No. 748,100. PATENTED DEC. 29, 1903.

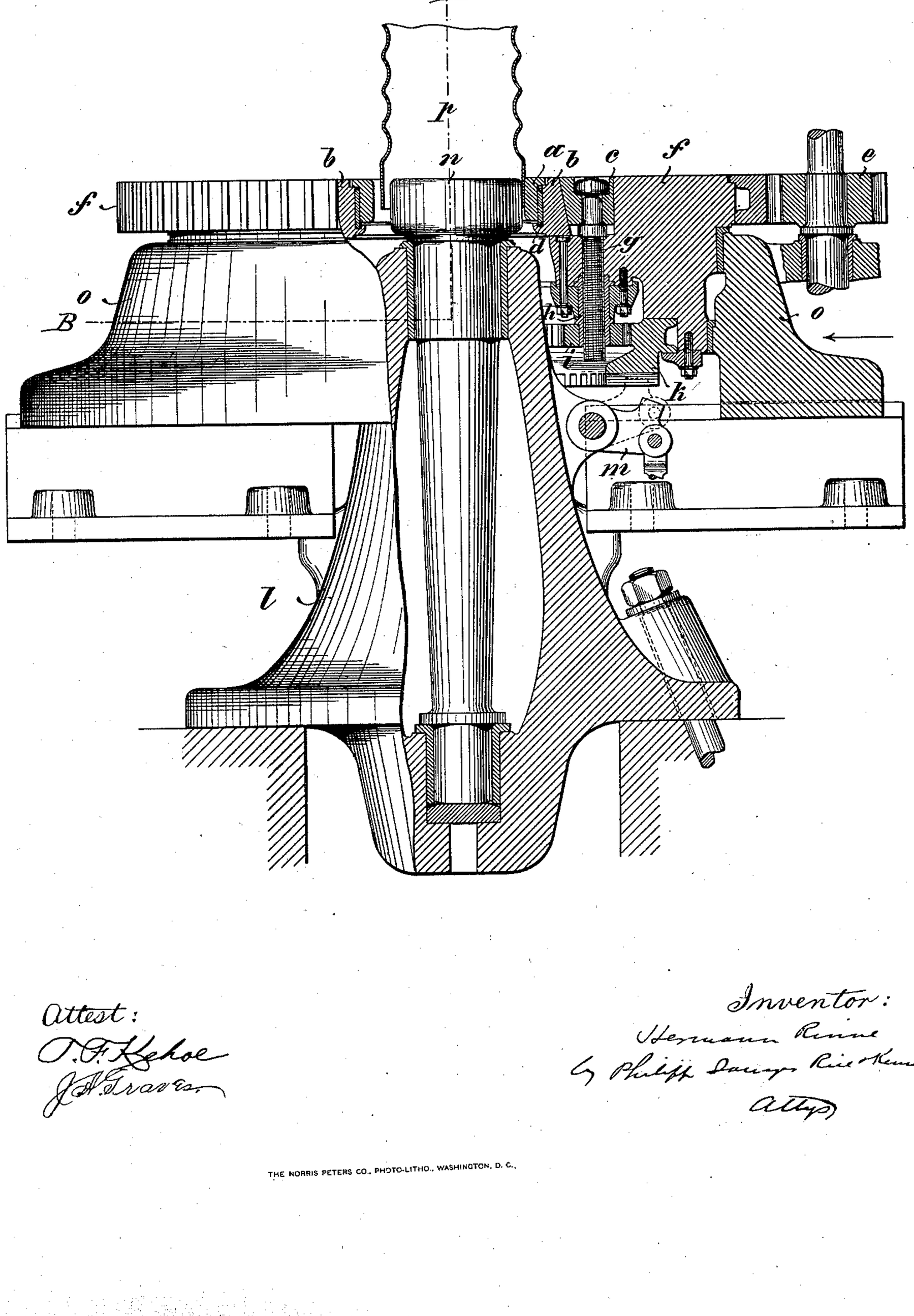
H. RINNE.

MACHINE FOR ROLLING TUBE ENDS.

APPLICATION FILED JULY 8, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

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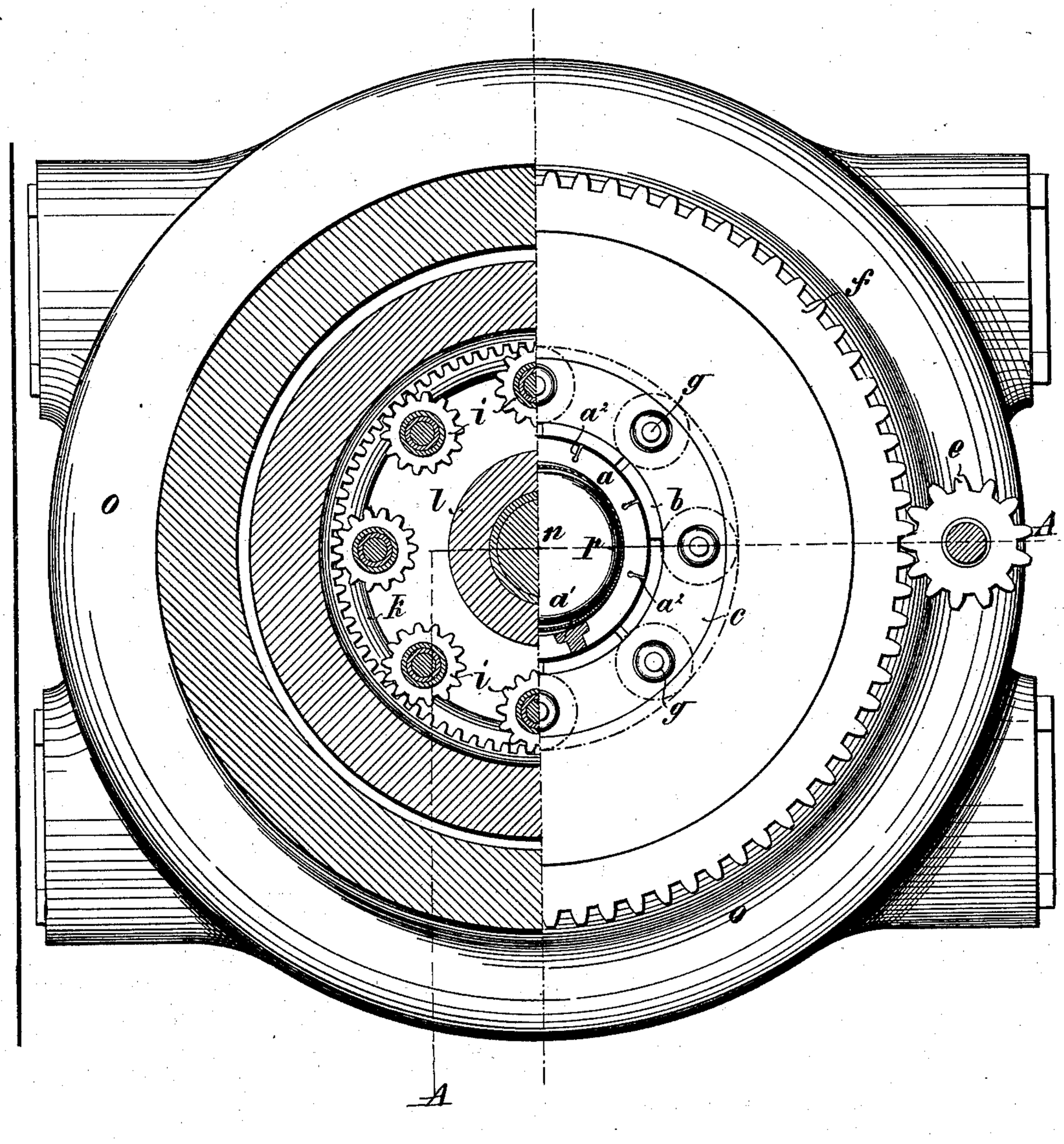
NO MODEL. 2 SHEETS—SHEET 2.

*Fig. 2.*

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# UNITED STATES PATENT OFFICE.

HERMANN RINNE, OF ESSEN-ON-THE-RUHR, GERMANY.

## MACHINE FOR ROLLING TUBE ENDS.

SPECIFICATION forming part of Letters Patent No. 748,100, dated December 29, 1903.

Application filed July 8, 1902. Serial No. 114,713. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN RINNE, a citizen of the German Empire, whose post-office address is No. 17 Kronprinzenstrasse, Essen-on-the-Ruhr, Prussia, German Empire, have invented a certain new and useful Machine for Rolling Tube Ends, of which the following is a specification.

In the manufacture of steam-boiler fire-tubes or boiler casing or jacket pipes, whether welded, seamless, smooth, or corrugated, it is necessary that the ends of such tubes or pipes which are to be joined either to the ends of the boilers or to adjoining pipes or tubes by means of rivets should have peripheries precisely corresponding to those of the part of the boiler to which they belong. With the method now employed in the manufacture of such boiler parts the desired peripheral dimensions can only be secured by heating the ends of the fire-tubes (or jacket tubes or pipes, as the case may be) in the fire and then adjusting their size by contraction or enlargement until the required peripheral measurements are attained. The employment of a rolling process—such, for example, as is used in rolling wheel-tires or of a method of shaping or profiling tube ends irrespective of whether the ends of tubes are treated "cold" or in a more or less heated condition—is not adequate to the purpose of producing tube or pipe ends of precisely predetermined peripheral dimensions, because they afford no means of exercising at any time during the rolling process an effective control upon the measurement of the periphery of the tube end which is being rolled. In other words, they do not permit the enlargement or contraction of the tube end to be with absolute certainty discontinued at the precise moment when the proper dimensions have been reached.

Now the present invention consists in a rolling-machine which enables the ends of boiler tubes or pipes to be brought to exactly the requisite size by cold-rolling and which renders any subsequent finishing or adjusting operation entirely unnecessary.

The annexed drawings show a preferred machine constructed in accordance with the invention.

In said drawings, Figure 1 is an elevation, partly in vertical section, on line A of Fig. 2. Fig. 2 is a top view, partly in horizontal section, on line B of Fig. 1.

A ring $a$, made of hard and elastic material and so turned as to present a true cylindrical surface, is cut open by cutting out a piece for forming an open space in the ring. This ring is externally surrounded by a ring $b$, made up of a number of parts or segments, and this ring $b$ in turn is surrounded by a ring $c$. To enable the ring $a$ to be contracted to a smaller diameter with comparative ease, it is preferably provided with a greater or less number of notches $a^2$ $a^2$ $a^2$ $a^2$, &c., extending inward from the outer periphery of the ring, each notch $a^2$ terminating in a drilled hole to obviate any splitting of the ring beyond the end of the notch. Now when it is desired to adjust the ring $a$ to a predetermined diameter a supplemental piece or wedge, such as $a'$, of sufficient width (or length) is inserted into the open space of the ring $a$. It will be readily understood that by selecting a piece of the proper size for insertion the inner diameter or periphery $a$ may within certain limits be varied at will. After the insertion of a piece $a'$ of the required size, which, if need be, may have a shape different from that shown in the drawings, the ring $a$ is compressed by the application of considerable force from outside until the inserted piece $a'$ is tightly clamped in the open part of the ring $a$. Preparatory to the compression of the ring $a$ by machinery this ring is externally surrounded by the ring $b$, made up of any number of parts, and this ring $b$ in its turn is inclosed in the ring $c$. The outer surface of the ring $b$ and the inner surface of the ring $c$ are so inclined in opposite directions that by forcing the ring $c$ down the ring $b$, and thereby the inner ring $a$, is contracted and the ends of the ring $a$ pressed against the piece $a'$, inserted in the ring $a$, the ring $a$ being thereby adjusted to the diameter determined by the size of the inserted piece $a'$. (See Fig. 1.) By moving the ring $c$ upward the ring $b$ is released, and the ring $a$ expands by reason of its elasticity. All these rings $a$, $b$, and $c$, (which may, if necessary, be supplemented by intermediate pieces $d$,) as shown in Fig. 1, are supported by a rotatable face-plate $f$, which is set in motion by a toothed wheel $e$. Within the face-plate $f$, below the ring $c$, is the operating

mechanism, whereby the ring *c* may with great force be drawn downward or driven upward, as the case may be—*i. e.*, according as the face-plate *f* is by means of reversing-gearing or the like set in rotary motion in one direction or the other. This mechanism for moving the ring *c* upward or downward consists of a number of screws *g*, nuts *h* on said screws and journaled and held against endwise movement in the face-plate *f*, and toothed wheels *i*, secured to the nuts *h*. The toothed wheels *i* are all arranged to engage with the toothed wheel *k*, located in the interior of the face-plate. This toothed wheel *k* is, moreover, provided with a number of teeth on its downward surface, whereby the possibility is afforded of arresting the said wheel by the aid of a tappet or pawl *m*, pivoted to the standard *l*. So long as the said arresting tappet or pawl continues in the position shown by the full lines in the drawings—*i. e.*, while it is out of engagement with the downward teeth of the wheel *k*—no relative displacement of the latter and the toothed wheels *i* can take place as a result of the rotation of the face-plate *f*, and consequently the screws or worms *g* receive no axial motion; but the moment the pawl *m* becomes caught in the wheel *k*, for which purpose it must take something like the position indicated in dotted lines, the wheel *k* will be held against rotation with the face-plate *f*, and the wheels *i*, moving with the face-plate, will be caused to rotate by reason of their engagement with the then stationary wheel *k*, and thereby to move the ring *c*, the interior of which is made of conical shape, either downward or upward, according to the direction of rotation of the face-plate. By such means the ring *a* is either tightly compressed or allowed to expand back to a larger diameter by its resiliency.

In the stationary pedestal or standard *l* is mounted the vertical roll *n*, while the face-plate *f* is supported by a slide-rest *o*, adapted to be moved backward and forward in the direction indicated by the arrow.

Now when a tube end, &c., is to be rolled to a predetermined peripheral size a supplemental piece *a'* of the required length is first of all inserted into the ring *a*, so that when this ring has been compressed its inner diameter shall correspond to the peripheral dimensions of the tube end. The tube or the like *p* is now placed in the position shown in the drawings and is held there in such a manner that it can move neither upward nor downward, but that it may revolve freely without altering its vertical position. Now the rest *o* is moved in the direction of the arrow with great force by means of any suitable mechanism. As soon as the tube or pipe *p* is tightly compressed between the roll *n* and ring *a* the face-plate *f* is set in rotary motion, and the rolling of the end of the pipe or tube is continued until such end completely fills the ring *a*. The ring *a* is cut open to facilitate the release and removal of the tubes tightly compressed in the ring in the process of rolling and also for the further purpose of enabling a comparatively small number of rings *a* to answer all practical requirements in the course of manufacture. It will be understood that the ring might be cut open at more than one point and a corresponding number of supplemental pieces *a'* provided. The construction shown is, however, preferred.

The rolling of the tube ends must be performed cold if it be desired accurately to calibrate the tubes, as otherwise the non-uniform shrinking consequent upon heating might prove a source of defects.

The principle of the invention would still apply were the roll *n* driven by machinery instead of the face-plate *f*, or, again, if both these parts were so driven and the means for displacing the slide-rest *o* in the direction of the arrow might be replaced by or combined with an arrangement for the lateral displacement of the standard *l* or of the roll *n*.

What I claim as my invention is—

1. In a machine for rolling tube ends, the combination with an inner rolling member, of a partly-open ring forming the outer rolling member, a supplementary piece adapted to be inserted into the open space of said ring, means for contracting and enlarging said ring, and means for actuating one of said rolling members to coöperate with the other to roll the tube end between said members, substantially as described.

2. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring forming the outer rolling member, a supplemental piece adapted to be inserted into the open space of said ring, means for contracting and enlarging said ring, and means for rotating one of said rolling members, substantially as described.

3. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring forming the outer rolling member, a supplemental piece adapted to be inserted into the open space of said ring, means for contracting and enlarging said ring, and means for rotating said ring, substantially as described.

4. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring, forming the outer rolling member, said ring being provided on the outer periphery with a number of notches, a supplemental piece adapted to be inserted into the open space of said ring, means for contracting and enlarging the said ring, and means for rotating one of said rolling members, substantially as described.

5. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring forming the outer rolling member, a supplemental piece adapted to be inserted into the open space of said ring, a number of ring-segments surrounding said ring and which are inclined at their outer faces, a ring

surrounding the ring-segments and oppositely inclined on the inner face, means for moving the outer ring upward and downward, and means for rotating said rings, substantially as described.

6. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring forming the outer rolling member, a supplemental piece adapted to be inserted into the open space of said ring, a rotatable face-plate, ring-segments having inclined outer faces, an outer ring having an oppositely-inclined inner face, screws arranged in said outer ring, pinions on said screws, a toothed wheel rotatably mounted on the face-plate in engagement with said pinions, and means for holding the toothed wheel against rotation, substantially as described.

7. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring forming the outer rolling member, a supplemental piece adapted to be inserted into the open space of said ring, a rotatable face-plate movable transversely of the axes of the rolling members, ring-segments having inclined outer faces, an outer ring having an inclined inner face, screws arranged in said outer ring, pinions on said screws, a toothed wheel rotatably mounted on the face-plate in engagement with said pinions, and an arresting tappet or pawl adapted to be brought into engagement with teeth on the under surface of said toothed wheel, substantially as described.

8. In a machine for rolling tube ends, the combination with an inner roller, of a partly-open ring forming the outer rolling member, a supplemental piece adapted to be inserted into the open space of said ring, a rotatable face-plate for supporting said ring and movable transversely of the axes of said rolling members, means for contracting and enlarging said ring, and means for rotating one of said rolling members, substantially as described.

9. In a machine for rolling tube ends, the combination with an inner rolling member, of a partly-open ring forming the outer rolling member, said ring having a single opening, a supplemental piece adapted to be inserted into the open space of said ring, means for contracting and enlarging said ring, and means for actuating one of said rolling members to coöperate with the other to roll the tube end between said members, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HERMANN RINNE.

Witnesses:
PETER LIEBER,
WILLIAM ESSENWEIN.