No. 782,005. PATENTED FEB. 7, 1905.

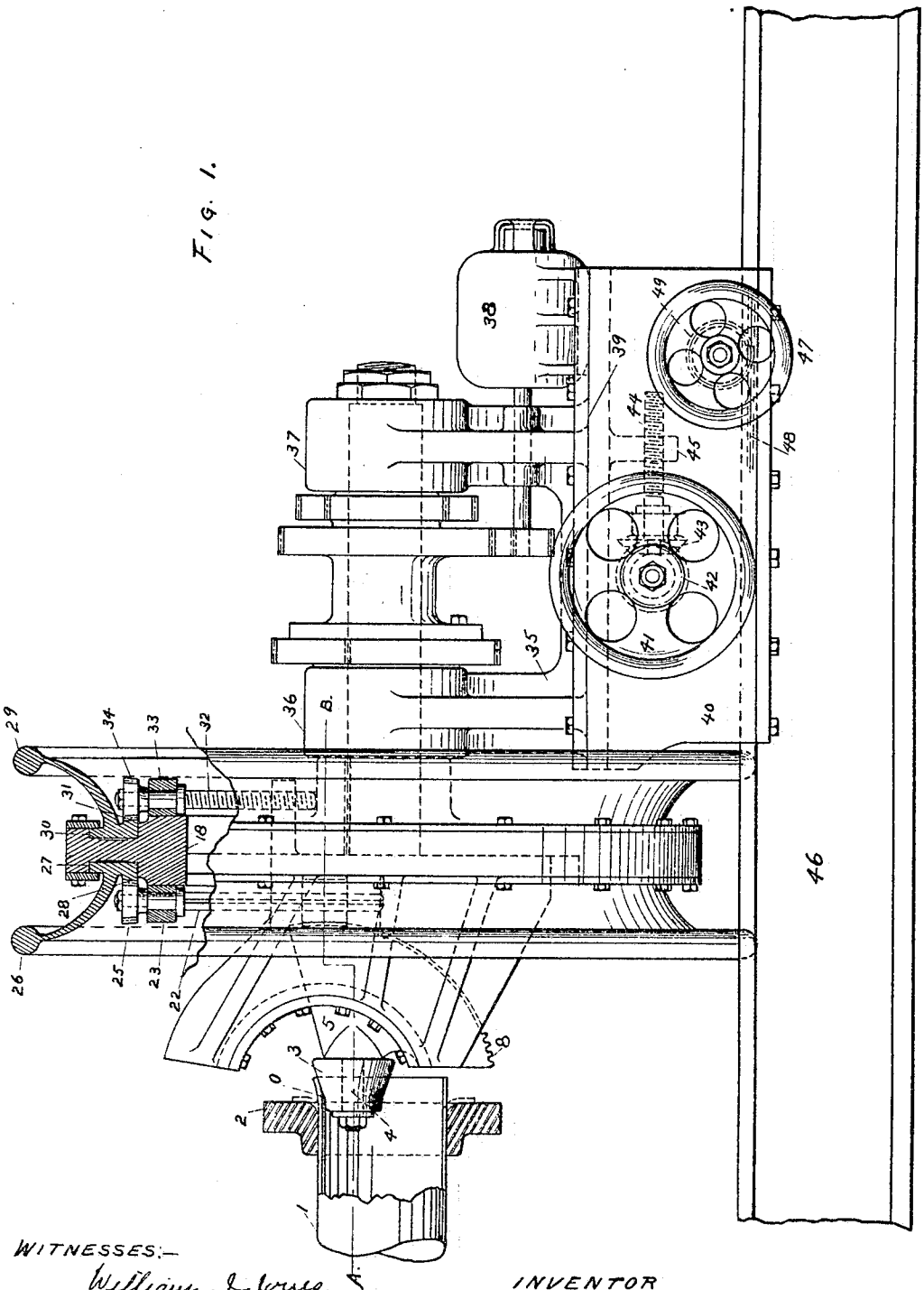
L. D. CHANDLER.

MACHINE FOR FLANGING THE ENDS OF PIPES OR OTHER TUBULAR BODIES.

APPLICATION FILED AUG. 11, 1904.

4 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:—

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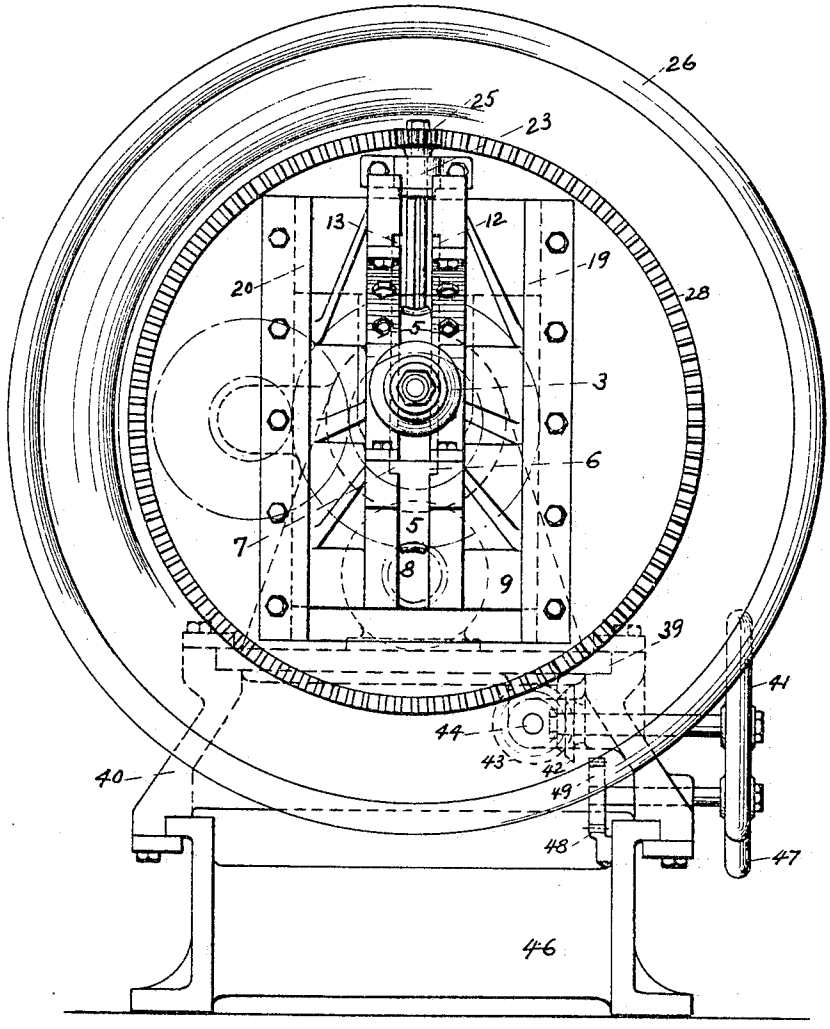
4 SHEETS—SHEET 2.

Fig.-2.



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4 SHEETS—SHEET 3.

FIG.-3.

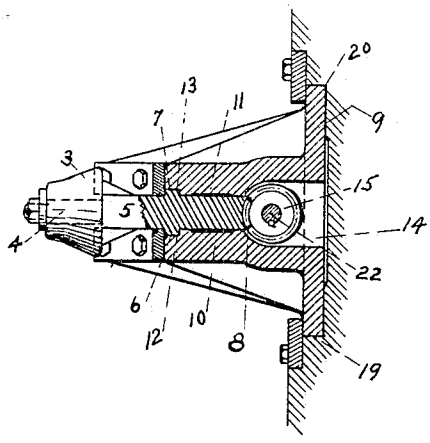
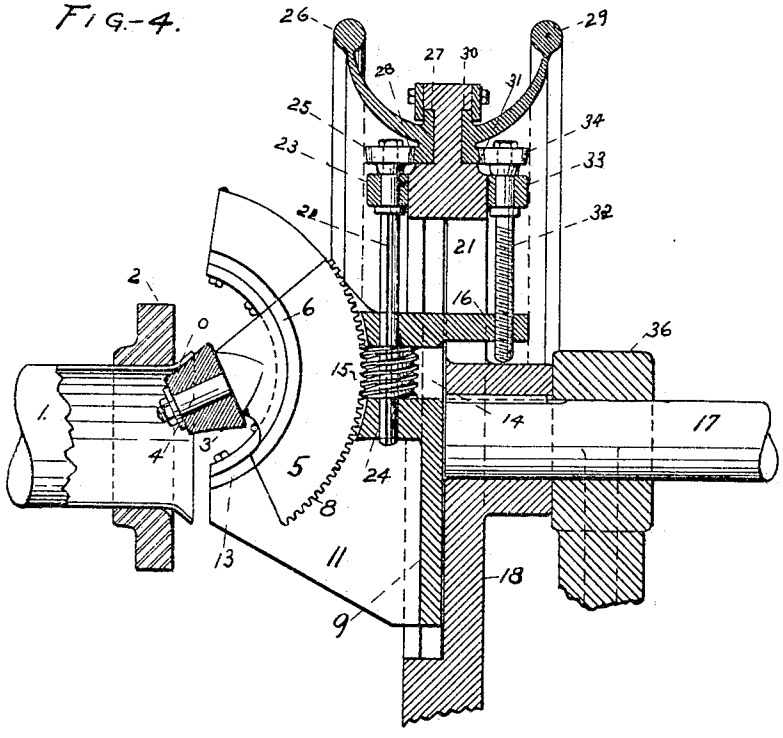


FIG.-4.



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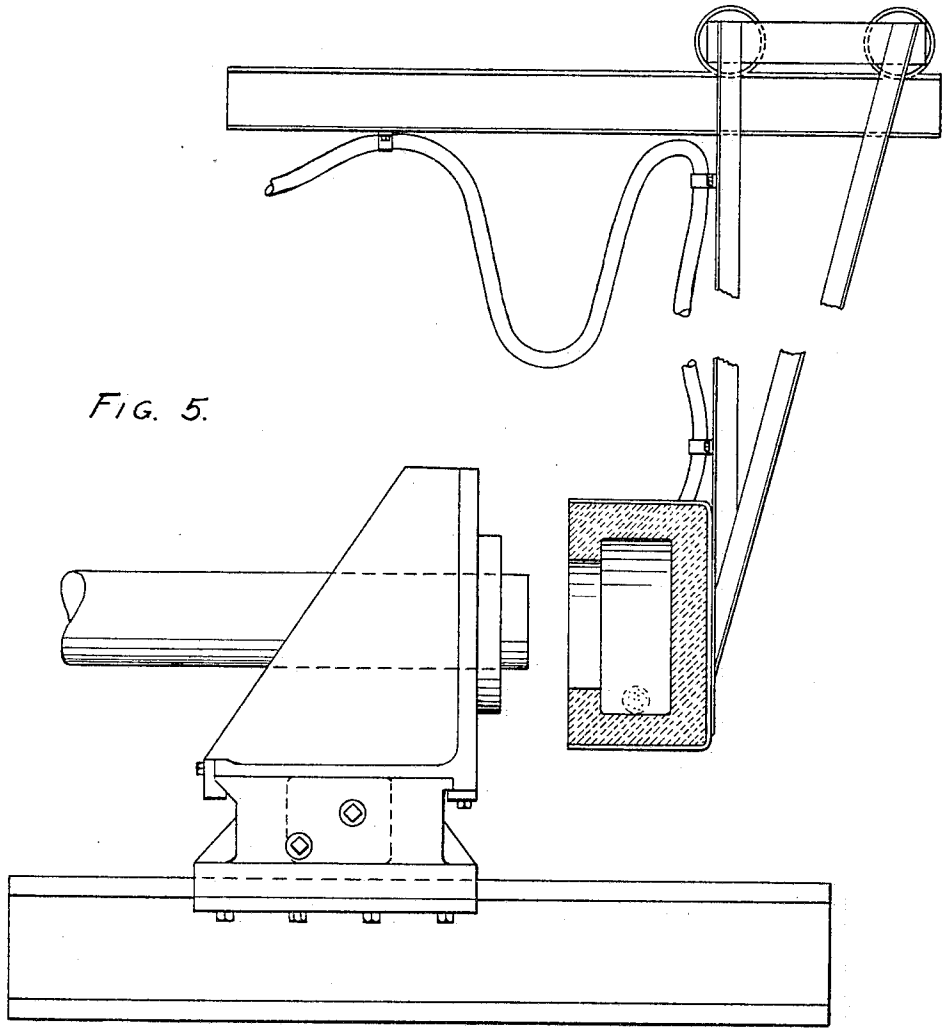
4 SHEETS—SHEET 4.

FIG. 5.



Witness
Harry S. Chandler.
Leonard B Chandler

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Leonard D. Chandler

No. 782,005. Patented February 7, 1905.

UNITED STATES PATENT OFFICE.

LEONARD DEXTER CHANDLER, OF SOMERVILLE, MASSACHUSETTS.

MACHINE FOR FLANGING THE ENDS OF PIPES OR OTHER TUBULAR BODIES.

SPECIFICATION forming part of Letters Patent No. 782,005, dated February 7, 1905.

Application filed August 11, 1904. Serial No. 220,441.

To all whom it may concern:

Be it known that I, LEONARD DEXTER CHANDLER, residing in the city of Somerville, county of Middlesex, and State of Massachusetts, have invented new and useful Improvements in Machines for Flanging the Ends of Pipes or other Tubular Bodies, of which the following is a specification.

My invention relates to that class of machines used for turning over, expanding, or flanging the ends of pipes or tubes.

The object of my invention is to produce a simple efficient machine the operation of which will economize in time and cost and produce a flange or lip on the ends of the pipes of maximum thickness and high degree of uniformity and finish and in every way mechanically superior to the flange made by the sledge or hammer method.

In the accompanying drawings, Figure 1 is a side elevation of the machine, the top of the face-plate being broken away, showing in section. Fig. 2 is a front end elevation of the machine. Fig. 3 is a part section through the radial carriage on the line A B, Fig. 1. Fig. 4 is a vertical half-section through the front part of the machine, showing the principal mechanism with the roller in its middle flanging position. Fig. 5 is a side elevation of a portable oil-furnace for heating the ends of the pipes.

In the different figures the similar parts are similarly numbered.

In Fig. 1, 1 is the pipe or other tubular body to be flanged over. 2 is a containing-flange placed over the end of said pipe and supports the lip of said pipe after it is flanged over. 3 is the flanging-roller. 4, Fig. 1, is the roller shaft or pin. 5 is a flat plate-sector. The roller-shaft 4 forms part of, or is rigidly connected to, said sector 5. 6 and 7 are circular ribs or guides on each side of the sector 5 and concentric about the point 0. 8 represents worm-wheel teeth cut in the outer circumference of the sector 5, concentric about the point 0, and by means of which the sector is driven. 0 is a point on the surface of the roller, although the exact location of this point is not important as regards the principle of the machine, except that it must be external to the axis of the roller and generally external to the roller itself. The point that I have chosen (marked 0) is the intersection of the face of the flanged-over lip with the adjacent element of the surface of the roller when the axis of said roller is parallel to the axis of the pipe. 9 is a radial carriage provided with two projecting arms 10 and 11, respectively, stiffened by ribs and between which the roller-carrying sector is carried and moves. 12 and 13 are circular ways or guides cut in the inner faces of the arms 10 and 11, respectively, for receiving the guides 6 and 7 and definitely determining the motion of the sector 5, and so of the roller 3. 14 is a pocket cut in the back of said carriage 9 for receiving and carrying a worm 15, which gives the sector 5, and thus the roller 3, their inclining motion. 16 is a lug projecting from the back of the carriage 9 and is in threaded engagement with a radial adjusting-screw. 17 is the main shaft or spindle of the machine and carries fastened to its front end a face-plate 18. 19 and 20 are ways in the front face of the face-plate 18, in which the radial carriage 9 slides. 21 is a radial slot in the face-plate 18, through which the lug 16 projects. 22 represents a radial splined shaft having near to its outer end a bearing in a lug 23 and at its inner end a bearing 24 in the carriage 9. Worm 15 is free to slide over the shaft 22, which acts as its axle and drives it by means of a key fastened in the worm and sliding in the spline of said shaft 22. Shaft 22 also holds the worm in gear with the sector 5. Radial motion of the shaft 22 is prevented by the lug 23, which is fastened to the face-plate 18. 25 is a bevel-gear fastened to the outer end of the shaft 22. 26 is a large hand-wheel having bearings in the front face of the face-plate 18 at 27 and is provided with a large bevel-gear 28 near its inner circumference which engages and drives the bevel-gear 25, and thus the shaft 22. 29 is another hand-wheel having bearings in the rear face of the face-plate 18 at 30 and is provided with a large bevel-gear 31 near its inner circumference. 32 is a screw-shaft in threaded engagement with the lug 16 and has a bearing in the lug 33, which is fastened to the rear face of the face-plate 18 and

takes up the radial thrust of the said screw-shaft 32. 34 is a bevel-gear fastened to the outer end of the shaft 32 and in gear with the large bevel-gear 31 on the hand-wheel 29, by means of which it is driven. 35 is the main machine-frame having the two main bearings 36 and 37, in which is carried and revolves the main shaft 17, and thus the machine. 38 is a motor mounted on the frame 35 and drives the main shaft 17 through spur-gears, either directly or through the back gears, as shown. The frame 35 slides in ways 39 on an intermediate carriage 40 and is adjusted on said ways 39 by means of the hand-wheel 41, through the bevel-gears 42 and 43 and the screw-shaft 44, which is in threaded engagement with a lug 45, projecting from the under side of the frame 35. Carriage 40 slides on the main bed or ways 46 and is moved by the hand-wheel 47 through the rack and pinion 48 and 49.

The operation of the machine is as follows: The pipe and containing-flange are first placed in a chuck or other clamping device (shown in Fig. 5) and their relative positions securely fixed, care being taken that the axis of the pipe coincides exactly with the axis of the machine and that the face of the containing-flange is perfectly normal to the axis of the pipe, with the end of the pipe projecting through it the exact distance to give the required dimensions to the finished flanged-over lip. The roller-axis is now brought parallel to the pipe or machine axis by turning the large hand-wheel 26, the motion being transmitted to the roller through the bevel-gears 28 and 25, the splined shaft 22, the worm 15, and the roller-sector 5. The radial position of the carriage 9, and thus the eccentricity of the roller 3, is now adjusted until the roller will just enter the pipe, as shown in Fig. 1. This is done by turning the large hand-wheel 29, the motion being transmitted, through the bevel-gears 31 and 34 and the screw-shaft 32, to the lug 16, and so to the carriage 9. The machine is now backed away from the end of the pipe on the main ways 46 by means of the hand-wheel 47. A portable furnace is now brought over the end of the pipe (shown in Fig. 5) and the pipe is heated to the required temperature. The necessity for this heating operation will depend on the kind of pipe and on the degree of flanging-over required. The furnace is now removed. The machine is set in motion by means of the motor and then is moved up on the main bedways until the roller has entered the pipe the required distance, when the machine is securely clamped in position on the main bed. The position of the roller in the pipe may be accurately adjusted by means of the lead-screw adjustment of the frame 35 on the carriage 40. The roller now simply revolves around on the inside surface of the pipe, doing no work or flanging. Now in order to flange the end of the pipe it is necessary that the roller be given an increasing inclination to the axis of the pipe while still having its revolving motion. This is done by simply retarding the motion of the hand-wheel 26, which gives a relative change of velocity to the hand-wheel and face-plate, and this motion is transmitted to the roller, as before stated. This retarding or braking action is very easily performed, as the machine turns very slowly. When the inclination of the roller has reached a point so that the turned-over lip is normal to the axis of the pipe, the hand-wheel is allowed to turn with the face-plate, thus giving no more inclination to the roller. The machine is now speeded up by throwing out the back gears or by other means and is also given a slight feed against the face of the turned-over lip by means of the lead-screw 44. This forces the lip to a firm and true bearing against the supporting-flange and gives its front face a smooth, even, and finished surface requiring no further tool-finish, thus completing the operation.

With the poorer qualities of lap-welded pipe it may be found advantageous to give the machine a reversing motion, so as to take some of the stress away from the lap or seam of the pipe—that is, the roller will flange over the end of the pipe from one side of the weld around to the other side, when the roller will be reversed and this operation continued until the pipe is nearly turned over to its final position, when the welded portion will be turned by itself, and then the machine can be given a continuous motion in one direction for finishing. This reversing motion does not alter at all the principle or the efficiency of the machine.

In order that the pipe may be properly turned over without unduly pressing the pipe against the containing-flange and still give the pipe its sharp bending at the proper point, it is necessary that the roller should have an inclination about a certain point external to its own axis. The point that I have chosen is marked 0 and located as before stated. In order that the roller may have this inclination about this point, it is simply necessary to place the roller on a pin or shaft fast to and located near the center or apex of a sector with its center or apex at the point 0, said sector being caused to turn about this point as a center by guides on its two opposite parallel faces, concentric with the point 0 and driven through the arc of a worm-wheel, also concentric with the point 0. This motion of the roller about a point eccentric or external to its own axis and generally to the roller itself is a very vital and important feature of this machine.

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

1. In combination in a flanging-machine, a flanging-roller; a roller shaft or pin for carrying said roller, and on which it turns; a plate-

sector carrying rigidly connected to itself said roller-shaft; circular ways or guides, concentric about a point on the surface of said roller, on both sides of said sector for guiding it; worm-wheel teeth cut in the circumference of said sector, and concentric about said point; a radial carriage; means for the radial adjustment of said carriage; two parallel arms or guides projecting from the front of said carriage and carrying said sector between them; ways or guides, concentric about above said point, on the outer extremities of said parallel arms or guides for guiding the said sector; a pocket formed in the back of said radial carriage; a worm mounted in said pocket and in gear with said worm-wheel sector; a radial splined shaft for driving said worm and holding it in gear; a main shaft; a face-plate mounted on, and fastened rigidly to, the front end of the said main shaft; radial ways on the front of the said face-plate for receiving and guiding said radial carriage; a large hand-wheel mounted in and free to turn in bearings on the front of said face-plate; a large bevel-gear cut in the inner circumference of said hand-wheel; a small bevel-gear fastened to the outer end of said splined shaft, and in gear with said large bevel-gear; a lug fastened to the front of said face-plate, and furnishing a bearing for the outer end of said splined shaft; bearings in the said radial carriage for guiding the inner end of said splined shaft; a main frame provided with two bearings for the said main shaft; a motor in spur-gear connection with said main shaft for driving it; an intermediate carriage provided with longitudinal axial ways on its top for receiving said main frame; a screw-shaft or lead-screw adjustment of said main frame on said intermediate carriage; a main bed or frame provided with longitudinal ways for receiving said intermediate carriage; a rack-and-pinion adjustment of said intermediate carriage on said main bedways, all substantially as shown and described.

2. In a flanging-machine, the combination of, a face-plate fastened to the front end of a main shaft or spindle; radial ways on the front of said face-plate; a radial carriage sliding in said ways; two parallel lugs projecting from the front of said radial carriage; a plate-sector carried between said two lugs; a roller pin or shaft carried by said plate-sector near its center; a flanging-roller mounted on said roller-pin; circular ways concentric about a point on the surface of said flanging-roller, formed on the inner adjacent sides of said projecting lugs near their outer extremities; circular ribs, concentric about the said point on the surface of said flanging-roller, on the two opposite parallel sides of said plate-sector, fitting in, and moving in the said circular ways in the said projecting lugs; means for producing motion of inclination of said flanging-roller about a point eccentric to its own axis; worm-wheel teeth concentric about the said point cut on the outer circumference of said sector; a pocket formed in the back of said radial carriage; a worm mounted in said pocket and in gear with said sector worm-wheel; a radial splined shaft passing through said worm and pocket; a key fastened in said worm and sliding in the spline of said splined shaft; bearings on either side of said pocket for the inner end of said splined shaft; a lug fastened to the front of said face-plate furnishing a bearing for the outer end of said splined shaft; a large hand-wheel mounted in bearings on the front face of said face-plate; a large bevel-gear cut on said hand-wheel near its inner circumference; a small bevel-gear fastened to the outer end of said radial splined shaft and in gear with said large bevel-gear, all substantially as shown and described.

3. In combination in a flanging-machine; main bed-guides; an intermediate carriage sliding on said main bed-guides; a rack-and-pinion drive for said intermediate carriage on said main bed-guides; longitudinal ways on the top of said intermediate carriage; a main bearing-frame sliding in said longitudinal ways; a screw-shaft adjustment of said main bearing-frame on said intermediate carriage; a main shaft or spindle supported in said main frame-bearings; means for driving said main shaft; a face-plate fastened to the front end of said main shaft; a radial carriage sliding in radial ways in the front of said face-plate; two parallel projecting lugs or arms projecting from the front face of said carriage; a plate-sector carried between said projecting lugs; circular guides on the opposite faces of said sector fitting in adjacent ways in the said lugs for guiding said sector; means for inclining said sector in said circular guides; a roller shaft or pin, fastened to said sector near its center; a flanging-roller mounted on and free to turn on said roller-pin; a hand-wheel provided with a bevel-gear near its inner circumference mounted in, and free to turn in, bearings on the front face of said face-plate; a radial splined shaft; a bevel-gear fastened to the outer end of said splined shaft and in gear with said hand-wheel; a worm, driven by and free to slide over said splined shaft and mounted in a pocket in the said radial carriage, and in gear with the said plate-sector, all substantially as shown and described.

In testimony whereof I herewith set my hand in the presence of two witnesses.

LEONARD DEXTER CHANDLER.

Witnesses:
WILLIAM J. JONES,
W. E. ARNOLD.