauge body by means of a pin 61, which passes through the body of the gauge traversing the slots 58 as well as traversing longitudinal slots 62 formed in the blades. Thus, while the slot in the blades permits longitudinal movement of the blades in the grooves 58 of the gauge body, the pin 61 prevents the inadvertent removal of the blades from the gauge body. At the same time pin 61, engaging with one end of the slot 62 in the blades, will locate the blades in uniform arrangement when withdrawn from projected position after use. The ends of the blades as shown in Figure 9 are formed with a cut-out portion 63, the cut-out portion in each blade varying as to length and depth so that when any blade is moved radially in the slots 58 to project the end carrying the cut-out portion beyond the end of the gauge body and into the path of a pipe being projected through the centre of the chuck, the end of the pipe will project against that part of the blade defining the cut out portion 63, as illustrated in Figure 12, and, having regard to the difference in size of the cut out portion 63 as between the various blades of the gauge, the pipe will be projected beyond the nose of the grips to a varied extent. Thus the operator, by selecting the appropriate blade, can gauge the exact amount of pipe to project beyond the nose of the grips 40 to give the desired flange. The end of the blades are provided with a projection 64 which is pref-

erably made of brass and is formed with a bevelled surface 65 designed to be stamped with the size of the pipe that the blade is used for. In this way a simple arrangement is provided so that accuracy in the flanging operation is assured at all times.

The sliding spindle, as previously stated, is operated towards and away from the chuck by means of the hand wheel 26. This provides for ordinary longitudinal movement but in the case where the flange-forming member has been moved to a point adjacent to the end of the pipe to be flanged, it is necessary to apply considerable pressure for the flanging operation. This is effected through the hand wheel 30. The hand wheel 26 is provided with the collar 66 which is provided with a cam slot 67 in which the roller 68 is designed to operate. The roller 68 projects from a clutch member 69 (see Fig. 6) which is designed to engage with the worm wheel 27 to place it in direct engagement with the shaft 25.

As shown in Figures 5 and 6, the slot 67 is of V shaped formation and when the roller 68 is positioned centrally of this slot, as shown, the clutch is in engagement with the worm wheel 27, thus placing it in driving engagement with the shaft. Consequently by rotating hand wheel 30, the shaft 25 may be rotated with great pressure through the medium of the worm 28 and worm wheel 27. This provides sufficient flange-forming pressure between the flange-forming member 35 and the end of the pipe. When, however, the flange-forming member is being disengaged from the pipe and being brought into proximity with the end of the pipe, the hand wheel 26 is employed and when this is rotated in either direction the roller 68 will be moved by the slot 67, thus withdrawing the clutch 69 from engagement with the worm wheel 27 and rendering the hand wheel 30 and associated mechanism inoperative. In this way means is provided for quickly moving the spindle 14 and carrying flange-forming member towards and away from the chuck, the action comparing with the operation of the cam ring in the chuck for moving the jaws towards and away from the pipe.

In the present instance the hand wheel 30 and the low pitch portion of the cam slots 44 in the chuck mechanism serve as the power members for applying the flange-forming member and the gripping members respectively. On referring to Figures 3, 10 and 11 it will be noted that the flange-forming is done in three operations. The first operation involves a forming member having a conoidal contour providing the flange-forming surface which flanges the pipe preliminarily. The second member presents a flat surface to the preliminarily flanged pipe and having regard to the fact that the forming members are held at an angle as previously referred to, the flat surface is applied to the flanged end of the pipe at an angle, thus bending it to a greater degree. The finished operation is carried out by the third forming member shown in Figure 11, which is provided with an annular recess, the surfaces of which are given a contour to engage with the bent end of the pipe to round it and apply it backwardly against the nose of the gripping jaws.

In each instance, as previously referred to, a portion of the surface of the forming member only, contacts with the end of the pipe, so that having regard to the rotational movement of the forming member when the spindle 14 is rotated,

the flanging of the pipe end is done gradually around its periphery without any possible strain.

In the general operation the appropriate forming member is placed in the head 32. The pipe to be flanged is then inserted within the chuck and the hand lever 53 is operated to cause the jaws to move radially inwards in a quick motion under the actuation of the high pitched portion of the cam slots 44. On further movement of the lever of the low pitched portions of the cam slots act on the jaws to firmly press the gripping members against the pipe, at which point the pin 51 passes centre and the grips are locked on the pipe. The hand wheel 26 is then rotated in a clock-wise direction, quickly bringing the forming member 34 into proximity with the end of the pipe to be flanged. At this point the hand wheel 30 is employed which gives the power action and thus under heavy pressure contacts the forming member with the edge of the pipe. The portion of the forming member which contacts with the periphery of the pipe due to rotation of the spindle and the preliminary operation of flanging is completed, as illustrated in Figure 3. The second and third steps using the forming head shown in Figures 10 and 11 are conducted in exactly the same manner, whereupon the pipe may be readily released by the chuck mechanism. During the insertion of the pipe for flanging, the pipe gauge is set to determine the length of pipe to be flanged. In this instance the appropriate blade 59 is moved radially to project in the path of the pipe and when the pipe is clamped the blade is returned to its normal position.

Having regard to the foregoing it will be apparent that I have provided a very efficient form of pipe flanging apparatus, the parts of which will be efficient in operation to flange pipes without any injurious strain, while the various parts are arranged for speed of action as well as application of the necessary gripping tension and pressure required. It will be obvious that the flange-forming members required are readily removed and inserted, owing to the simple construction employed.

Various modifications may be made in this invention without departing from the spirit thereof or the scope of the claims, and therefore the exact forms shown are to be taken as illustrative only and not in a limiting sense, and it is desired that only such limitations shall be placed thereon as are disclosed in the prior art or are set forth in the accompanying claims.

What I claim as my invention is:

1. In a pipe flanging machine, a flange forming unit including a head and flange forming member mountable therein, said head being bored at an angle to its axis to provide a mounting cavity, a ball race tightly fitted in said cavity and a shank on said forming member freely insertable within said ball race, said forming member when mounted being disposed with its axis at an angle to the axis of the head.
2. In a pipe flanging machine, a flange forming unit including a head and flange forming member mountable therein, said head being bored at an angle to its axis to receive the forming member, said forming member being formed with a shank insertable in the bore of the head whereby said forming member when mounted is disposed with its axis at an angle to the axis of the head.
3. In a pipe flanging machine, a flange forming unit including a removable head and flange forming member mountable therein, said head being

bored at an angle to its axis to provide a mounting cavity, bearing means positioned within said cavity, a shank formed on said forming member removably mountable in said bearing means, said forming member when mounted being disposed with its axis at an angle to the axis of the head.

4. In a pipe flanging machine, a flange forming unit including a head having a sloped outer end and a flange forming member mountable therein,

said head being bored at an angle to its axis to provide a mounting cavity, bearing means positioned within said cavity having its outer face lying flush with the sloped end of the head, said flange forming member being freely mounted within said bearing means whereby when mounted said forming member is disposed with its axis at an angle to the axis of the head.

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