(No Model.) 3 Sheets—Sheet 1.

H. A. WILLIAMS.

MACHINE FOR COLD ROLLING WIRE.

No. 381,311. Patented Apr. 17, 1888.

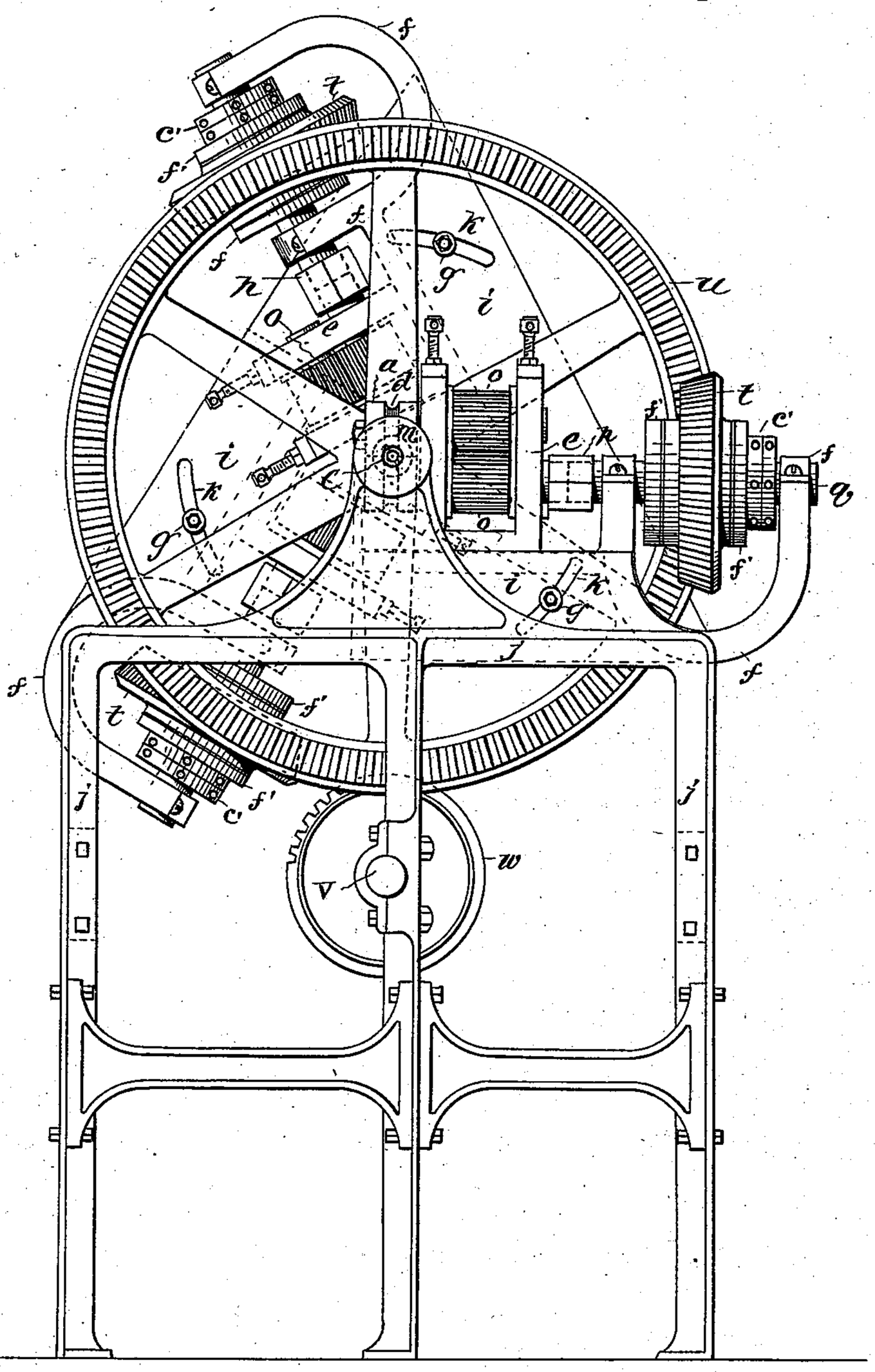

Fig. 1.

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H. A. WILLIAMS.

MACHINE FOR COLD ROLLING WIRE.

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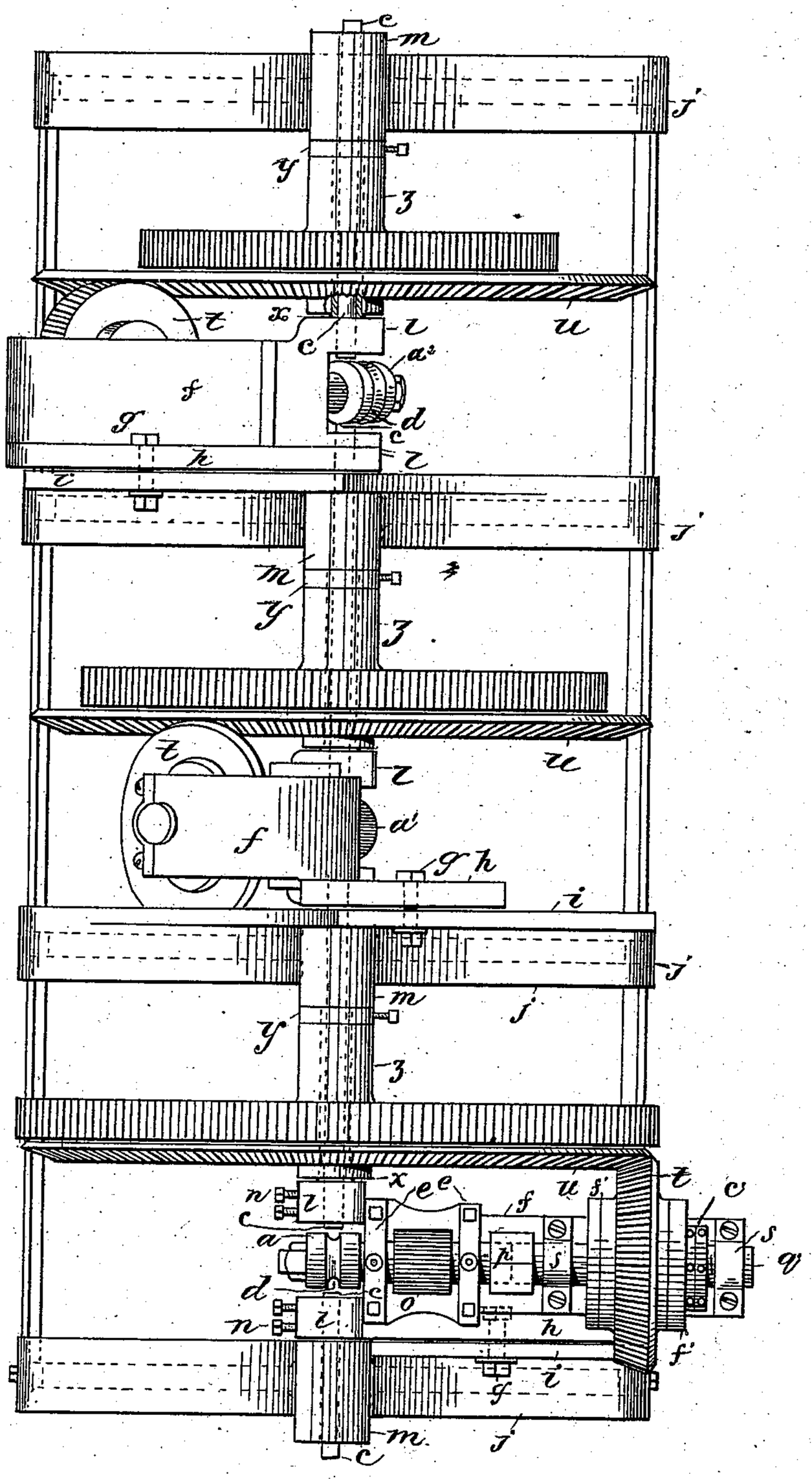

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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MACHINE FOR COLD ROLLING WIRE.

No. 381,311. Patented Apr. 17, 1888.

Fig. 3.

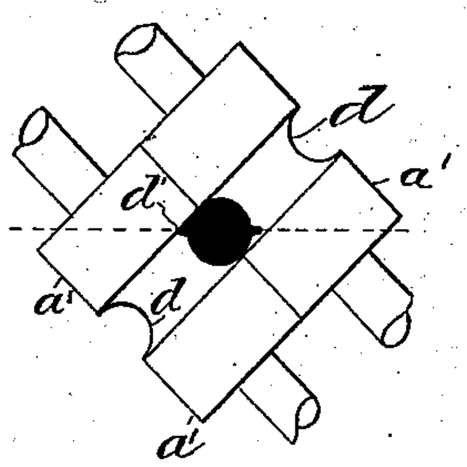


Fig. 4.

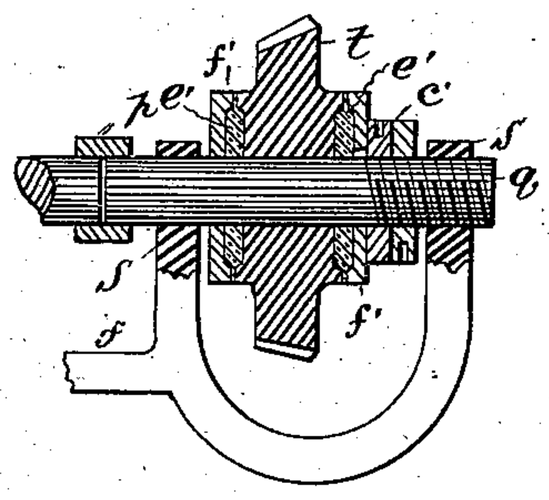
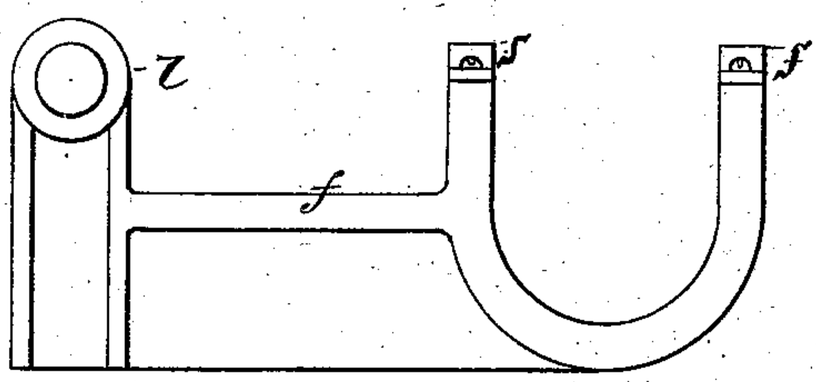


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY ALEXIS WILLIAMS, OF TAUNTON, MASSACHUSETTS.

MACHINE FOR COLD-ROLLING WIRE.

SPECIFICATION forming part of Letters Patent No. 381,311, dated April 17, 1888.

Application filed June 30, 1887. Serial No. 242,923. (No model.)

To all whom it may concern:

Be it known that I, HENRY ALEXIS WILLIAMS, a citizen of the United States, residing at Taunton, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Machines for Cold-Rolling Wire; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists of improvements in continuous train-rolls adapted for reducing wire cold, so as to make wire of different gages more effectively and economically than as heretofore made, and without annealing, reference being made to the accompanying drawings, in which—

Figure 1 is an end elevation of my improved machine. Fig. 2 is a plan view. Fig. 3 is a detail illustrating the operation of the rolls. Fig. 4 is a detail in section, showing a friction device in the driving-gear of the rolls; and Fig. 5 is a side elevation of one of the roll-supporting bed-plates.

In this example I have represented three pairs of rolls in a series forming a continuous train in one line; but it is to be understood that any preferred number may be used according to the number of reductions it may be necessary to make in reducing wire rods to the desired thickness of the wire to be made.

The several pairs of rolls, as a a' a^2, are arranged in different angles about a common axis, in which a guideway, consisting of hollow steel tubes c, is provided, so that the scores or grooves d, forming the passes of the rolls, coincide with the guideway, and the rolls are adjustable in a circle around the guideway for varying the angles thereto, and also varying the angles of the different pairs relatively to each other, the object of which will be shown farther on.

The rolls are mounted in housings e, supported on bed-plates f, pivoted at one end in the axis of the guideway for the wire, and otherwise supported by clamp-bolts g, by which they are clamped through a flange, h, to a face-plate, i, of the main frame j, in which there is a curved slot, k, allowing the roll-supporting beds to be shifted for the circumferential adjustment before referred to. Various other adjustable supporting devices may be employed instead of this clamping device, if desired. The bed-plates are mounted at the pivoted end on the steel guide-tubes c by the strong ear-lugs l, which tubes are securely fitted in the bearing-heads m of the main frame j and in said ear-lugs with binding-screws n. The rolls of each pair are geared together by toothed wheels o in the usual manner, and one roll is coupled at p with a driving-shaft, q, carried in bearings s on the bed-plate f and geared by a bevel-wheel, t, with a large compound bevel and spur driver, u, which revolves around the guideway for the wire and is geared with the main driving-shaft v by a smaller spur-wheel, w, all the rolls being similarly geared to this shaft with suitable variations in the sizes of the wheels w and the spur portions of the compound wheels u to increase the speed of the rolls successively as the speed of the wire increases by elongation.

The bevel spur-wheels u are mounted between the roll-bed and the next bearing-head m of the frame on a long trunnion-sleeve, x, of the roll-bed, supported by the steel tube c and carrying a collar, y, to be set up against the hub z of the wheel u to resist the thrust of the bevel-wheels t u.

In consequence of the great difficulty in practically varying the speeds of the rolls in the same measure as the movements of the wires vary by elongation, and so that the loops of slack between the pairs of rolls in the one case and the overtension in the other case may be avoided, I arrange a friction device in the connection between the wheels t and shafts q, enabling the shafts to shift therein and allow the rolls to be held back by the overtension and run a little slower than wheels t, said wheels being geared up to or slightly greater than the maximum speed of the wires, thus enabling the wires to run in a straight guideway, and also enabling the rolls to be located closer together than where provision must be made between the pairs of rolls for loops of slack.

The friction device consists of washers e', of rawhide, placed between collars f' and the hubs of the wheels t, with check-nuts c' screwing on

the shaft to regulate the friction, the wheel being fitted so as to turn loosely on the shaft, and one of the collars being permanently secured to the shaft and the other so as to slide but not turn thereon. Other arrangements of friction devices may be employed. One of the principal difficulties of making round wire in the continuous rolling process with rolls successively located in different angles consists in the local wear in the grooves made by the fins produced in the preceding rolls, which, if confined to one locality of the grooves, soon wears them thereat more than in the rest of the grooves, owing to the greater labor of reducing the metal at the fins than elsewhere.

It is to shift the rolls about to change the localities of the excessive wear by the fins, so as to distribute the same over the surfaces of the grooves, that I have arranged the roll-beds for circumferential adjustment, as before described. For illustration see Fig. 3, in which it will be seen that the fins *d'* in the plane of those made by the first pair of rolls will be brought in contact with different localities of the grooves of the next pair of rolls, according as the rolls are set in different angles.

With this improved machine, which, it will be seen, is very compact, simple in construction, and adapted for economy in wearing parts and driving-power, the practical manufacture of small bright round, square, hexagon, or octagon cold-rolled wire may be successfully carried out in competition with the drawing process, with the advantage of a product of practically uniform density throughout the thickness of the wire, whereas drawn wire has an exterior shell of much greater density and consequently very different tensile strength than the core.

Steel wire is drawn at a speed of about one hundred feet per minute and iron wire about three hundred feet per minute. I can roll at least six hundred feet per minute of any metal which makes it practicable to reduce wire from, say, three-eighths to one sixty-fourth without annealing, while drawn wire must be annealed after drawing from two to three numbers or sizes, (commonly called "gages.")

The more equal flow of the metal, resulting from the quicker work and avoidance of the changes of cooling and annealing, makes the density uniform, or practically so, from surface to center, and the tensile strength correspondingly greater.

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

1. The combination of a series of pairs of rolls arranged in different angles about a common axis and being adjustable circumferentially thereto, and a guideway in said axis for conducting the wire from one pair to another of said rolls, substantially as described.

2. The combination of a series of pairs of rolls arranged in different angles about a common axis and being adjustable circumferentially thereto, and a guideway in said axis consisting of hollow guide-tubes, substantially as described.

3. The combination of a series of pairs of rolls arranged in different angles about a common axis and being adjustable circumferentially thereto, and a guideway in said axis consisting of hollow guide-tubes, which are also the pivot-supports of the roller-beds, said tubes being supported in the main frame, substantially as described.

4. In a wire-rolling mill, a series of pairs of rolls arranged in a continuous train and successively geared with a common driver, so that each pair shall have a greater speed of rotation than the one that precedes it, and each pair separately geared to said driver, with an intervening friction-clutch adapted to shift and graduate the speed of the rolls to the speed of the wire, substantially as described.

5. The combination, with the series of pairs of wire-reducing rolls arranged in different angles about a common axis, of a driving-wheel, *u*, geared with each pair and mounted on a sleeve concentric with said axis and also geared with pinions on the common driving-shaft, substantially as described.

6. The roller-bed frames pivoted on the guide-tubes supported in the main frame and having a trunnion-sleeve, *x*, forming the bearing of the driving-wheel *u*, substantially as described.

7. In a wire-rolling mill having a series of pairs of rolls adjustably arranged in different angles about a common axis, the roll-bed frames pivoted in said axis and having a clamping-flange, *h*, in combination with a slotted clamping-flange, *i*, of the main frame and a clamping-bolt, *g*, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY ALEXIS WILLIAMS.

Witnesses:
ELISHA T. JACKSON,
BENJ. L. WOOD.