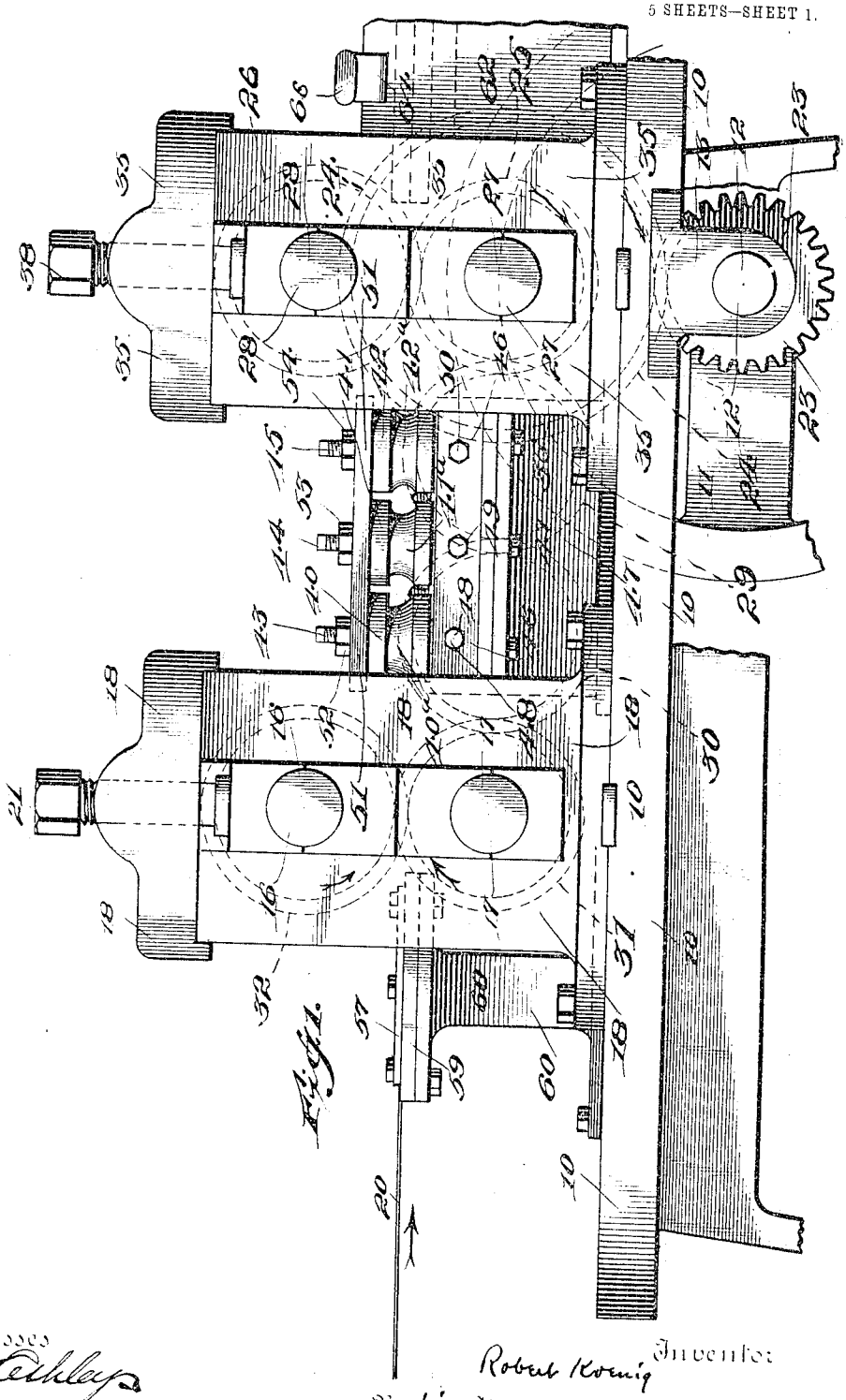
No. 819,143. PATENTED MAY 1, 1906.

R. KOENIG.

MACHINE FOR ROLLING TUBES.

APPLICATION FILED JULY 14, 1904.

5 SHEETS—SHEET 1.



Witnesses
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C. Mitchell

Inventor
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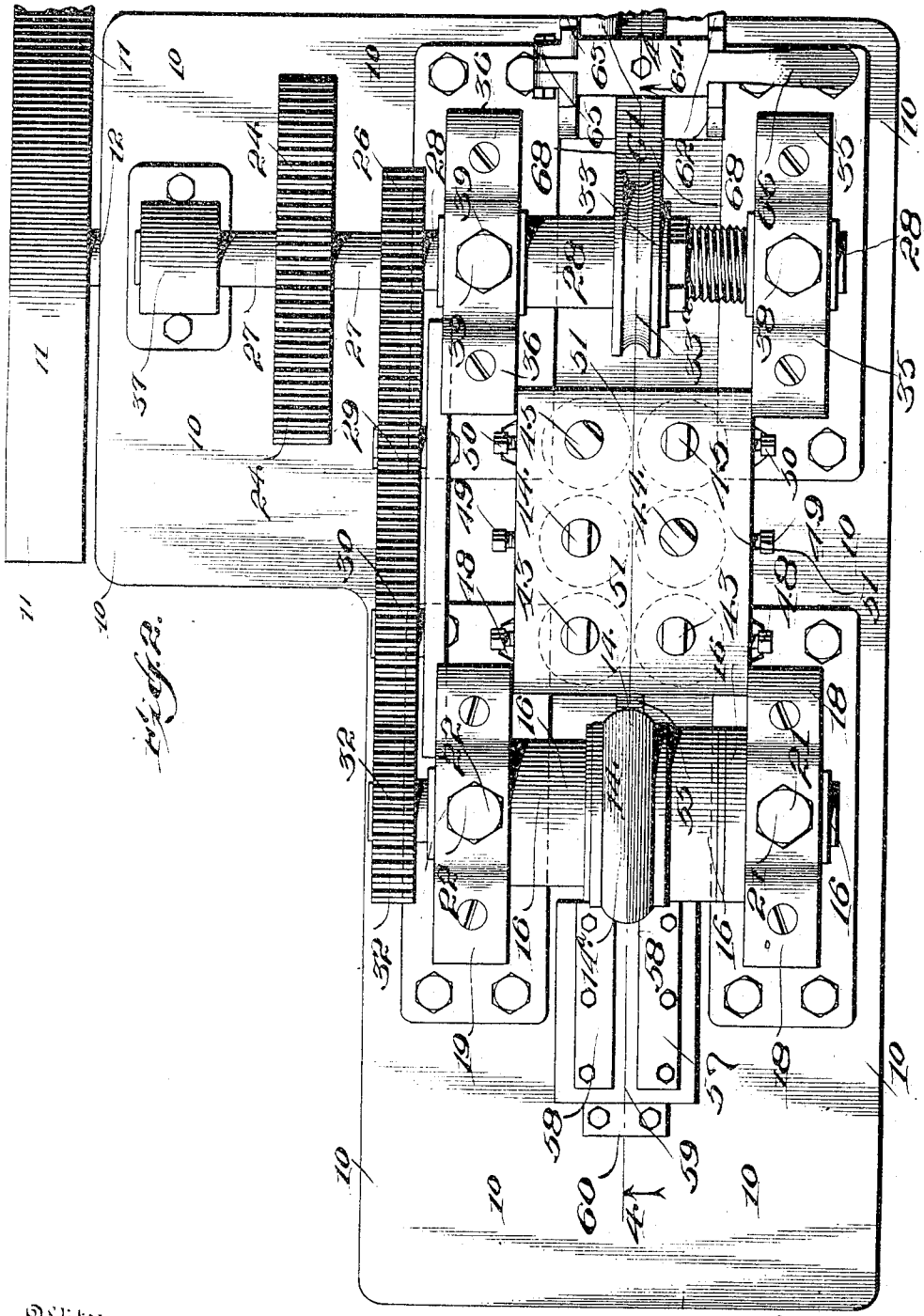
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5 SHEETS—SHEET 2



Witnesses
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No. 819,143.

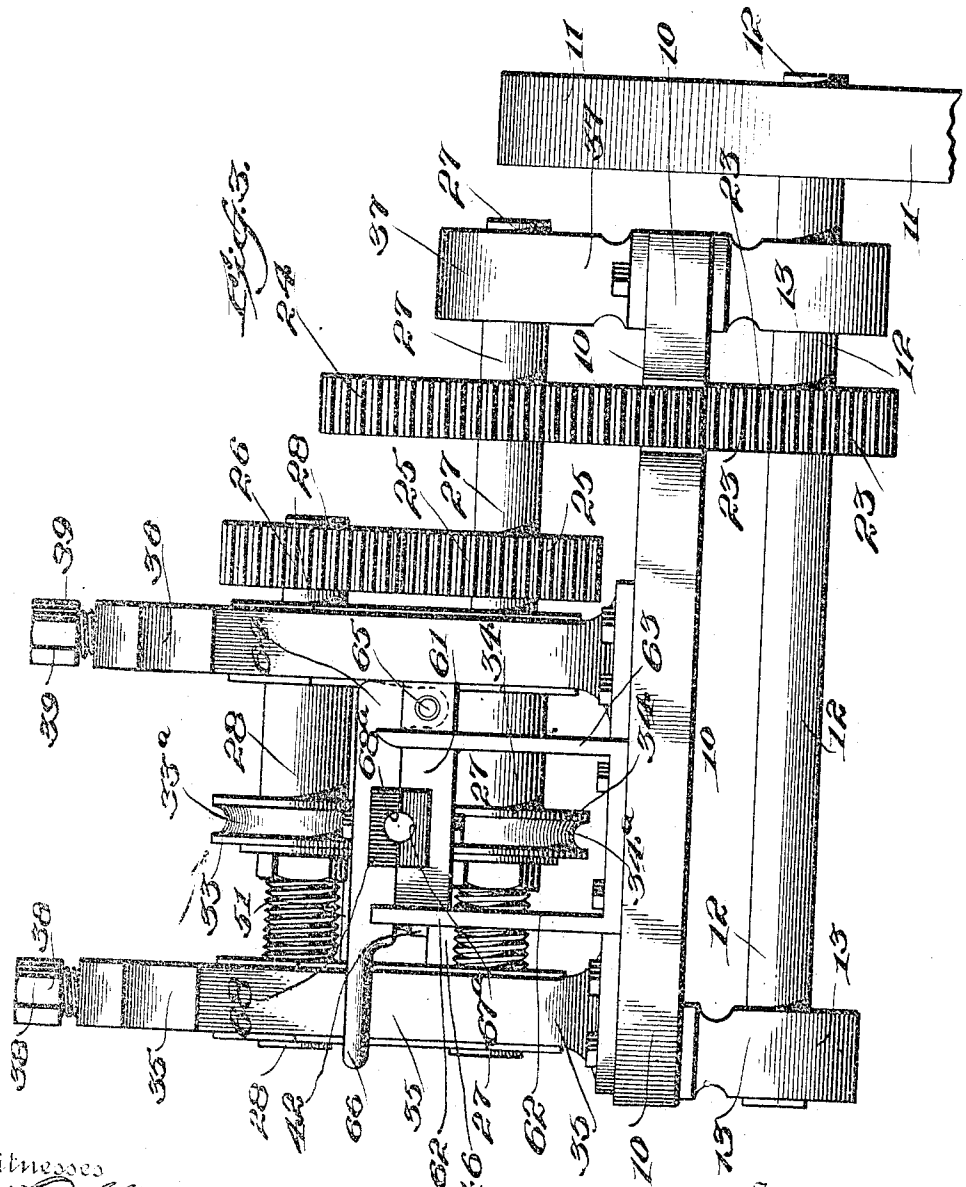
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5 SHEETS—SHEET 3.



Witnesses

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By his Attorney

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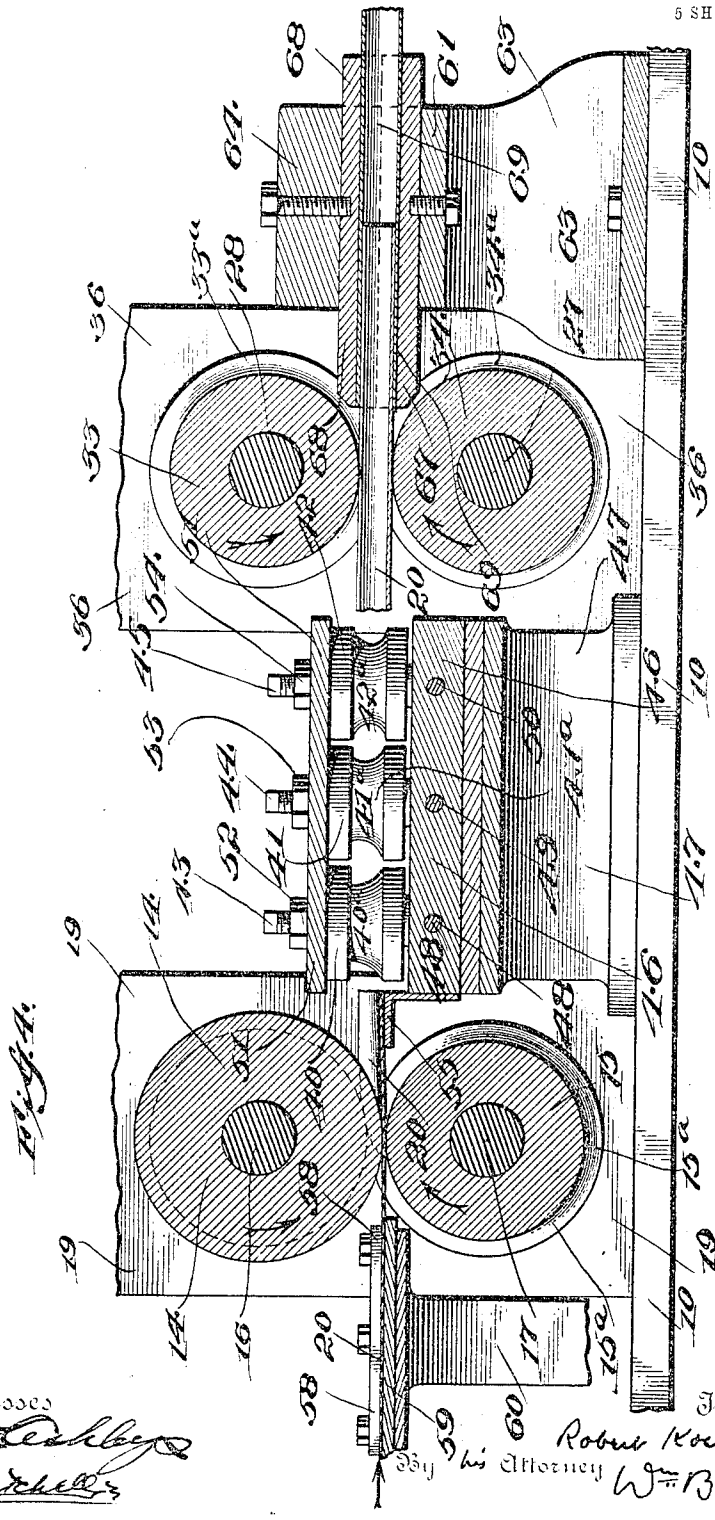
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5 SHEETS—SHEET 4.



Witnesses
[illegible]

Inventor
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No. 819,143

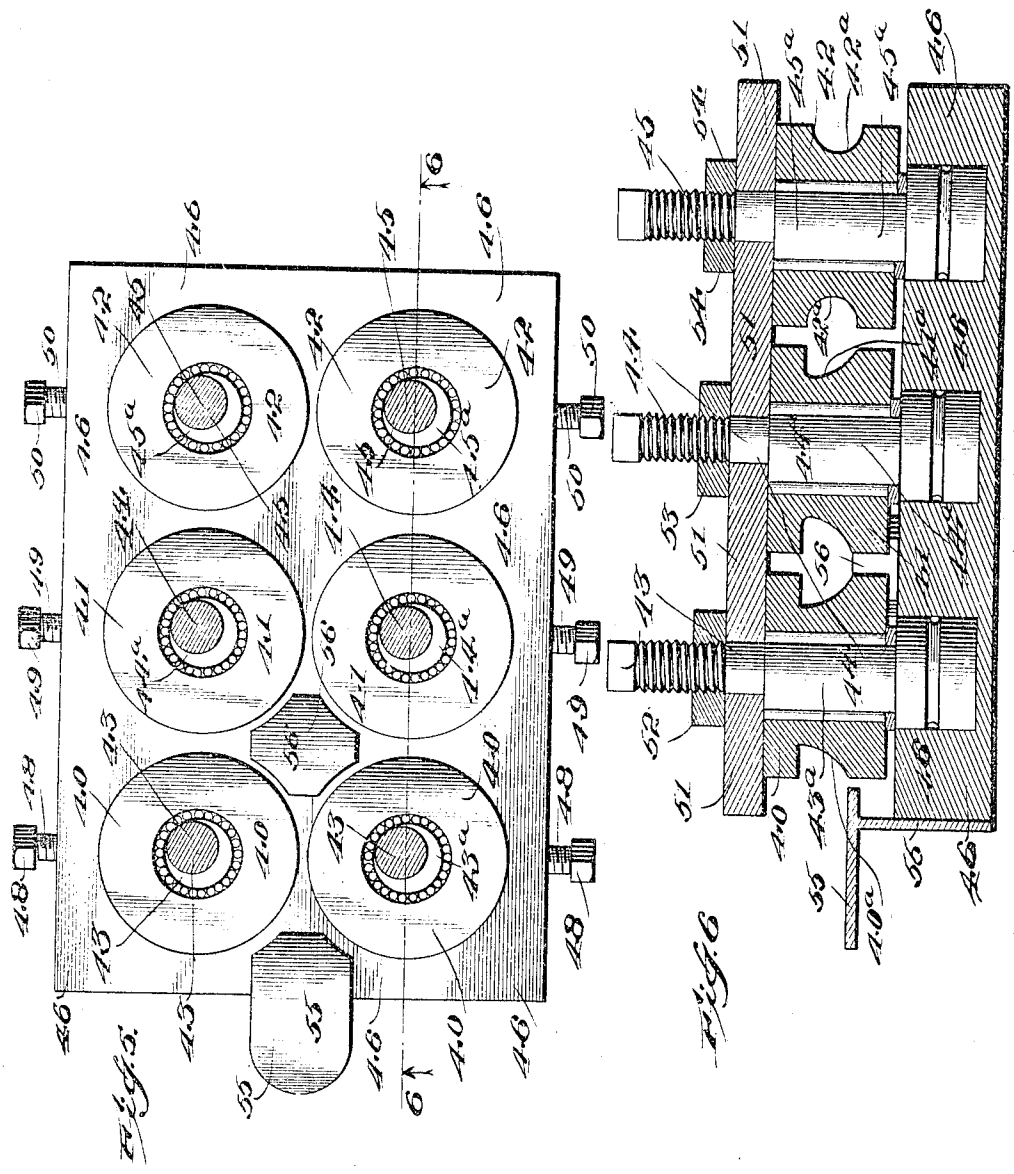
PATENTED MAY 1, 1906.

R. KOENIG.

MACHINE FOR ROLLING TUBES.

APPLICATION FILED JULY 14, 1904.

5 SHEETS—SHEET 5.



Witnesses:

Inventor
Robert Koenig
By his Attorney Wm. B. Whitney

UNITED STATES PATENT OFFICE.

ROBERT KOENIG, OF NEW YORK, N. Y., ASSIGNOR TO THE PHENIX TUBE COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MACHINE FOR ROLLING TUBES.

No. 819,143. Specification of Letters Patent. Patented May 1, 1906.

Application filed July 14, 1904. Serial No. 216,455.

To all whom it may concern:

Be it known that I, ROBERT KOENIG, a citizen of the United States, residing in the borough of Brooklyn, in the city of New York, county of Kings, and State of New York, have invented a new and useful Machine for Rolling Tubes, of which the following is a specification.

My invention relates to a machine for forming tubes from flat material, particularly cold sheet metal, an operation which is ordinarily and so far as I am aware has in a practical commercial way always been performed by drawing a sheet or strip of metal through a drawing-plate upon a draw-bench, a tag which can be readily passed through the hole in the plate and grasped by the tongs having first been formed at one end of the sheet or strip.

The object of the invention is to save the time, labor, and waste involved in the preparation of the sheet of metal for the drawing-plate and to provide a machine which will not only roll tubes from flat material without previous manipulation, but will also, with no greater operating expense, materially increase the output over that obtained by the present draw-bench practice. I attain this object by the mechanism hereinafter fully described, and pointed out in the claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the entire machine; Fig. 2, a plan thereof; Fig. 3, an elevation of the finishing end of the machine; Fig. 4, a longitudinal vertical section on the line 4 4 of Fig. 2; and Fig. 5, a detailed plan, and Fig. 6 a longitudinal vertical section on the line 6 6 of Fig. 5 of a part of the machine.

Similar reference-numerals indicate similar parts throughout the several figures of the drawings.

A table or plate 10, suitably mounted on legs or standards, constitutes the framework of the machine, to which power is supplied to operate the rollers, hereinafter referred to, by means of a belt-pulley 11 on a shaft 12, which is journaled in hangers 13, secured to the under side of the table.

A pair of male and female starting-rollers 14 15 are mounted vertically one above the other on shafts 16 17, respectively, which shafts turn in vertically-sliding journal-boxes in standards 18 19, secured to the upper side and near one end of the table. The upper or male roller rests normally upon and is supported by the lower roller, its convex face 14^a fitting into the corresponding concave face 15^a of the latter; but when in operation a sheet or strip of metal, as 20, is fed between them, the upper roller rises, its upward movement and the pressure with which it bears on the sheet or strip being regulated by set-screws 21 22. These rollers are rotated positively in the direction indicated by the arrows, Figs. 1 and 4, by a gear-train comprising the gear-wheels 23 24 25 29 30 31 32, the two latter being mounted, respectively, on the shaft 17 of the lower roller and shaft 16 of the upper roller, gear 31 (not shown) meshing with gear 30 on one side and with gear 32 immediately above it.

Two finishing-rollers 33 34, each with a groove 33^a 34^a, semicircular in section around its face, are mounted vertically one above the other on shafts 27 28, respectively, which shafts turn in vertically-sliding journal-boxes in standards 35 36, secured to the upper side of the table, shaft 27 having an additional bearing in a third standard 37. The upper roller rests upon and is supported by the lower roller, and their faces are kept in contact by set-screws 38 39. The rollers are rotated in the direction indicated by the arrows, Figs. 1 and 4, the lower roller by the gear-wheels 23 24, the latter mounted on its shaft 27, and the upper roller by a gear-wheel 26 on its shaft 28, which meshes with a gear-wheel 25 on shaft 27.

A series (here shown as three in number) of intermediate grooved rollers 40 41 42, arranged in pairs, revolve freely on antifriction-rollers on vertical shafts 43 44 45, which are set in cylindrical sockets in the upper side of a horizontal bed-plate 46, bolted to a flanged web 47, secured to the upper side of the table and are held therein by set-screws 48 49 50. A top plate 51 provides upper bearings for the vertical shafts and rests upon shoulders thereon, being secured thereto by nuts 52 53 54. That part of each shaft on which the roller revolves (43^a of shaft 43) is eccentric to its main axis, and each roller is thereby made independently adjustable horizontally and can be moved toward or away from its companion and each pair brought into alinement with the starting and finishing roller by turning the shaft around in its bearings, first

loosening the set-screw and nut (48 and 52 in case of shaft 43) and then tightening them to retain the adjustment. The grooves around the faces of each pair of intermediate rollers are alike; but those of each pair differ from those of the other pairs, the series being so designed and arranged as to take the sheet or strip of material as it comes from the starting-rollers and roll it progressively into the substantially tubular form in which it is received by the finisning-rollers. The groove 40^a of the first pair of rollers 40 has a plane upper side and a lower side and bottom formed by a tapering concave surface which intersects the plane upper side at an angle. Rollers 41 of the second pair have a groove 41^a, similar to that of the first pair, except that its tapering surface is somewhat more concave and connects with the upper plane surface by a comparatively sharp outward curve. The groove 42^a of the final pair of these rollers 42 is approximately semicircular in section and a little larger in size than the groove of the finishing-rollers. By thus shaping the peripheral grooves of these intermediate rollers the upper sides of the grooves serve to press the central portion of the sheet or strip of material down against and to conform it to the curvature of the lower sides of the grooves, and I am thereby enabled to do away with the guides, spindles, or other mandrels heretofore found necessary in machines of this class.

A plate 55, attached to the bed-plate 46, affords a support for the material as it is fed from the starting-rollers to the first pair of intermediate rollers, and a second plate 56 serves a similar purpose between the first and second pairs of intermediate rollers. Parallel guide-strips 57, 58, bolted to a plate 59, which is mounted on a flanged web 60, form a guideway in which the material is fed to the machine.

The operation of the machine, as hereinabove described, is as follows: A sheet or strip of flat material is started through the guideway to the starting-rollers, which draw it in, curve it along its longitudinal center, and feed it through the intermediate and to the finishing rollers. The first pair of intermediate rollers turns up the sides and further curves the center of the sheet or strip, while the next pair turns in its edges and at the same time maintains the central curve, and the last pair curves its sides and brings its edges nearly together. The finishing-rollers then seize the substantially tubular strip, bring its sides together to close the tube, and feed it out of the machine.

In many cases one tube is fitted in and used as a lining for an outer tube or shell—as, for example, in the manufacture of iron-lined brass tubing—and in order to avoid a separate operation for the insertion of one tube within another, an operation heretofore performed by hand, I provide an attachment for my machine by means of which the end of an outer tube, previously formed, is held close to and in alinement with the opening formed by the grooves of the finishing-rollers, so that the lining-tube as it is rolled up in the machine can be fed directly from the finishing-rollers into the outer tube. This attachment consists of two clamping members, a lower member 61, which is supported horizontally upon two standards 62 63, secured to the upper side of the table behind the finishing-rollers, and an upper member or lever 64, which is hinged to the lower member at one end, as at 65, and is provided with a handle 66 at its other end. Clamping-blocks 67 68, each having a longitudinal groove 67^a 68^a of semicircular section in its contact-face, are set transversely into and secured to the inner sides of the clamping members respectively, and when the clamping members are brought together these grooves form a cylindrical opening in alinement with the opening between the grooved finishing-rollers, in which the end of an outer tube 69 may be placed and held, as shown in Fig. 4. When not required for use, this attachment may be removed entirely, or the lever may simply be thrown back and the face-block taken out of the lower clamping member, if necessary.

While I have described a machine adapted to rolling tubes of circular cross-section, I wish it understood that I do not limit myself thereto, since it is obvious that by changing the form of the grooves of the finishing-rollers and perhaps one or more pairs of intermediate rollers tubes having an elliptical or other shaped section may be made equally as well, and other modifications may be made both in the construction of the machine and in the arrangement of its parts without departing from the spirit of my invention or losing the advantages to be obtained therefrom.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for rolling tubes, the combination of starting and finishing rollers and one or more pairs of intermediate rollers, to feed a sheet or strip of material and roll it progressively from a flat to a tubular shape, said intermediate rollers being placed horizontally and provided with peripheral grooves so shaped that the upper sides of said grooves will press the central portion of the sheet or strip of material down against and conform it to the shape of the lower sides of said grooves.

2. In a machine for rolling tubes, the combination of a pair of starting-rollers, a pair of finishing-rollers, and one or more pairs of horizontal intermediate rollers, said intermediate rollers having peripheral grooves so shaped that their upper sides will press the sheet or strip of material down against and

conform it to the shape of their lower sides, and means for positively rotating one or more of said pairs of rollers to feed the sheet or strip of material through the machine.

3. In a machine for rolling tubes, the combination of positively-rotated starting and finishing rollers, and one or more pairs of loose horizontal intermediate rollers provided with peripheral grooves so shaped that their upper sides will cause a sheet or strip of material to press down against and conform to the shape of their lower sides.

4. In a machine for rolling flat sheets or strips of material into tubes, the combination of male and female starting-rollers, grooved finishing-rollers, and a plurality of sets of horizontal intermediate grooved rollers the grooves of each set differing in shape from those of each other set and so shaped and arranged that the upper sides of the grooves will cause the sheet or strip of material to conform to the shape of their lower sides and thereby progressively advance the curvature of the sheet or strip from the preliminary shaping given it by the starting-rollers to approximately the finished shape which it receives in passing through the finishing-rollers, and means for feeding the sheet or strip through said rollers.

In testimony whereof I have hereunto signed my name in the presence of two witnesses.

ROBERT KOENIG.

Witnesses:

ALBERT CONNELLY,

WILLIAM H. CROW.