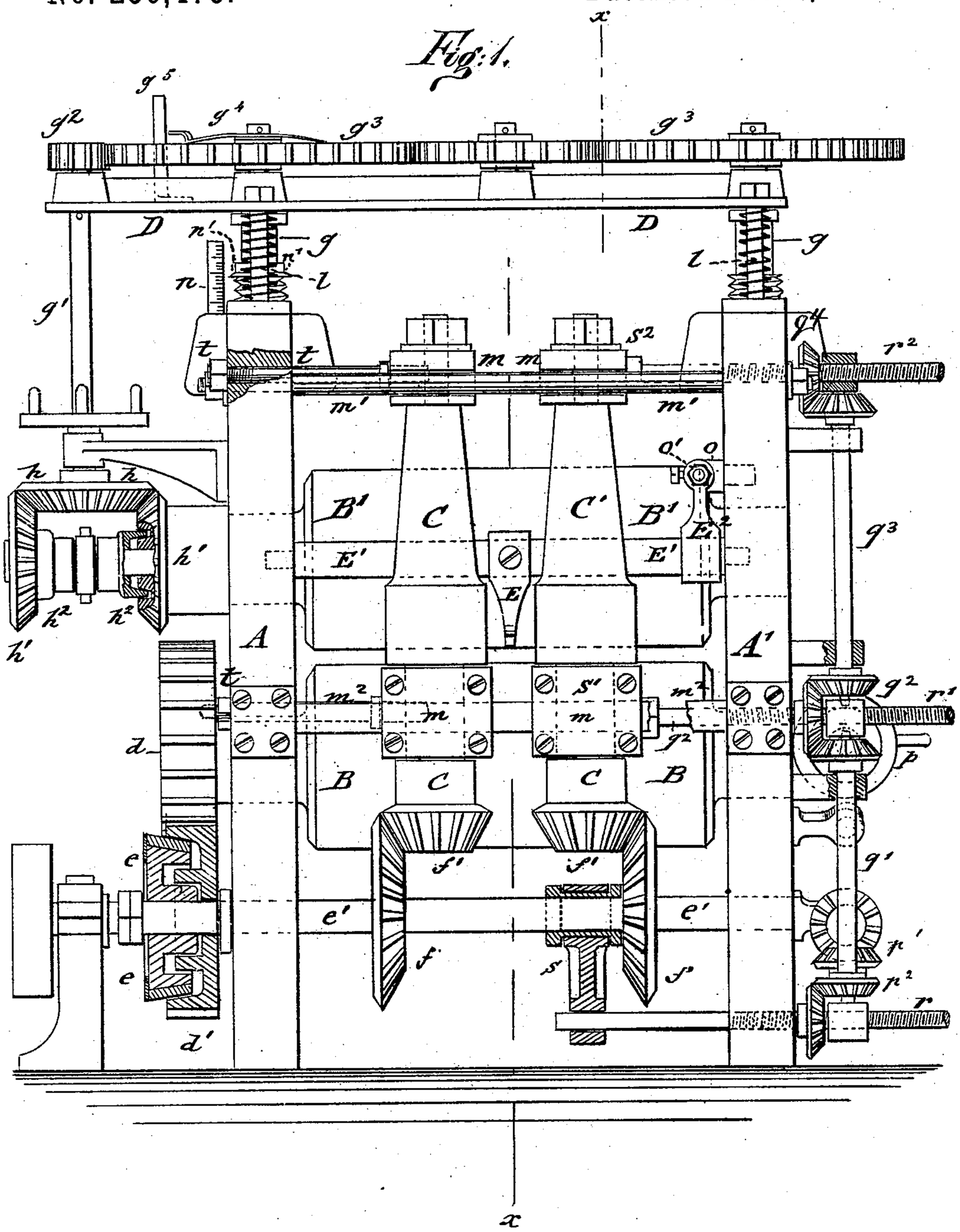
(No Model.) 3 Sheets—Sheet 1.

E. VON ZWEIGBERGK.

ROLLING MILL.

No. 250,473. Patented Dec. 6, 1881.

Fig: 1.



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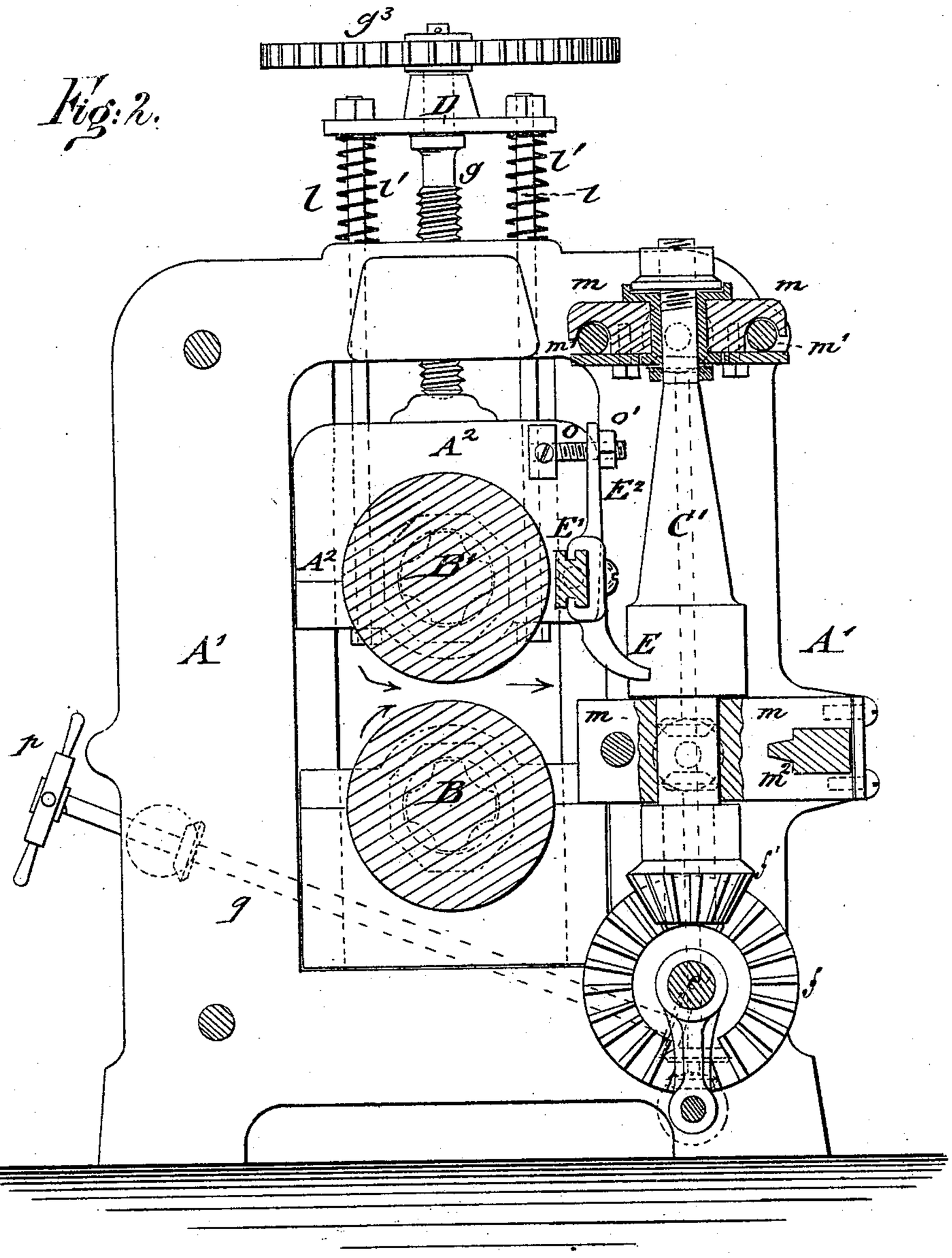
(No Model.) 3 Sheets—Sheet 2.

E. VON ZWEIGBERGK.

ROLLING MILL.

No. 250,473. Patented Dec. 6, 1881.

Fig: 2.



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(No Model.) 3 Sheets—Sheet 3.

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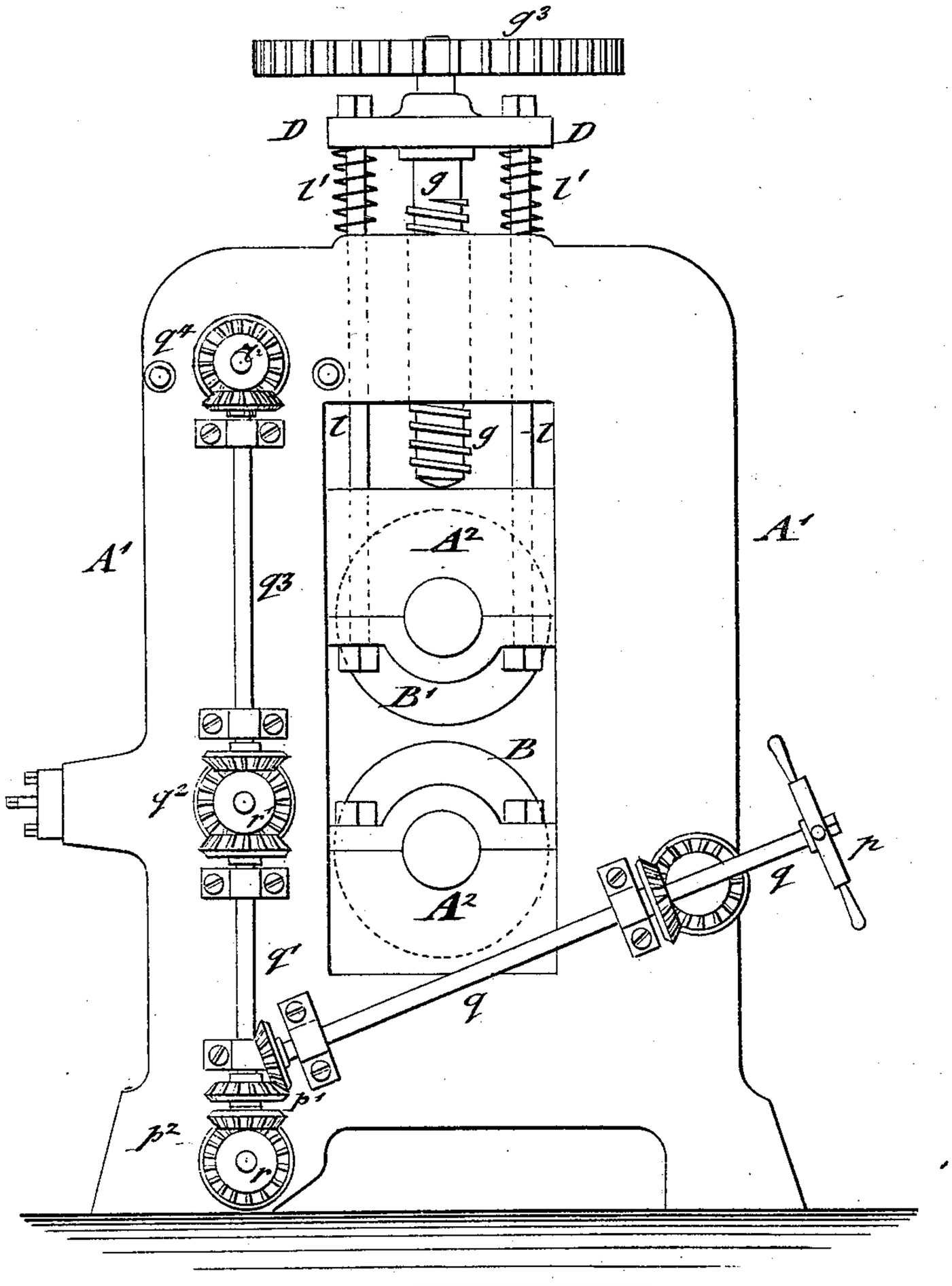
Fig: 3.



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UNITED STATES PATENT OFFICE.

ERNST VON ZWEIGBERGK, OF STOCKHOLM, SWEDEN.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 250,473, dated December 6, 1881.

Application filed June 30, 1880. (No model.) Patented in Belgium May 13, 1880.

To all whom it may concern:

Be it known that I, ERNST VON ZWEIGBERGK, of Stockholm, in the Kingdom of Sweden, have invented certain new and useful Improvements in Rolling-Mills; 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.

This invention has reference to an improved rolling-mill, by which the iron is rolled with perfectly sharp edges to any desired thickness and width, at a considerable saving of time, and by means of simple adjusting mechanism.

The invention consists of a rolling-mill in which two horizontal main rollers, one of which is fixed, the other vertically adjustable, are employed in connection with two vertical rolls and mechanism for adjusting them laterally to the required width. The upper horizontal roll is raised or lowered, together with its bearings, in the supporting-standards by means of adjusting screw-bolts and transmitting-gearing, the lower half of the bearings being hung to suspension-rods and balanced by intermediate spiral springs. The vertical rolls are guided by cross-heads in fixed transverse rails and adjusted laterally by suitable mechanism. To the bearings of the upper horizontal roll is pivoted a transverse rail, which carries a laterally-adjustable guide-heel, that is set higher or lower with its guide-rail by a lever and set-screw, so as to bear on the iron bar and prevent the twisting of the same after it has left the rolls.

In the accompanying drawings, which fully represent my invention, Figure 1 represents a front elevation of my improved rolling-mill, partly in section. Fig. 2 is a vertical transverse section on line *x x*, Fig. 1; and Fig. 3 is a side elevation of the same, showing the mechanism for adjusting the feed-screws of the vertical guide-rolls.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A A′ represent the iron supporting-standards of my improved rolling-mill. The standards A A′ support a pair of horizontal rolls, B B′, and a pair of vertical rolls, C C′, in front of the same. The horizontal rolls B B′ receive rotary motion in the usual manner in rolling-mills, whereas the vertical rolls C C′ receive their motion from two sets of bevel-wheels, *f f′*, and a transverse shaft, *e′*, which is revolved by means of gear-wheels *d d′* and a clutch, *e*, as appears clearly in Fig. 1. The rolls B B′ determine the thickness and the vertical rolls C C′ the width of the iron bar or plate to be rolled. The lower horizontal roll, B, revolves in fixed bearings, while the upper roll, B′, can be raised or lowered by mechanism connected to its journal-bearings A^2, which are for this purpose guided in rectangular openings of the standards A A′. The upper sections of the adjustable bearings of the roll B′ are acted upon by vertical center screws, *g*, the upper smooth ends of which turn in bearings of a transverse top rail, D. The center screws of both journal-bearings A^2 receive motion from a vertical shaft, *g′*, pinion g^2, and intermediate gearing, g^3. The shaft *g′* carries at its lower end a conical gear-wheel, *h*, which is thrown in or out of gear with two beveled wheels, *h′*, on the shaft of the upper roll, B′, by means of a double friction-clutch, h^2, so that when the clutch is pushed into gear with either one of the beveled wheels *h′* the vertical transmitting-shaft is turned in one direction or the other, and thereby a corresponding motion imparted to the adjusting center screws, *g*, by which the upper sections of the journal-bearings A^2 are raised or lowered with the roll B′, as required. This is accomplished by confining the top rail, D, between collars on the feed-screws, by which the rail is compelled to move up and down therewith. The screws *g* press upon the upper bearings of the roll B′ and force the same downward. When they are turned in reverse direction the roll is raised by virtue of the connection of the rods *l* with the lower sections of the bearings of the roll and the top rail. The lower sections of the journal-bearings A^2 are hung to the lower ends of vertical screw-rods *l*, which are connected at their upper ends to the top rail, D, of the machine, so as to cause the lower sections to follow the motion of the upper sections of the bearings. Spiral springs *l′* are placed around the supporting-rods *l*, between the top of the standards A A′ and the top rail, D, which springs facilitate the upward motion of the rail D when the screws *l* are turned in reverse di-

rection, the springs taking thereby the place of the weights heretofore in use for this purpose.

The vertical rolls C C′ turn in cross-heads *m*, of which the upper cross-heads are guided by end grooves in fixed transverse guide-bars *m′*, while the lower cross-heads are guided on a square or oblong guide-rail, m^2. Of the vertical rolls C C′, one only requires adjustment, the other roll being, therefore, connected to one of the side standards by means of screw rods and nuts *t*, as shown in Fig. 1. The second roll, C′, however, requires frequent adjustment to the different widths of the iron to be rolled. It is for this purpose adjusted laterally by an adjusting-gear, which consists of a hand-wheel, *p*, arranged at the upper end of an inclined connecting-shaft, *q*, the lower end of which sets by a bevel-gear, *p′*, a vertical shaft, *q′*, and by a second double conical gearing, q^2, a second vertical shaft, q^3, in motion. By a bevel-gearing, p^2, below the bevel-gear *p′*, a horizontal screw-rod, *r*, by the intermediate bevel-wheel of the gearing q^2 a second horizontal screw-rod, *r′*, and by a bevel-gearing, q^4, of the upper shaft, q^3, a third horizontal screw-rod, r^2, are set in motion. The horizontal screws *r r′* r^2 are connected to the journal-bearings *s s′* s^2 of the vertical roll C′, and impart lateral motion to the same and its cross-heads and revolving gear whenever the adjusting hand-wheel *p* is set in motion.

In order to regulate the exact adjustment of the upper horizontal roll, B′, a graduated scale, *n*, is arranged at the upper parts of one of the side standards, near to the center screw, *g*, on which, in conjunction with a fixed projecting index, *n′*, of the center screw, *g*, the exact figures are indicated to which the upper roll has to be set for producing a proper grade of iron. The left-hand screw *g* is provided with a fixed pointer, g^4, which rotates therewith, and indicates, in connection with a vertical arm, g^5, of the top rail, D, the relative position of the gear-wheel g^3, and consequently the number of revolutions required to produce a certain thickness of iron, in conjunction with the scale *n* and index *n′*.

For the purpose of preventing the twisting of the iron bar after it has left the rolls B B′, a guide-heel, E, is arranged intermediately between the vertical rolls C C′, the guide-heel E being applied to a transverse guide-rail, E′, which is pivoted to the bearings A^2 of the upper adjustable roll, B′. The guide-heel E is capable of lateral adjustment on the transverse guide-rail E′, which is for this purpose grooved at its top and bottom, so as to receive and guide the heel E by the tongue-shaped projections. After adjustment the upper part of the heel is rigidly secured to the guide-rail by a clamp-screw. A fixed lever-arm, E^2, at one end of the guide-rail E′, works in connection with a swiveled rod, *o*, and nut *o′*, for the purpose of axially turning the guide-rail E′, and setting thereby the heel E higher or lower, so as to bear on the iron bar as it leaves the rolls, and prevent any change in its shape by the twisting of the iron. The horizontal as well as the vertical rolls are thus capable of quick adjustment to the proper size of the iron to be rolled, either during the motion of the rolls or before they are started. They are thereby adapted to turn out bar-iron of any desired size in a smooth and finished manner, without the use of grooved rolls and with sharp edges, at a considerable saving of time.

I am aware that vertical rolls which are capable of lateral adjustment have been used in connection with horizontal rolls in rolling-mills, and I therefore do not claim this feature.

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

1. The combination, with the upper horizontal roll, B′, mounted in adjustable bearings, of the screws *g*, top rail, D, rods *l*, spiral springs *l′*, gearing g^3 g^2, shaft *g′*, gears *h h′*, double clutch h^2, splined to journal of rolls B′, and the lever for operating said clutch, substantially as set forth.

2. The combination, with the upper horizontal roll, B′, mounted in adjustable bearings, of top rail, D, gearing g^3 g^2, pointer g^4, vertical arm g^5, attached to top rail, D, screws *g*, shaft *g′*, gears *h h′*, and double clutch h^2, as specified.

3. The combination, with rolls C C′, bearings *s s′* s^2, rolls B B′, and gears *f f′*, of the screws *r r′* r^2, shafts *q′* q^3, double gearing q^2, gears q^4 p^2 *p′*, shaft *q*, and hand-wheel *p*, as described.

4. The combination, with the rolls C C′, the bearings *s s′* s^2, screws *r r′* r^2, shafts *q′* q^3, double gearing q^2, gears q^4 p^2 *p′*, shaft *q*, and hand-wheel *p*, of the stop-screws of roll C, substantially as set forth.

5. In a rolling-mill, the combination of the horizontal rolls B B′ and the vertical rolls C C′ with a pivoted transverse guide-rail, E′, carrying the guide-heel E, and with mechanism for laterally and vertically adjusting the guide-heel, substantially as described.

6. In a rolling-mill, the combination of a laterally-adjustable guide-heel, E, with a transverse guide-rail, E′, which is pivoted to the journal-bearings of the upper horizontal roll, and provided with a fixed lever-arm, E^2, and adjusting swivel-screw and nut *o o′*, for the purpose of raising or lowering the heel, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 8th day of May, 1880.

ERNST VON ZWEIGBERGK.

Witnesses:
OSKAR A. NUELL,
GUSTAF ADAM WIMAN.