

(No Model.)

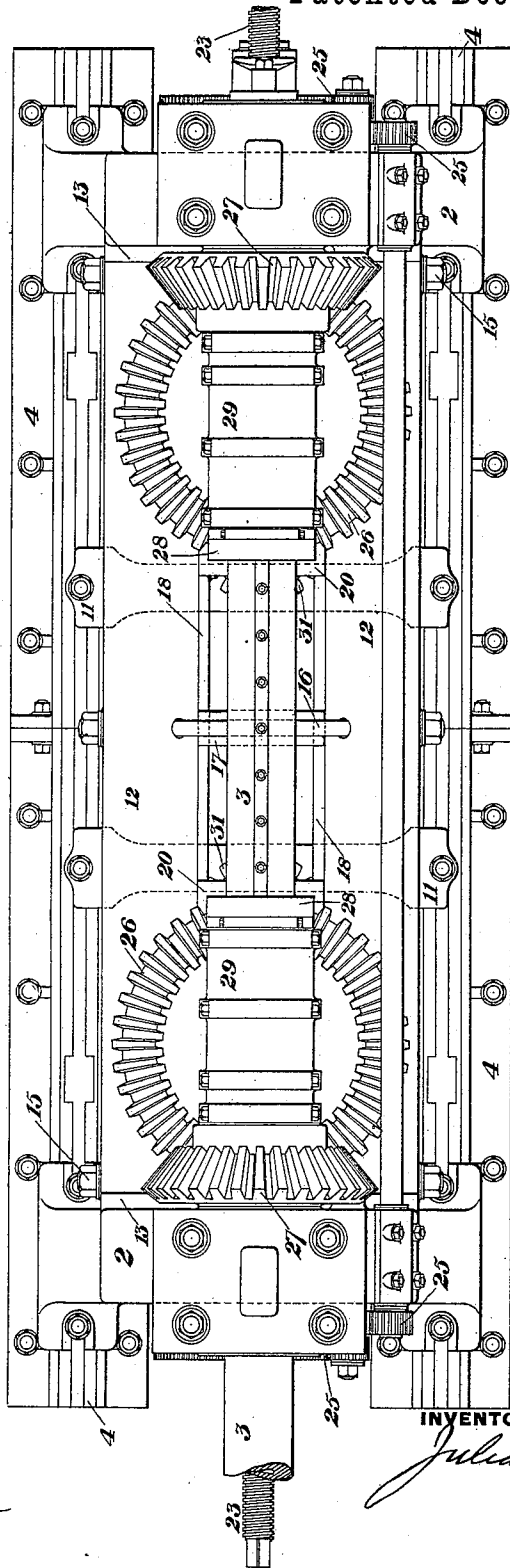
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J. KENNEDY.
ROLLING MILL.

No. 466,051

Patented Dec. 29, 1891.

Fig. 1.



WITNESSES

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(No Model.)

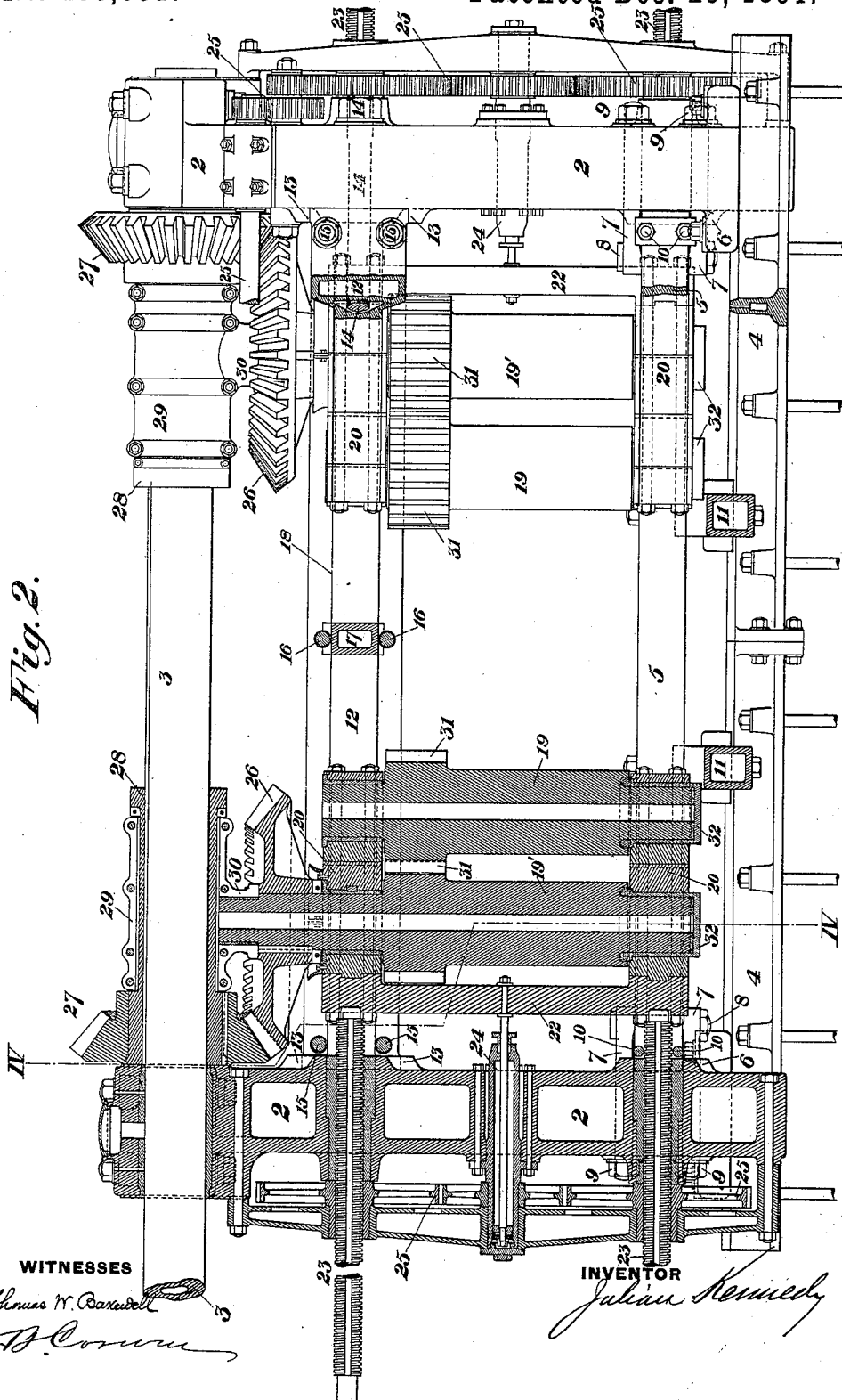
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Fig. 2.



WITNESSES

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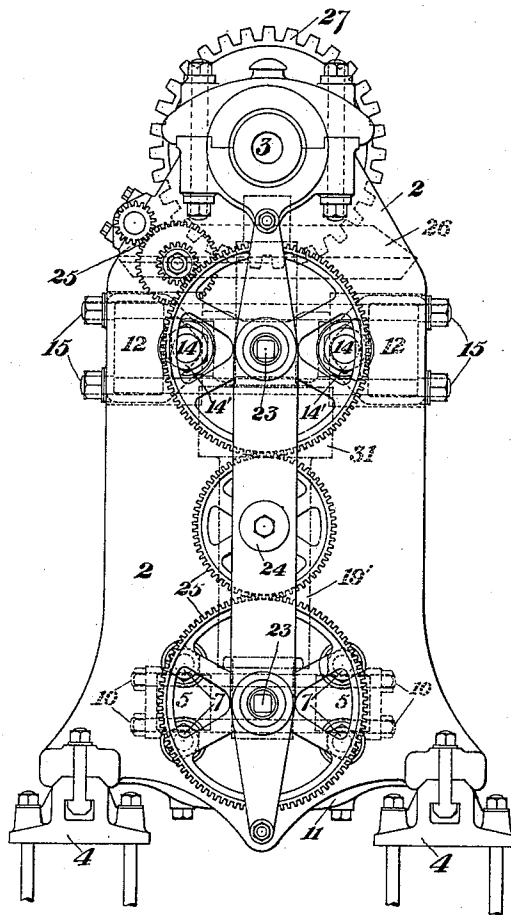
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Fig. 3.



WITNESSES

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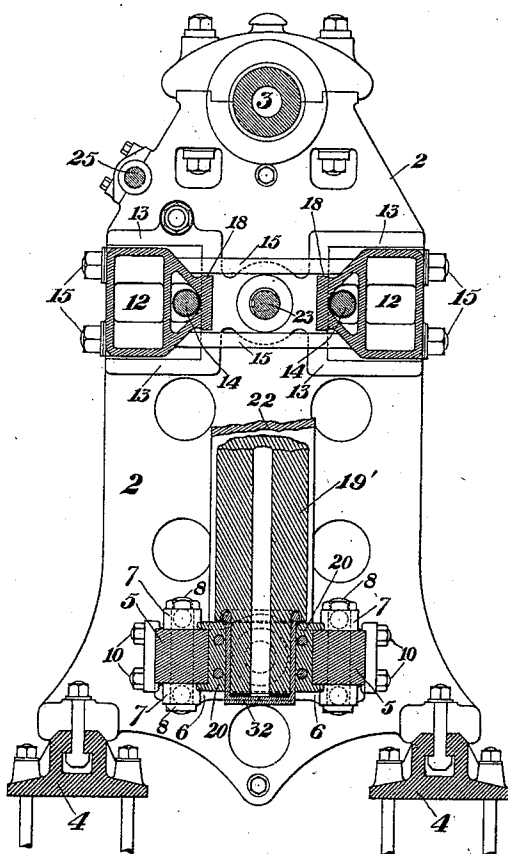
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Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

JULIAN KENNEDY, OF PITTSBURG, PENNSYLVANIA.

ROLLING-MILL.

SPECIFICATION forming part of Letters Patent No. 466,051, dated December 29, 1891.

Application filed July 30, 1891. Serial No. 401,141. (No model.)

To all whom it may concern:

Be it known that I, JULIAN KENNEDY, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rolling-Mills, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, in which—

Figure 1 is a plan view of my improved rolling-mill. Fig. 2 is a side elevation thereof, partly in vertical central section. Fig. 3 is an end elevation, and Fig. 4 is a vertical section on the line IV IV of Fig. 2.

Like symbols of reference indicate like parts in each.

My invention has for its object to improve the construction of upright rolls of a universal rolling-mill and to provide mechanism of great strength and compactness, easy to set and to maintain in working order, and more effective in operation than other rolls heretofore known.

In the drawings, 2 2 represent the housings or end frames within which the rolls are set and which are secured at their bases to foundation-shoes 4, and 3 is the main driving-shaft, journaled in suitable bearings therein. The bearings of the rolls are confined and guided in their adjustment by parallel upper and lower guide-bars arranged between the housings. The lower guide-bars 5, which are or may be square in cross-section, rest upon seats or shoulders 6, formed on the inner opposite sides of the housings and are held thereto by link-bolts 7, whose inner ends have eyes or links fitting upon pins or bolts 8, which extend transversely through the bars, while the outer ends extend through the housings and are held by nuts 9. The two lower guide-bars are connected at their ends by bolts 10, and at points intermediate of their length are supported by cross beams or blocks 11. The upper guide-bars 12, which are hollow longitudinally, are supported on shoulders 13 on the inner sides of the housings and are held firmly thereto by long bolts 14, which extend through the guide-bars and through the housings and at their end are provided with nuts 14'. The guide-bars are tied together at the ends by cross-bolts 15 and at the middle by bolts 16 and a separating-block 17. The shape in cross-section of the upper guide-bars is shown in

Fig. 4, each having a strong body portion and on the inner side a longitudinally-grooved flange or seat 18, by which flanges on the roll-bearings are upheld and guided. The ends of the upper and lower guide-bars bear against the housings, and when the connecting-bolts are drawn tight the guide-bars thus act as separating pieces or struts for the housings, enabling them to be held as a firm, substantial, and self-contained structure. Especially is this so with respect to the action of the guide-bars as used in connection with the long connecting-bolts.

There are two working rolls 19 19 employed in the apparatus and two driving-rolls 19' 19', situate on the outer sides of the working rolls and geared thereto. The bearing-blocks 20 of each pair of these rolls are made in vertically-divided sections, which are fitted around the roll-journals between the guide-bars and have flanges which fit on the guide-bars and support the bearings. The adjacent bearing-sections are securely bolted together by bolts, which also secure them to the respective ends of an upright carrier or frame 22, and this likewise fits between and is supported by the guide-bars. The lateral adjustment of these carriers and the consequent adjustment of the rolls carried thereby is had by means of adjusting-screws 23, which pass through nuts in the housings and bear on the carriers, being adapted when driven to move the carriers inwardly, and by counterbalancing-cylinders 24, set in the housings and having their pistons connected with the carriers, an outwardly-acting water-pressure is exerted (preferably constantly) on these pistons, so that when the motion of the adjusting-screws is reversed the carriers will be retracted by the counterbalancing water-pressure.

25 25 are the usual gear-wheels and shaft by which all the adjusting-screws are connected. They are driven by a suitable motor. (Not shown.)

The upper necks of the working rolls terminate, preferably, at or about the level of the upper guide-bars; but the neck of each of the outer rolls extends upwardly nearly to the shaft 3, and above the guide-bars is fitted with a bevel gear-wheel 26, whose teeth mesh with the teeth of a bevel-pinion 27, keyed to an ordinary elongated hub 28, which is set with

a feather-and-spline or other traveling connection on the driving-shaft 3.

29 is a sectional collar which encircles the hub 28 loosely, and which has a bearing-socket 30, in which the end of the neck of the roll is fitted. As the rolls are adjusted laterally with their carriers, the neck of each roll 19', acting on the collar, moves the hub 28 along the driving-shaft and maintains the latter in constant power connection with the roll.

Each working roll is connected with its adjacent driving-roll by encircling gear-teeth 31, which are formed integral with or are suitably attached to the rolls, preferably below the upper guide-bars. The bodies of the rolls are thus somewhat separated; but as they are positively geared together the rotation of the driving-rolls will drive the working rolls uniformly and with certainty. In this respect my improved apparatus is greatly superior to prior devices in which the working rolls are driven merely by frictional contact with the others, for in such case in the event of the application of heavy work to the working rolls the driving-rolls are apt to slip, thus not only wearing the rolls injuriously, but tending to cause the opposite working rolls to act with lack of uniformity. This is avoided by gearing the rolls together, since the action is thus made positive and necessarily uniform. It is also better than other prior devices where the driving-roll in frictional contact with the working roll, as above explained, is also connected therewith by gearing, since by my arrangement, in which the rolls are separated, I can use larger gearing. When the rolls are connected by gearing and are also in frictional contact, any wear of the rolls will destroy the uniformity between the action of the gearing and the frictional driving, thus imparting to the gearing serious strain and wear, which are not present in my apparatus. A novel and advantageous feature of my apparatus is also the location of the connecting-gearing of the rolls between the bearings—a place best adapted to securing the best condition of strength and effectiveness in transmission of power.

In using the mill the rolls are driven by rotation of the driving-shaft 3, the piece to be rolled is passed between the working rolls 19, and the width of the pass is successively lessened by action of the adjusting mechanism in order to effect the desired reduction of the metal.

The reason for using two pairs of rolls—a working pair and a driving-pair—is that if but a single pair were used the gear-wheels 26 would prevent their being brought sufficiently close to roll metal of small dimensions unless such gear-wheels were made of unduly small diameter or the rolls made of unduly large diameter, either of which constructions would be disadvantageous.

I shall now indicate certain features of construction of the mill not described above. The lower necks of the rolls within the bear-

ing-blocks are provided with encircling cylindrical linings 32, in which they have direct bearing. These linings at their upper ends extend into annular grooves formed at the end of the roll-bodies, and in this way the rolls themselves act as efficient shields to the bearings and prevent the entrance of scale, which would spoil or injure them. The rolls may be made hollow, so as to afford axial passages through which grease may be fed to the bearings from above. The bearing-linings at the upper necks of the driving-rolls may also be provided at their upper ends with upwardly and outwardly extending portions, forming pans or receptacles into which lubricant may be poured and by which it may be guided to the journals.

Advantages of my improvement other than those already stated are as follows: By reason of the construction of the rolls and lower guide-bars either of the driving-rolls can be removed simply by disengaging the bearing-sections, freeing one of the lower guide-bars and removing it laterally, removing the upper guide-bar, and taking out the roll. The inner rolls can be removed by disconnecting the bearing-sections and dropping the rolls through a window or enlarged space formed at the middle of the lower guide-bars. If desired to use the mill for rolling wide pieces, the inner rolls can be removed thus and the outer rolls used as the working rolls. Setting the guide-bars on seats on the housings and securing them thereto renders them easy to be removed and replaced by disengagement of the securing-bolts. I believe I am the first to set the guide-bars so that they shall be removable laterally. The connection of the housings by the long bolts which extend through the upper guide-bars is also of advantage in that it is a compact arrangement and enhances greatly the strength of the mill. The same device may be applied to the lower guide-bars, if deemed desirable.

The novel features of my invention are recited in the following claims, each of which states an item of invention unqualified by the limitations and elements not expressed therein, though stated in other claims.

I claim—

1. In a rolling-mill, the combination of driving-rolls, inner working rolls which are connected therewith by gearing and whose bodies are separated from the driving-rolls, and means for adjusting the rolls laterally, substantially as and for the purposes described.

2. In a rolling-mill, the combination of guide-bars, driving-rolls, and inner working rolls connected therewith by gearing situate on the inside of the guide-bars, and means for driving the first-named rolls, and means for adjusting the rolls, substantially as and for the purposes described.

3. In a rolling-mill, the combination of guide-bars, driving-rolls, and inner working rolls connected therewith by gearing situate on the inner side of the guide-bars, a power-

shaft, and gearing situate on the outer side of the guide-bars and connecting the driving-rolls with the shaft by a traveling connection, substantially as and for the purposes described.

4. In a rolling-mill, the combination of guide-bars, driving-rolls, inner working rolls not in frictional contact with the driving-rolls, gearing connecting the outer rolls with the inner rolls, and gearing connecting the outer rolls with a motor, substantially as and for the purposes described.

5. In a rolling-mill, the combination, with the opposite housings, of guide-bars fitted between the housings, and bolts which extend through the guide-bars, connect the housings, and are arranged to draw the housings together upon the interposed guide-bars, substantially as and for the purposes described.

6. In a rolling-mill having vertical rolls, the

combination, with the opposite housings, of guide-bars fitted on seats on the housings, having their ends bearing against the housings and removable laterally therefrom, roll-bearings set movably between the guide-bars, and means for securing the guide-bars, substantially as and for the purposes described.

7. In a rolling-mill having vertical rolls, the combination, with the opposite housings, of guide-bars extending between the housings, and link-bolts extending through the housings, and pins on the guide-bars to which the link-bolts are fitted, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 22d day of July, A. D. 1891.

JULIAN KENNEDY.

Witnesses:

W. B. CORWIN,

H. L. GILL.