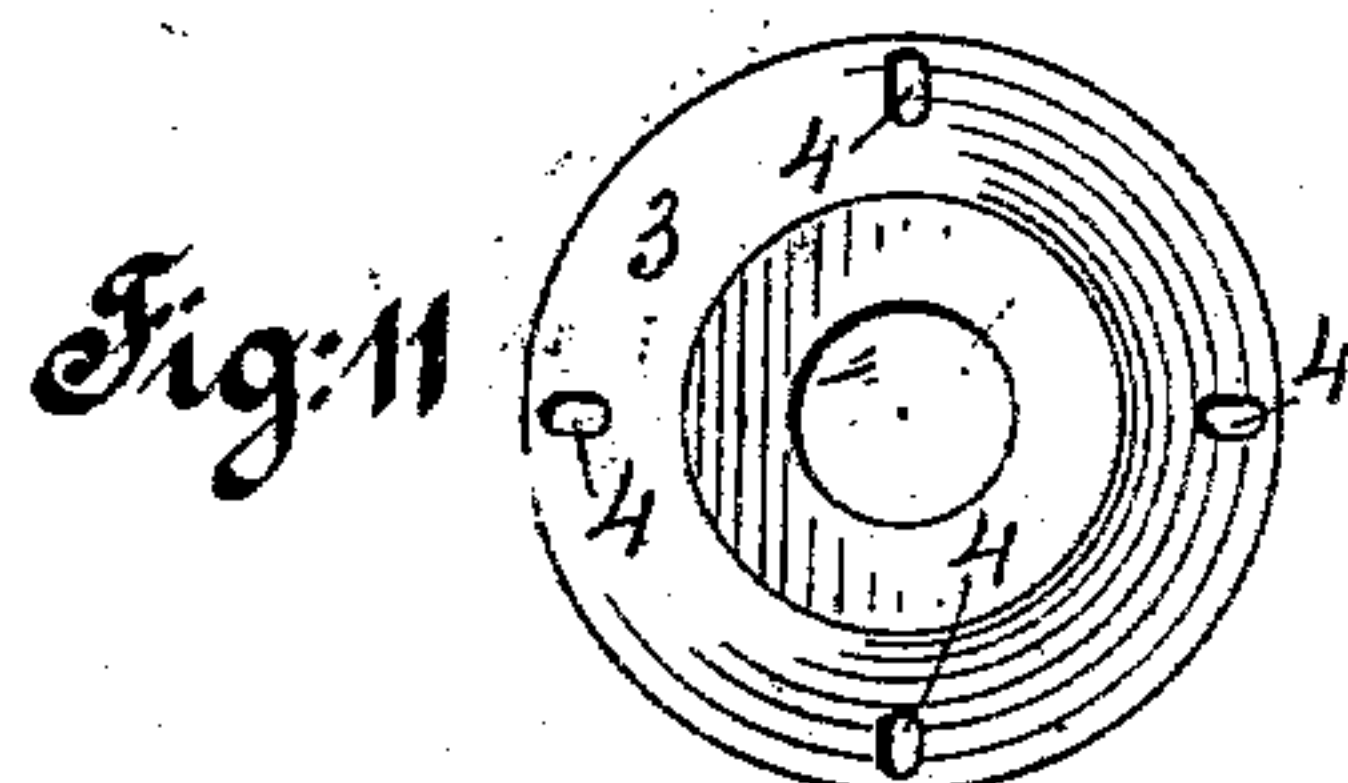
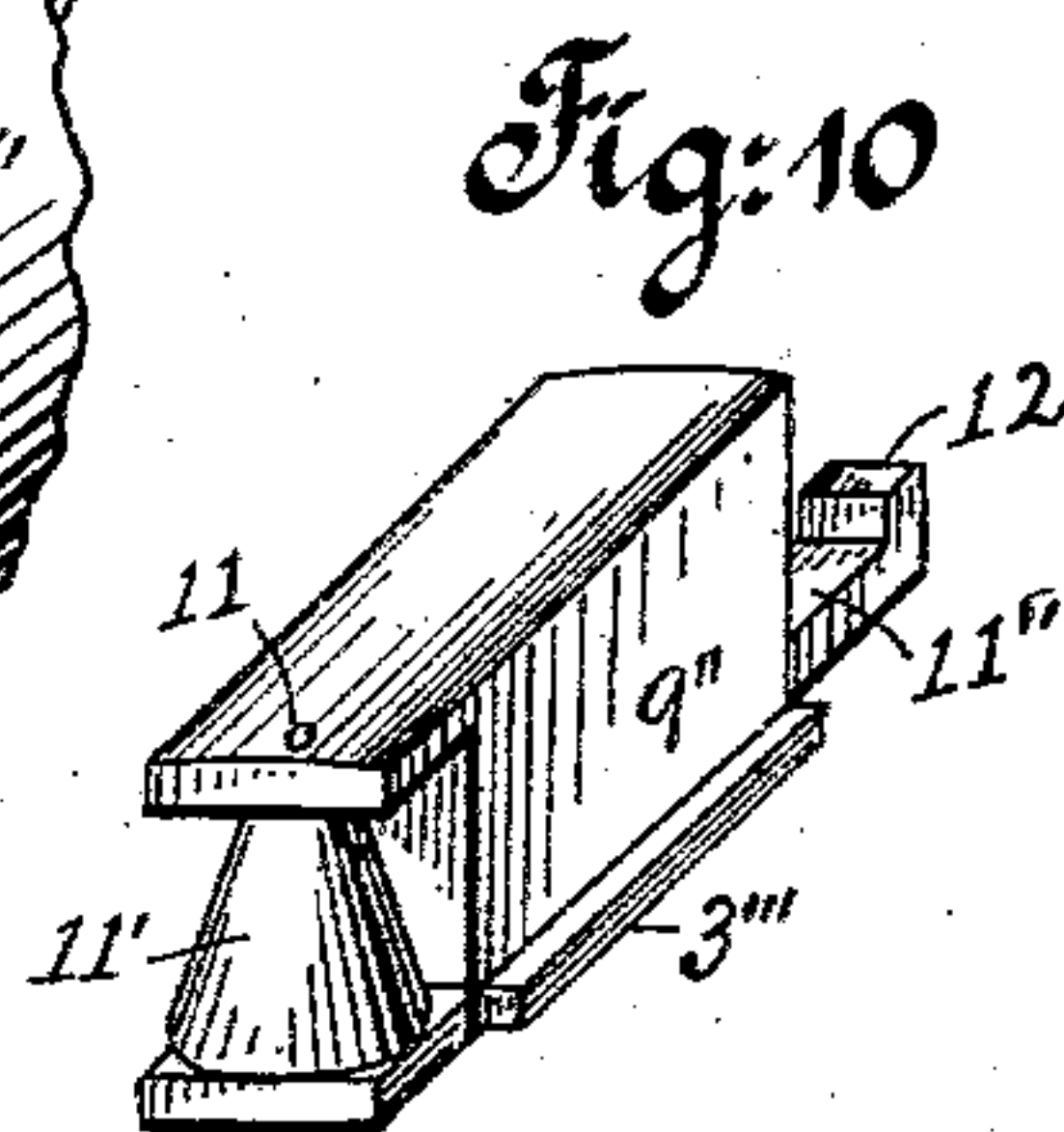
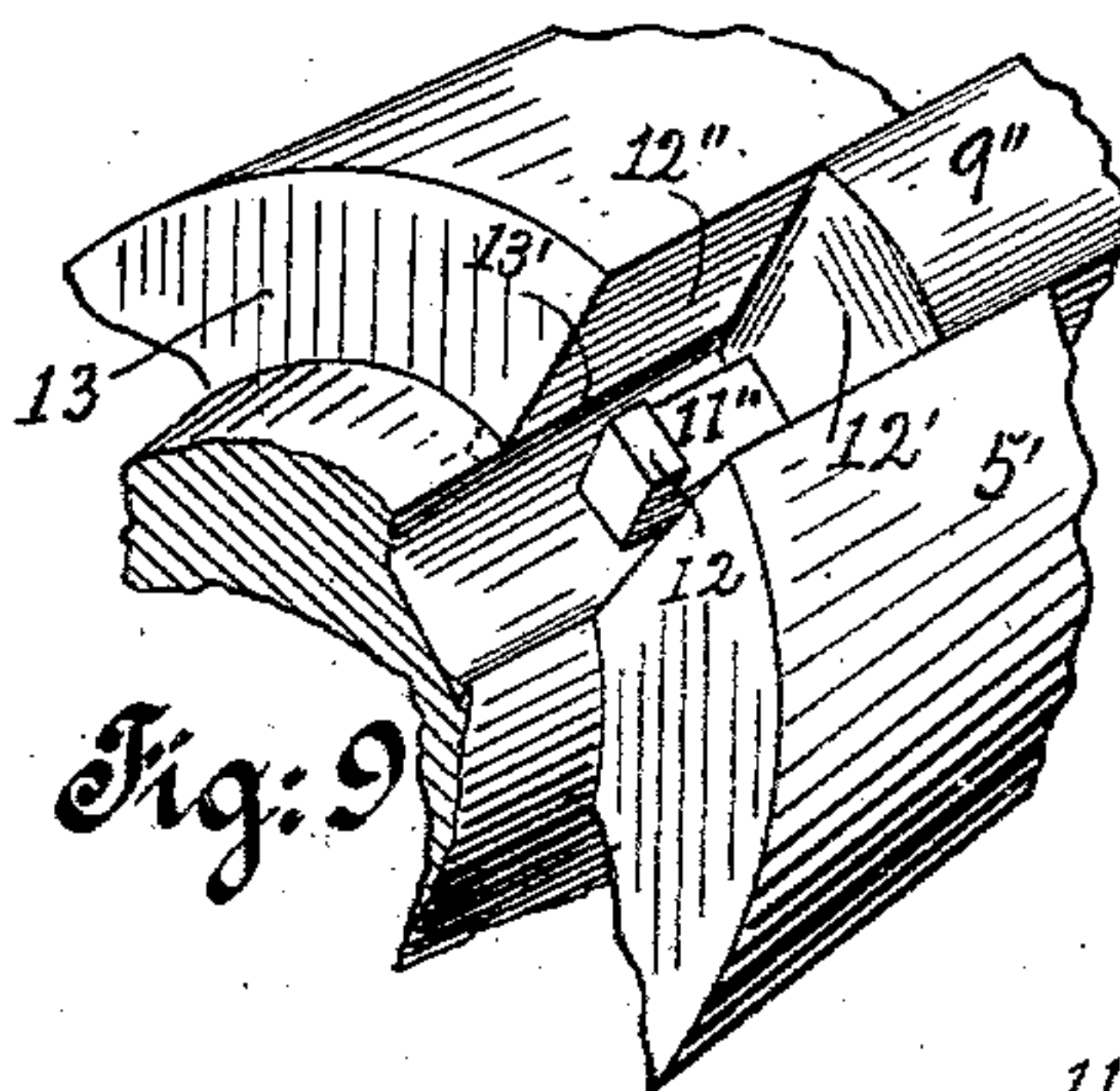
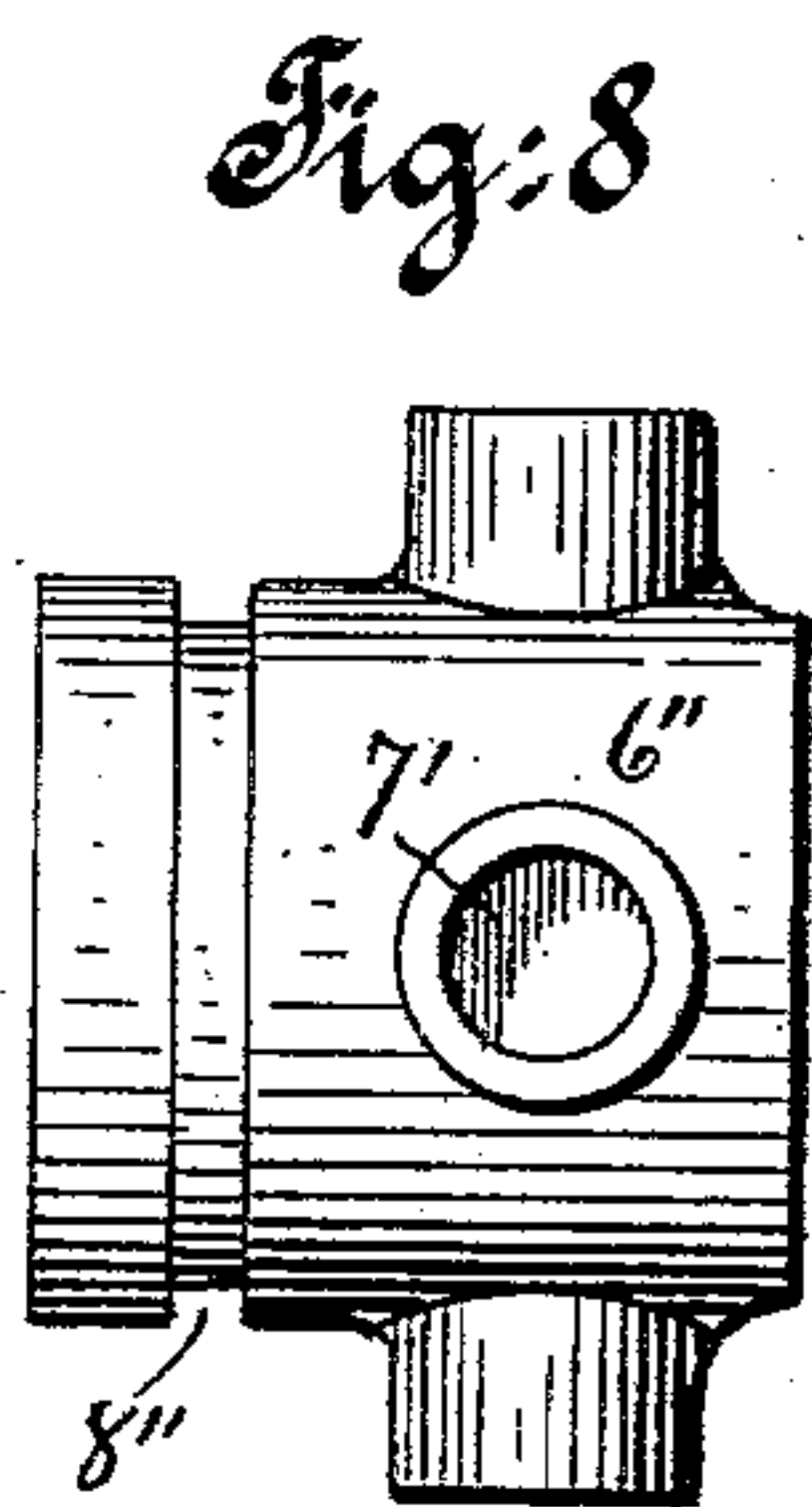
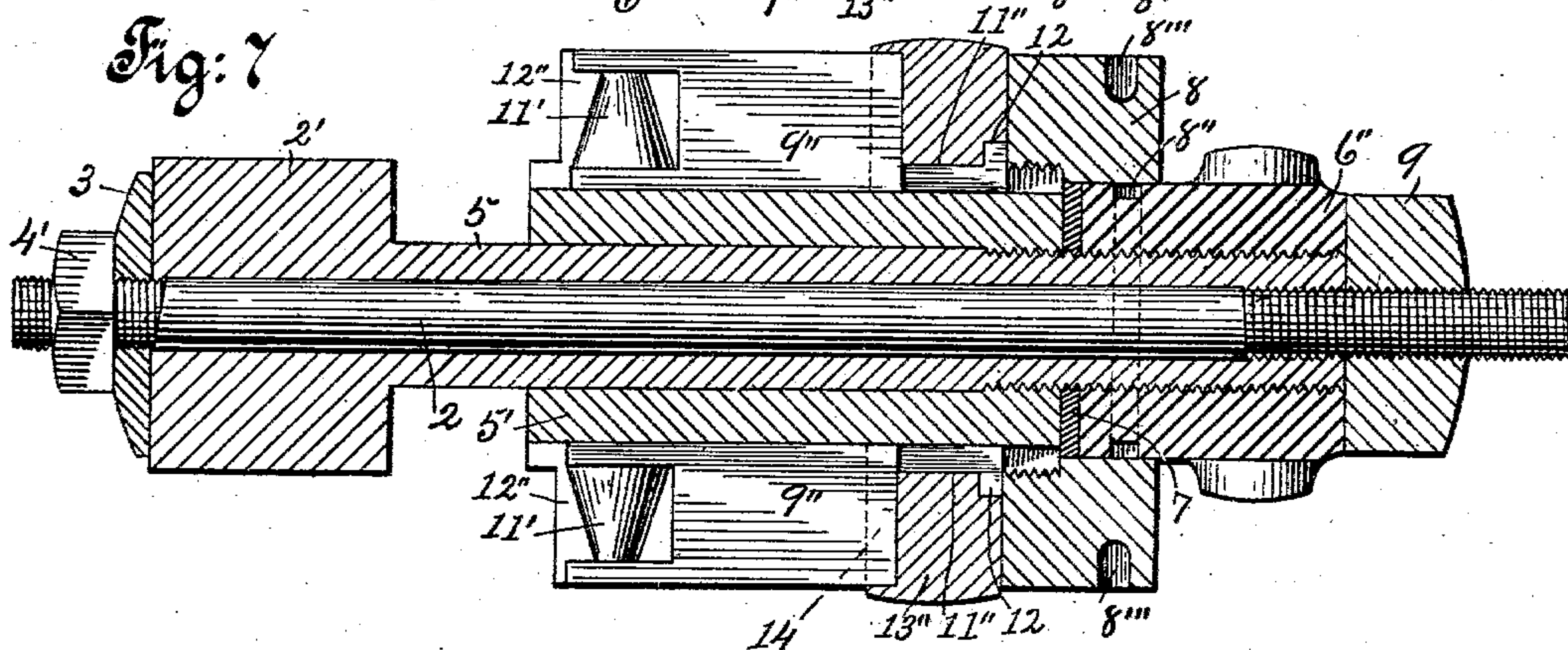
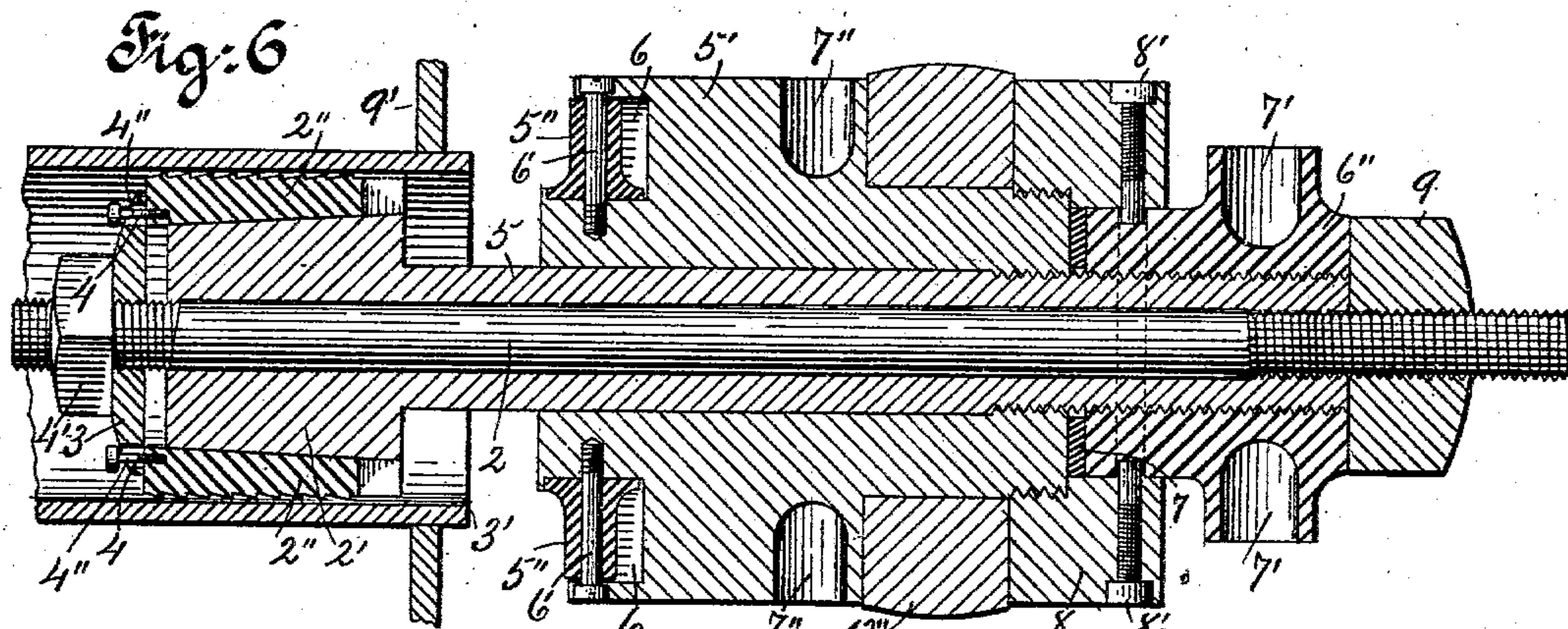


S. E. CONDON.
DEVICE FOR SHAPING AND SETTING TUBES.

APPLICATION FILED AUG. 6, 1902.

NO MODEL.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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DEVICE FOR SHAPING AND SETTING TUBES.

SPECIFICATION forming part of Letters Patent No. 740,239, dated September 29, 1903.

Application filed August 6, 1902. Serial No. 118,583. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. CONDON, a citizen of the United States, and a resident of New York, Brooklyn borough, in the county of Kings and State of New York, have invented certain new and useful Improvements in Devices for Shaping and Setting Tubes, which improvements are fully set forth in the following specification.

This invention relates to improvements in mechanical structures of that class extensively employed for the purpose of flanging, beading, or shaping tubes formed from yielding material and for the purpose of setting such tubes or producing between each of the same and a part coöperating therewith, as the tube-sheet of a boiler, a sealed or tight junction, such structures being commonly known as "devices for shaping and setting tubes." The object of this invention is to provide a device of the character above indicated which shall be simple, inexpensive, and novel as regards construction, which shall be positive, durable, and efficient in service, which shall insure marked convenience to the user in applying the same to practical purposes, which shall embody novel features of construction whereby accurate and speedy adjustment of the working parts may be effected, which shall be constructed in a manner to facilitate repairing operations and the ready substitution of serviceable parts for those becoming worn or defective through use or otherwise, and which shall possess certain well-defined advantages over prior analogous structures.

The invention consists in the employment of certain parts novel as to form, in the novel disposition and arrangement of the various parts thereof, in certain combinations of the latter, and in certain details of construction, all of which will be specifically referred to hereinafter and set forth in the appended claims.

The invention is clearly illustrated in the accompanying drawings, wherein similar reference-numerals denote corresponding parts throughout the several views, in which—

Figure 1 is a front end view of a device for shaping and setting tubes constructed in accordance with my invention. Fig. 2 is a side elevation of the device, certain of the mov-

able parts thereof being shown relatively in position for service, and to better illustrate the practical application of the device as a whole there is shown in connection therewith and in central longitudinal section a portion of a boiler-tube. Fig. 3 is a transverse section taken along the line *a a* of Fig. 2. Fig. 4 is a transverse section taken along the line *b b* of Fig. 2. Fig. 5 is a fragmentary sectional view illustrating the coöperative relation of certain minor elements of the device and the positions assumed thereby in service. Fig. 6 is a central longitudinal section taken along the line *a a* of Fig. 1, the parts being released from their locked position as shown in Fig. 2. Fig. 7 is a central longitudinal section taken along the line *b b* of Fig. 1. Fig. 8 is a view illustrating in side elevation the tool-head impeller which I purpose employing as an element of my improved device. Fig. 9 is a view in perspective, illustrating certain features of construction of the tool-head which I make use of. Fig. 10 is a view in perspective, showing one of the tool-slides which I make use of detached from the general construction. Fig. 11 is a face view of the gripper-block which constitutes an element of my improved device, said block being shown detached from the general construction.

In a general sense my invention comprises an axial element or spindle, means for temporarily fastening one end of said spindle within the end portion of a tubular object, so that said spindle when thus disposed will accurately coincide or register with the longitudinal axis of such tubular object, a tool-head adapted to be impelled to and fro with respect to the longitudinal axis of said spindle, and means for thus impelling said tool-head.

It further comprises a tool-head, a tool conjoined with and movable to and fro in a plane parallel with the axis of said head and independently thereof, a controller situated away from said tool, and a member interposed between said controller and said tool and supporting the latter for service.

In practice, and particularly where it is desired to utilize the device in the shaping and setting of objects such as boiler-tubes, it is essential that elements be employed whereby

a portion of the device may be securely locked temporarily within the tube or object to be acted upon and in such manner that the longitudinal axis of the device as a whole will coincide or aline with the longitudinal axis of such object, and in the accomplishment of this result, reference being had to the accompanying drawings, the spindle 2, gripper-head 2', grippers 2'', and gripper-block 3 are directly concerned.

The grippers 2'' are suitably spaced circumferentially of the head 2', are arranged for movement simultaneously and uniformly therealong, and are adapted when duly moved in service to effect a binding or locking force between the head 2' and the surrounding wall of the tubular object (indicated in the drawings by the numeral 3') in connection with which the device is being used.

The grippers 2'' may be of any suitable form in cross-section and are here shown as being arranged to undergo each a sliding movement lengthwise with respect to the head 2', said grippers being let into suitable channels, one in each channel, formed at the circumferential portion of the head 2' and each extending lengthwise therealong. The base of each of the channels containing the grippers 2'' is inclined or beveled lengthwise, and the bottom of each gripper is accordingly inclined or beveled, so that at all times in service and irrespective of the position occupied by any of the grippers relatively to its containing-channel and of the movements of said grippers, respectively, along their containing-channels the outer or gripping surface, ordinarily serrated or otherwise roughened, of each gripper 2'' will remain parallel with the longitudinal axis of the device as a whole, and accordingly with the longitudinal axis of the tubular object in connection with which the device is being used, and the gripping-surfaces of the several grippers may accordingly be caused to simultaneously and uniformly approach and likewise recede from the interior wall of such tubular object by duly moving said grippers jointly in their containing-channels. Each of the channels in which work the grippers 2'' is provided with a lateral groove coextensive with the length of the channel, and each of said grippers is provided with a lateral tongue which takes into the groove of its containing-channel, this construction being employed to prevent displacement of any of said grippers radially away from the head 2'. The important characteristic of each of the channels containing the grippers 2'' is its inclined base, an inclined surface being accordingly provided, along which a cooperating gripper moves in operation, and while I prefer to provide material at the opposite sides of these inclined surfaces whereby channels for containing said grippers may be secured and which serves to guide said grippers each in its movements along its cooperating inclined surface it will be understood that other means

for thus guiding the grippers 2'' may be availed of.

I purpose employing for the grippers 2'' channels conforming in all essential details to the channel illustrated in Fig. 9 of the drawings, save that the latter will not ordinarily have an inclined base and is provided to contain a part, ordinarily one of a series of like parts, which will be described hereinafter. For cooperation with the grippers 2'' I provide the gripper-block 3, the same being here shown in the form of a disk having suitably-spaced radially-elongated openings 4 and firmly adjusted to the spindle 2 in advance of the head 2'. I have shown the block 3 as having a threaded engagement with the spindle 2, and any suitable means, as the check-nut 4', may be employed for holding said block against movement independently of the spindle, the said check-nut being situated still in advance of the block 3. Where the construction thus far described is employed, it will be seen that longitudinal movement of the spindle 2 in one direction with respect to the head 2', the latter being held stationary, will result in the grippers 2'' being withdrawn each partially from its containing-channel away from its locking position and through the medium of the block 3 and pins 4'', all as indicated in Fig. 6, while a reverse longitudinal movement of said spindle will result in said grippers being urged to their locking position between the head 2' and the object being acted upon, as indicated in Fig. 5 of the drawings, and through the medium of the block 3, which now abuts against the adjacent ends of the grippers.

The gripper-head 2' is provided with an extension 5, on which is loosely mounted a tool-head 5', said tool-head being ordinarily capable of movement both longitudinally and rotarily with respect to said extension.

In connection with the head 5' any suitable tool or series of tools may be employed. In this connection, however, I have shown a series of beaders 5'' let into pockets 6, one in each pocket, at the front end of the head 5'. Each of the beaders 5'' is held in position for service within its containing-pocket by means of an axial element 6', on which the beader rotates in service. The elements 6' are shown in the accompanying drawings, each in the form of a bolt extending radially inward through the adjacent pocket 6 and tapped into the head 5'.

The beaders 5'' are suitably contoured exteriorly to engage and bead over outwardly the adjacent end of the tube 3' when the head 5' shall have been duly urged or impelled longitudinally along the extension 5 in the direction of the tube 3' and thereafter rotated on the extension 5.

For urging the tool-head 5' longitudinally along the extension 5, as above stated, I employ an impeller 6'', adapted to be operated by means of a turning-bar, wrench, or the

like. This impeller by preference approximates the form of an enlarged nut, has a threaded engagement with the extension 5, as illustrated in the drawings, and the head 5' occupies a position along the extension 5 in advance of said impeller. I further purpose interposing between the head 5' and the impeller 6" an antifriction-washer or analogous element 7, the function of which will be explained hereinafter.

While I have shown the impeller 6" as being provided with recesses 7', suitably spaced circumferentially thereof and designed each to receive an operating or turning bar, said impeller may be formed many-sided to permit the use of a wrench or analogous implement in connection therewith, if desired.

Where the construction under consideration is employed, it will be observed that through the medium of the impeller 6" when properly manipulated or rotated in one direction on the extension 5 a substantial direct impelling force will be exerted upon the head 5', thereby causing the latter to move longitudinally along the extension 5 until the beaders 5" shall have been brought firmly into engagement with the adjacent end of the tube 3', whereupon the user inserts into one of the recesses 7'', formed in the head 5' and suitably spaced circumferentially with respect thereto, a turning-bar or analogous device and rotates the head 5', thus producing a beading effect upon the adjacent end of the tube 3'. As the beading operation thus progresses the beaders 5" may be kept in due contact with the tube 3' by properly manipulating the impeller 6'', as will be clearly understood, and in this connection the antifriction-washer 7 permits the head 5' to thus rotate without affecting the impeller 6". Also the impeller 6" may be held against rotative action while the head 5' is being rotated by means of the turning-bar used in connection therewith, and the adjustment of these parts, the impeller 6'', and head 5' with respect to the extension 5 is such as to permit speedy operation thereof by direct hand-pressure when desired.

It is desirable that means be employed whereby the head 5' shall be caused to accompany the impeller 6" in the latter's receding action along the extension 5 and at the same time permit rotative action of either of the parts 5' 6" each independently of the other, and in this connection a coupling of any suitable and approved construction may be availed of.

For the attainment of the foregoing purpose I have shown a collar 8, screwed onto the rear end of the head 5' and interiorly shouldered, so that it may be firmly seated on said head. This collar may be formed many-sided or otherwise, as with openings 8'', to permit the use in connection therewith of a suitable implement—as a wrench, turning bar, or the like—for adjusting the same to the head 5'. A pin 8' extends radially inward

through the collar 8 and engages the annular recess 8'' with which the impeller 6" is provided, the recess 8'' being clearly shown in Fig. 8 of the drawings. If deemed advisable, a plurality of pins 8' may be employed for the purpose specified.

Here it may be pointed out that the action of the spindle 2 with respect to the head 2' and whereby the grippers 2'' are caused to move into a locked position or the position indicated in Fig. 2 of the drawings is effected and controlled by means of a part conjoined with said spindle, which part is here shown in the form of a nut 9, threaded to the spindle 2 at the rear end thereof and abutting against the rear end of the extension 5 under the locked condition of the parts now under consideration, the head 2', with its extension 5, accordingly serving as an intermediate member between said grippers and the nut 9.

To release the parts just referred to from their locked positions, it is only necessary to reversely move the nut 9 somewhat and thereafter still further directly move the impeller 6'', which, as the beaders are now firmly in contact with the tube 3', will result in the head 2' being withdrawn somewhat from the tube 3', and accordingly from its locked relation with respect to the grippers 2'', thus liberating the latter from their grasp on the tube 3'.

In some instances it is desirable to subject the tube 3' to an operation whereby the same shall be partially expanded or flanged, as indicated in Fig. 5 of the drawings, such operation being preliminary to the final beading operation, whereby the setting of the tube as to the tube-sheet 9' is effected.

To the foregoing end I purpose making use of a tool-slide 9'', adjusted to the head 5' so as to be movable to and fro longitudinally therealong. The slide 9'' terminates at its front end in two opposing members, between which is mounted to rotate, as on the axial element or pin 11, connecting said opposing elements, a primary tool 11' of any suitable general contour, though here shown as conical. The form of the tool 11' and its disposition with respect to the slide 9'' may be modified to suit varying requirements, as will be fully understood. The slide 9'' is provided at its rear end with an elongated member 11'', whose bottom surface by preference coincides with the bottom surface of the slide 9'', and the member 11'' terminates at its distant end in an upturned stop or offset 12, the rear end of said slide proper accordingly approximating the character of a shoulder opposing the offset 12, and the same is indicated by the numeral 12'. The conjoining of the slide 9'' with the head 5' may be effected in any approved manner, though I purpose providing said head with a channel for the reception of said slide, as clearly illustrated in Fig. 9. Specifically, I reduce the head 5' at its rear, thus forming a shoulder 13, and the collar 8 accordingly engages the reduced por-

tion of the head 5', at the rear end thereof. The channel 12'' is formed at the circumference of the head 5', runs parallel with its axis, and is coextensive with both the main and reduced portions thereof. As will be observed, the channel 12'' is out of registry with any one of the beaders 5'' and is provided to contain for longitudinal sliding movement the tool-slide 9''. To this end the channel 12'' is provided with a lateral groove 13', and the tool-slide 9'' is accordingly provided with a lateral tongue 3'', taking into said groove, all as clearly illustrated in Figs. 9 and 10 of the drawings.

13'' is a controller, here shown as arranged for direct hand operation and whereby the slide 9'' may be duly controlled in its movements along its containing-channel 12''. The controller 13'' in this instance approximates the general form of an enlarged annulus and when the parts are assembled is disposed for rotative movement on the reduced portion of the head 5' between the shoulder 13 and the collar 8 and traversing the member 11'' between the shoulder 12' and the offset 12, the said member 11'' accordingly lying between the controller 13'' and the reduced portion of the head 5', with its offset 12 engaging said controller at the rear thereof.

In assembling the parts now under consideration the member 11'' of the slide 9'' is first duly adjusted with respect to the controller 13'', whereupon the said slide is inserted into the channel 12'', at the rear end thereof, and is accompanied by the controller 13'', which latter as the slide 9'' progresses along its containing-channel in due course finds its bearing on the reduced portion of the head 5'. The foregoing is permissible, as the channel 12'' at the reduced portion of the head 5' corresponds, substantially, with the thickness of the member 11'', so that the outer surface of the latter will not ordinarily project beyond the circumferential surface of the reduced portion of the head 5'. The operative relation existing between the controller 13'' and the slide 9'' is such that a partial rotative movement imparted to the former in one direction will result in the latter being urged forwardly along its containing-channel a distance sufficient to bring the tool 11' partially in advance of the adjacent beader or beaders 5'' for preliminary action on the tube under treatment, as indicated in Fig. 5, and like movement of said controller in the opposite direction will result in said slide being reversely moved along its containing-channel to a point in the rear of the adjacent beader or beaders 5'', as indicated in Fig. 2. Accordingly I have shown the controller 13'' as being provided at its front face with a depression whose working surface 14 or a substantial portion of which surface is beveled or inclined, so as to act on the shoulder 12' after the manner of a cam, and accordingly impart to the slide 9'' a movement forwardly along its containing-channel when the controller 13'' is partially

rotated in one direction, as hereinbefore stated. The depression aforementioned is preferably formed so that one wall thereof will lap along the slide 9'' at one side thereof, and thus limit the reverse rotative movement of the controller 13'' in the practical operation of the device. The controller 13'' is provided at its rear face and immediately opposite the working surface 14 with a depression whose working surface 14' is beveled or inclined uniformly with the surface 14, said working surface 14' being provided to act on the offset 12 after the manner of a cam and accordingly cause the slide 9'' to undergo a reverse movement upon a reverse movement being imparted to the controller 13''. In other words, the working surface 14 engages at all times the rear end of and urges the slide 9'' forwardly, and the working surface 14' effects a return movement of said slide accordingly as the controller 13'' is partially rotated in opposite directions. The depression last referred to is also formed by preference so that one wall thereof is adapted to be engaged by the offset 12, and consequently limit the direct rotative movement of the controller 13'' in the practical operation of the device.

It will be understood that a plurality of tool-slides 9'' may be arranged for coöperation with the head 5' and controller 13'', the said head being channeled accordingly, the adjustment of each tool-slide with respect to the controller 13'' being such as already described and said controller being provided with working faces 14 14' at each segment thereof co-operating, respectively, with the said tool-slides, all as clearly indicated in the drawings. In this connection the tool-slide channels of the head 5' conform each to that denoted by the numeral 12'' and are located one channel midway between neighboring beaders 5'', so that the several channels may be uniformly spaced circumferentially of the head 5'. Accordingly the controller 13'' serves as a universal controller for the slides 9'', and when rotatively moved it transmits a sliding movement simultaneously to the several tool-slides, as will be readily understood.

It will be seen that my improved apparatus for shaping and setting tubes, whose operation will be apparent from the foregoing description thereof, is well adapted for the purposes for which it is intended, and, further, that the same may be modified to some extent, particularly as regards the form of the impeller 6'', the form of the controller 13'', the means employed for guiding the tool-slides 9'' in operation, the means employed for guiding the grippers 2'' in operation, and the details of the general construction, without materially departing from the spirit and principle of my invention.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A device of the class herein described comprising a gripper-head having a plural-

ity of grippers conjoined therewith each for a sliding movement longitudinally therealong; a spindle extending loosely through the gripper-head and provided with a gripper-block linked to each of said grippers, the parts being arranged so that said grippers will be simultaneously moved each to, and held at, its locking position upon said spindle being duly adjusted with respect to said gripper-head and held against reverse action; and means for thus adjusting and holding the said spindle, substantially as herein specified.

2. A device of the class herein described comprising a gripper-head having a plurality of inclined gripper-surfaces extending longitudinally along said head, and a plurality of grippers conjoined therewith for movement, one along each of said surfaces, the bottom of each of said grippers being inclined oppositely to the inclination of its cooperating inclined surface; a spindle extending loosely through the gripper-head and provided with a gripper-block linked to each of said grippers, the parts being arranged so that said grippers will be simultaneously moved each along its cooperating inclined surface to, and held at, its locking position, upon said spindle being duly adjusted with respect to said gripper-head and held against reverse action; and means for thus adjusting and holding the said spindle, substantially as herein specified.

3. A device of the class herein described comprising a gripper-head having a plurality of inclined gripper-surfaces extending longitudinally therealong, and a plurality of grippers conjoined therewith for movement, one along each of said surfaces, the bottom of each of said grippers being inclined oppositely to the inclination of its cooperating inclined surface; a spindle extending loosely through the gripper-head and provided with a gripper-block linked to each of said grippers, the parts being arranged so that said grippers will be simultaneously moved into, and away from, their locking position, upon said spindle being duly adjusted in opposite directions with respect to said gripper-head; and means whereby said spindle may be thus oppositely adjusted, substantially as herein specified.

4. In a device of the class herein described, in combination, a gripper-head 2'; grippers 2'' movably conjoined with said head; a spindle 2 extending loosely through the gripper-head and provided with a gripper-block 3; links between said gripper-block and each of said grippers, whereby said gripper-block and grippers are loosely conjoined for cooperation; and means for adjusting said spindle with respect to the gripper-head, all substantially as herein described and for the purpose set forth.

5. A device of the class herein described comprising a tool-head; a tool-slide conjoined with said head and movable to and fro longi-

tudinally therealong; and a controller for operating said slide, substantially as herein specified.

6. A device of the class herein described comprising a tool-head; a plurality of tool-slides conjoined with said head and movable each to and fro longitudinally therealong; and a controller for simultaneously operating said slides, substantially as herein specified.

7. A device of the class herein described comprising a tool-head having a tool-slide channel extending longitudinally therealong; a tool-slide within said channel; and a movable controller on said tool-head, said controller being adapted, when partially moved in one direction, to impart a direct movement to said slide, and when partially moved in the opposite direction, to impart a reverse movement to said slide, substantially as herein specified.

8. A device of the class herein described comprising a tool-head having a tool-slide channel extending longitudinally therealong; a tool-slide having a shoulder and an offset opposing its shoulder, the said slide being contained in said channel; and a rotating controller on said tool-head and traversing said slide between its shoulder and offset, the said controller having a working surface at one side for engaging the shoulder of the slide and urging the latter forwardly in its containing-channel, when said controller is partially rotated in one direction, and having a working surface at its opposite side for engaging the offset of said slide and urging the latter rearwardly in its containing-channel, when said controller is partially rotated in the opposite direction, substantially as herein specified.

9. A device of the class herein described comprising a tool-head having a plurality of tool-slide channels extending each longitudinally therealong; a plurality of tool-slides, one in each of said channels; and a rotating controller for simultaneously operating said tool-slides, the said controller being adapted, when partially rotated in one direction, to impart a direct movement simultaneously to said slides, and when partially rotated in the opposite direction, to impart a reverse movement simultaneously to said slides, substantially as herein specified.

10. A device of the class herein described comprising a tool-head having a plurality of tool-slide channels extending each longitudinally therealong; a plurality of tool-slides, each having a shoulder and an offset opposing its shoulder; a rotating controller on said tool-head, and traversing the several slides, each between its shoulder and offset, the said controller having at one side thereof a plurality of working surfaces, one for cooperation with the shoulder of each tool-slide, the said faces being adapted to simultaneously urge the tool-slides forwardly in their containing-channels, respectively, when said controller is partially rotated in one direction,

and having at its opposite side a plurality of working surfaces, one for coöperation with the offset of each tool-slide, the working faces last named being adapted to simultaneously
 5 urge said tool-slides rearwardly in their containing-channels, respectively, when said controller is partially rotated in the opposite direction, substantially as herein specified.

11. A device of the class herein described
 10 comprising a member 5; a tool-head mounted on said member and movable longitudinally and rotarily with respect thereto; means for impelling said tool-head in opposite directions longitudinally along said member; a tool-
 15 slide conjoined with said tool-head and movable longitudinally to and fro therealong; and a rotating controller for operating said tool-slide, the said controller being adapted, when partially rotated in one direction, to
 20 impart a direct movement to said slide, and when partially rotated in the opposite direction, to impart a reverse movement to said slide, substantially as herein specified.

12. A device of the class herein described
 25 comprising a tool-head having a rotatable beader at its front end; a tool-slide conjoined with said tool-head, movable to and fro longitudinally therealong, and provided with a rotatable flanger at its front end; and a con-
 30 troller for operating said tool-slide, the said controller being adapted, when rotated in

one direction, to directly move said slide so that its flanger will occupy a position somewhat in advance of the said beader, and when partially rotated in the opposite direction, 35 to reversely move said slide so that its flanger will occupy a position somewhat in the rear of said beader, substantially as herein specified.

13. A device of the class herein described 40 comprising a tool-head having a plurality of rotatable beaders at its front end; a plurality of tool-slides conjoined with said tool-head, each movable to and fro longitudinally therealong, and each provided with a rotatable 45 flanger at its front end; a controller for operating said tool-slides, the said controller being adapted, when partially moved in one direction, to directly move said slides simultaneously, so that the flangers carried by the 50 several tool-slides will respectively stand somewhat in advance of the adjacent beaders, and when moved in the opposite direction, to reversely move said slides simultaneously, so that the flangers carried by the 55 several slides, will respectively stand somewhat in the rear of the adjacent beaders, substantially as herein specified.

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