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G. CATULLE

2,181,173

BACKED ROLL MILL

Filed Sept. 11, 1936

2 Sheets-Sheet 1

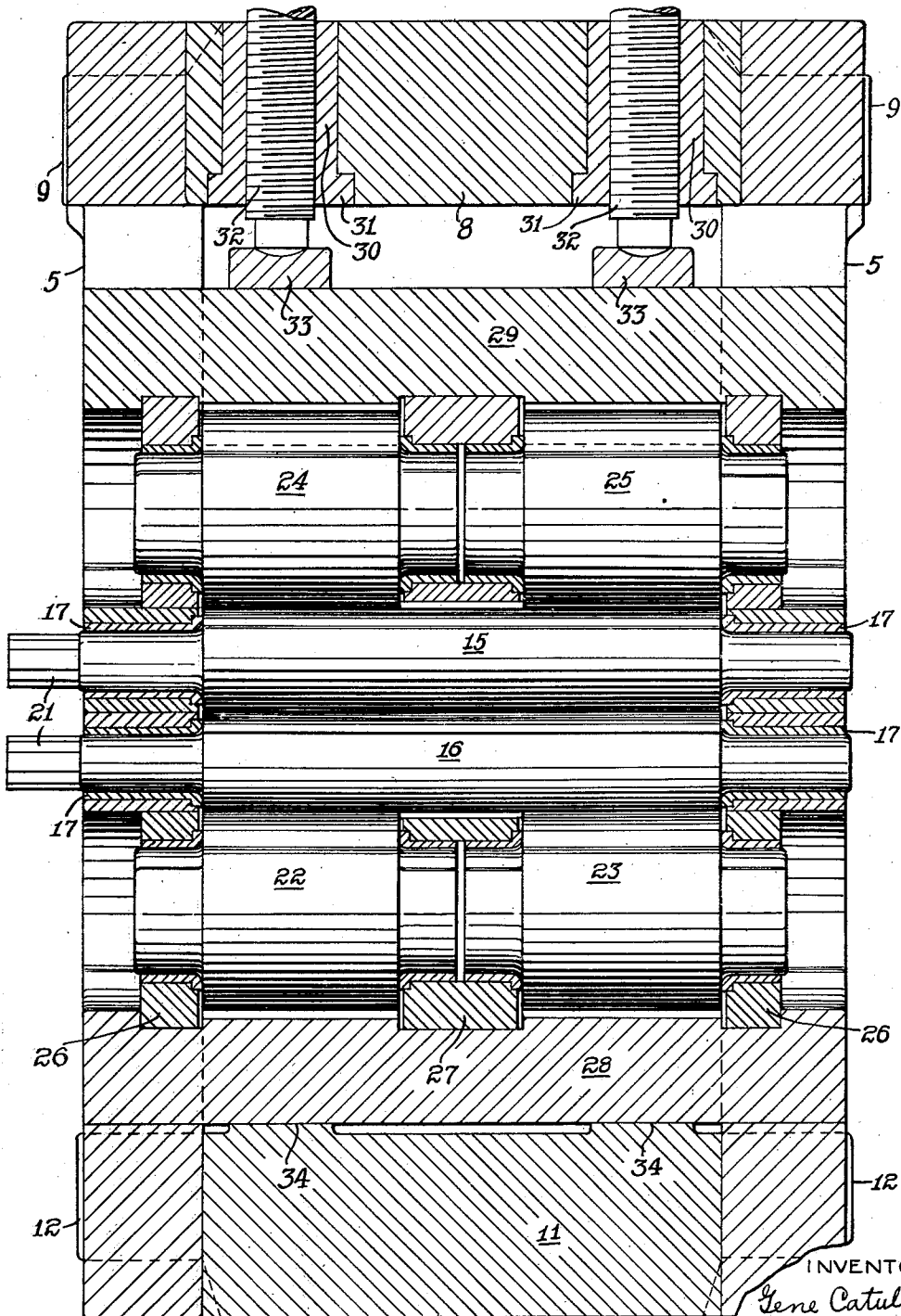


Fig. 1

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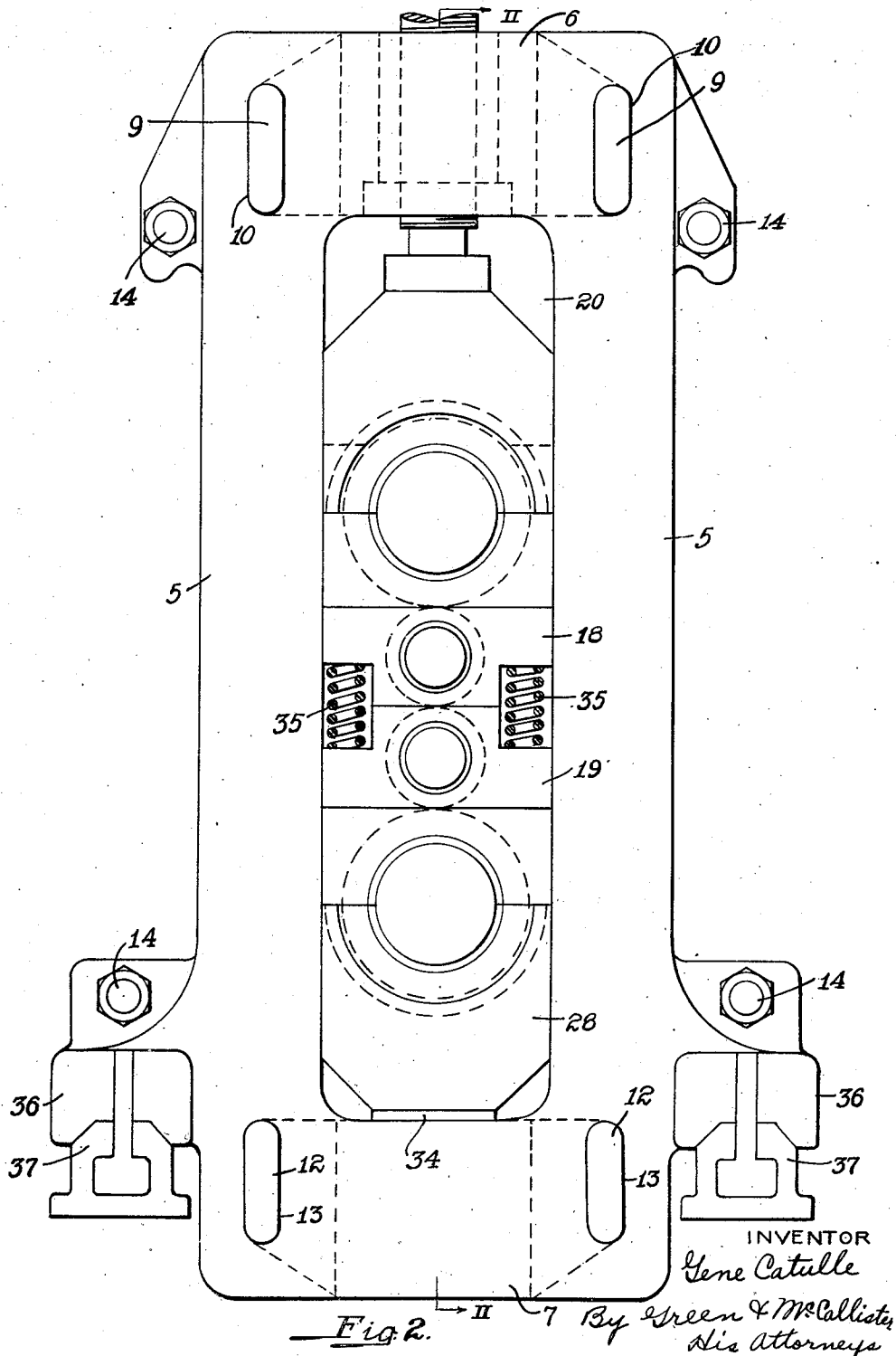
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,181,173

BACKED ROLL MILL

Gene Catulle, Brackenridge, Pa.

Application September 11, 1936, Serial No. 100,302

1 Claim. (Cl. 80—33)

This invention relates to backed roll mills and is of particular value in connection with mills for use in the rolling of flat material such as strips, sheets and plates.

5 An object of this invention is to produce an improved backed roll mill in which the deflections occasioned during rolling can be predetermined and reduced to a minimum.

10 Another object is to produce a backed roll mill which for a given size (maximum width of material capable of being rolled) is materially cheaper to construct than backed roll mills of the present designs whether of the four-high type or the cluster type.

15 A further object is to produce a backed roll mill housing in which there are no reentrant angles in those portions thereof which are subjected to the stresses occasioned during rolling.

20 A still further object is to produce a backed roll mill in which the stress to which the housing posts is subjected during rolling can be predetermined.

25 A further object is to produce a mill in which during rolling the housing posts are directly loaded and not eccentrically loaded as are the housing posts of all present types of backed roll mills.

30 A still further object is to produce a mill in which it is possible to predetermine the stretch of the housing as well as the total deflection under different roll reductions.

35 These, as well as other objects, I attain by means of the mill described in the specification and more or less diagrammatically illustrated in the drawings accompanying and forming part of this application.

In the drawings:

Figure 1 is a sectional elevation of a mill embodying this invention and

40 Fig. 2 is a view in side elevation of said mill.

45 In a mill of this invention, the reducing or working rolls are preferably of relatively small diameter as is the practice in the present types of backed roll mills. Each of these reducing rolls is backed by a pair of axially aligned backing rolls of moderate diameter instead of being backed by a single roll of relatively large diameter as in the present types of four-high mills.

50 The bearings for the necks of each pair of axially aligned backing rolls (which may be of any desired type of anti-friction bearing) are carried by a rigid member, preferably a steel casting, which spans the space between the mill housings and fits within the housing windows.

55 Each housing of my mill is a unitary casting

comprising front and rear corner posts or up-rights and top and bottom connecting members. These housings are cross-connected by means of extremely rigid top and bottom bridging members. These bridging members form the top 5 and bottom members of the mill stand and each such member is provided with spaced end tenons or projections which extend into recesses, openings or mortises formed for their reception in the housing corner posts adjacent their upper and 10 lower ends.

The top bridging member carries the two screwdowns or adjusting screws and these bear against breaker blocks carried by the upper backing roll support in line with the backing roll 15 bodies or between the inner and outer neck bearings for the backing rolls.

The bottom bridging member is provided with two upstanding pads which contact with the bottom of the lower backing roll support and are in line with the breaker blocks and have substantially the same contact area. 20

Each of the housings of the mill diagrammatically illustrated in the drawings is made up of front and rear corner posts 5, a top member 6, 25 and a bottom member 7. These parts are preferably formed as an integral unitary casting. A top bridging member 8 which spans the space between the housings and which forms a top member for the mill stand is provided at each end with two spaced apart tenons or projections 30 9 which fit within openings, recesses or mortises 10 provided for their reception at the centers of the housing corner posts or uprights 5 and adjacent the tops of the same. 35

A bottom bridging member 11 which spans the space between the housings adjacent their lower ends is also provided with spaced apart end projections or tenons in this case numbered 12 which 40 fit within centrally located openings, recesses or mortises 13 formed for their reception at the center of the housing corner posts and adjacent the lower ends thereof. The top and bottom bridging members are secured in aligned position by means of suitable wedges (not shown), which 45 are driven into position between projections 9, 12 and the walls of the openings or mortises 10, 13 into which they extend.

The housings are securely held in proper relative position and in rigid contact with the ends 50 of the bodies of the bridging members 6 and 7 by means of suitable tie rods 14.

The reducing rolls 15, 16 are preferably of relatively small diameter as is now customary and the necks of these rolls are journaled within 55

bearings 17 of any desired or preferred type. These bearings or rather their housings or support members 18, 19 fit within the housing windows 20. One end of each reducing roll is machined as shown at 21 to accommodate a coupling member (not shown) by which the rolls are adapted to be connected to suitable driving mechanism such as a motor or pinion stand.

Each reducing roll is backed by a pair of axially aligned backing rolls. In the case of lower reducing roll 16, the backing rolls are numbered 22 and 23 and in the case of upper reducing roll 15, the backing rolls are numbered 24 and 25. The bearing assemblies for the outer necks of the lower pair of backing rolls 22-23 are numbered 26 and those for the inner necks 27. These assemblies are carried by a support member 28 which spans the space between the housings and at its ends is designed to fit within the housing windows. This member I term the lower backing roll support member.

A similar support 29 spans the space between the housings above the upper backing rolls 24-25 and its ends are also designed to fit within housing windows 20. This support member, which I term the upper backing roll support member, carries the bearing assemblies for the necks of upper backing rolls 24-25.

Bridging member 8 is drilled for the reception of two bushings 30 which extend therethrough and are provided with enlarged lower heads 31. These bushings are internally threaded for the reception of screwdowns or adjusting screws 32. The lower unthreaded ends of these screws are rounded to make proper contact with breakers or breaker blocks 33 carried on the backing roll support 29. The adjusting screws are spaced apart one from the other and from the housings and the pressure of each is exerted on backing roll support 29 in line with the backing roll bodies or between the inner and outer necks of one of the upper backing rolls 24-25.

Lower bridging member 11, in line with each breaker block 33 is provided with an upstanding pad 34 of substantially the same contact area as the breaker blocks.

Compression springs 35 which are positioned between bearing housings or blocks 18 and 19 for the reducing roll necks at each side of the mill yieldingly hold upper reducing roll 15 in contact with its backing rolls 24-25.

The housings, as is usual, are provided with shoes 36 which cooperate with suitable rails 37.

The backing roll support members fitting into the housing windows as they do and being of extremely rigid construction, keep the backing rolls in proper alignment. By positioning adjusting screws 32 and contact pads 37 in the manner disclosed, I form supports for backing roll support members 28 and 29 such that the deflections under load are not only equal but are determinable. These backing roll support members may be treated as simple beams each with a load at its center and with loads at its overhanging ends.

It will be seen that in the mill herein disclosed, there are no reentrant angles in those portions of the housings which are subjected to stresses occasioned during rolling and since the housing posts are directly loaded, the stress to which they are subjected during rolling and therefore their stretch can be predetermined.

While I have merely shown plain bearings for both the reducing and backing rolls, I contemplate using anti-friction bearings of any well-known type for the necks of the reducing rolls as well as for the necks of the backing rolls.

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

The combination in a backed roll mill, of separately formed mill housings each having front and rear posts and connecting portions between their upper and lower ends and with said posts defining the housing windows, top and bottom bridging members extending between the tops and bottoms of said housings and having tenons fitting into centrally located openings within and adjacent the tops and bottoms of said posts, a pair of reducing rolls, a pair of axially aligned backing rolls for each reducing roll, a support member for each pair of backing rolls and having its opposite ends located within the housing windows, bearings for the backing roll necks carried by said support members and adjusting screws carried by the top bridging member in spaced relation one to the other and to the housings and arranged to exert pressure against the support member for the upper backing rolls in line with the bodies of such rolls.

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