Feb. 16, 1943. J. M. O'MALLEY 2,311,075

ROLLING MILL

Filed March 5, 1940 2 Sheets-Sheet 1

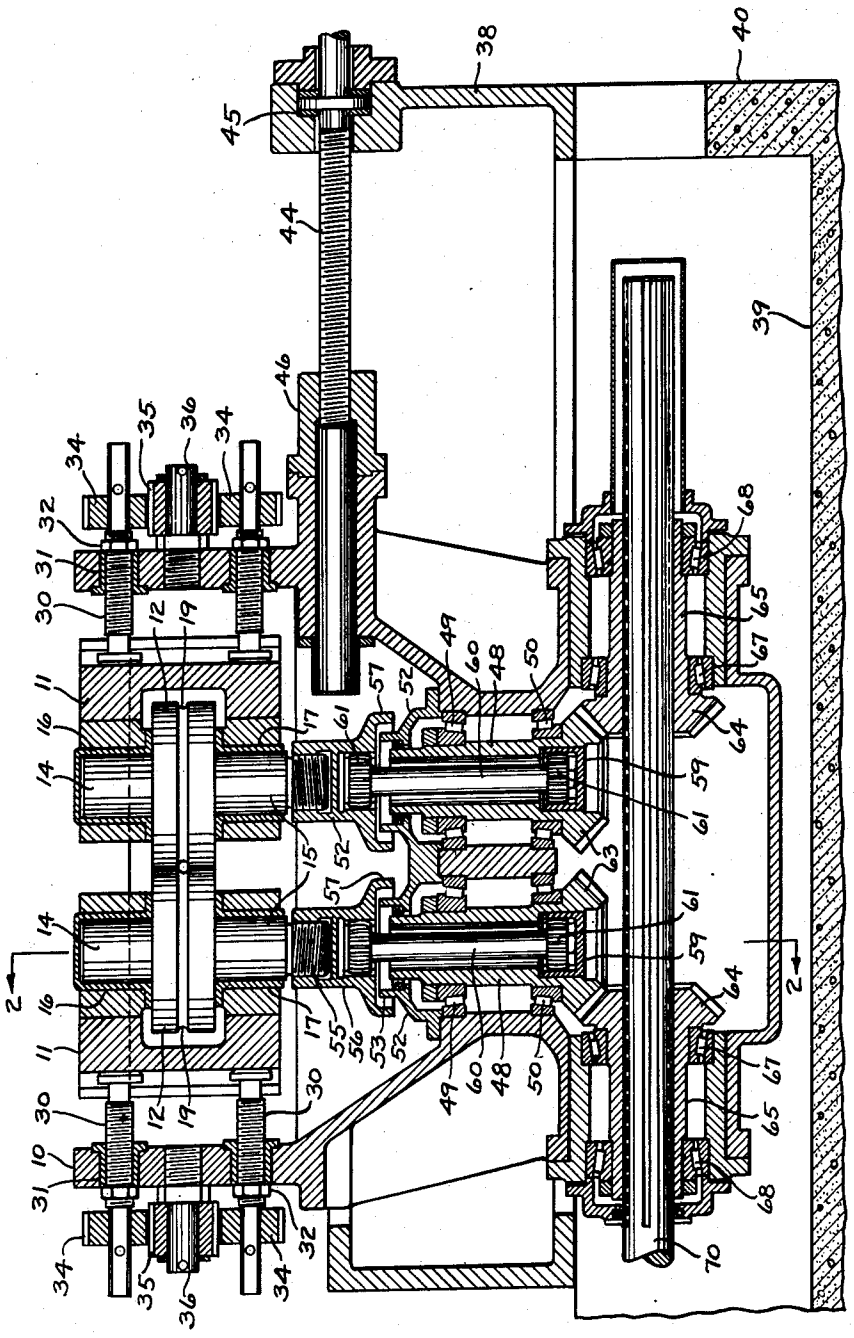


Fig. 1

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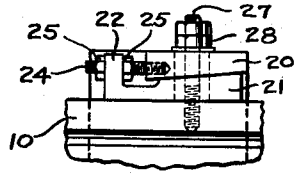


Fig. 4

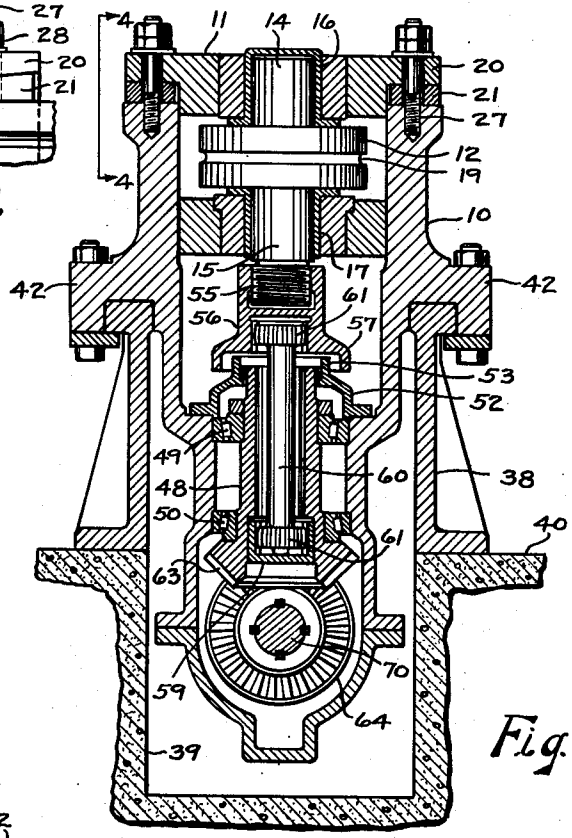


Fig. 2

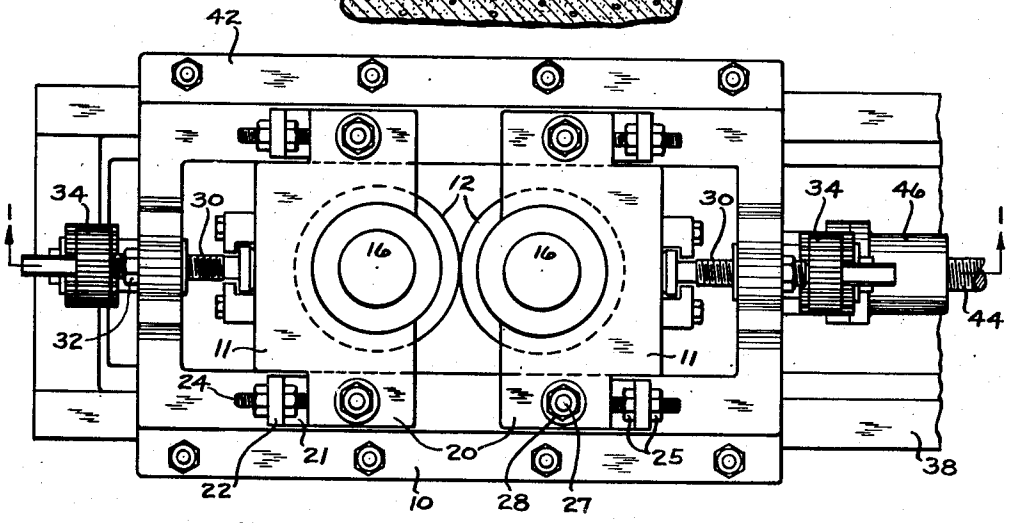


Fig. 3

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Patented Feb. 16, 1943 2,311,075

UNITED STATES PATENT OFFICE

2,311,075

ROLLING MILL

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Application March 5, 1940, Serial No. 322,331

3 Claims. (Cl. 80—54)

This invention relates to rolling mills, and more particularly to the construction and arrangement of vertical mills adapted to form a part of a continuous mill for the rolling of metal bars, rods and the like.

It is one object of the invention to provide a vertical mill having a simple, compact and dependable mechanism for driving the rolls without interfering with the adjustment of the rolls as desired.

It is a further object of the invention to provide a vertical mill in which the rolls are firmly and rigidly supported against the rolling pressure, and in which provision is made for adjusting the spacing of the rolls as well as the position of the pass line of the mill.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is a vertical section through a rolling mill, the section being taken on the line 1—1 of Fig. 3;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of the rolling mill; and

Fig. 4 is a fragmentary elevation taken on the line 4—4 of Fig. 2.

The embodiment illustrated comprises a housing 10 in the form of a hollow casing open at the top and enclosing in its upper portion two laterally opposed bearing chocks 11. Each chock serves to support a vertical roll 12 having an upper roll neck 14 and a lower roll neck 15 rotatably mounted in upper and lower bearings 16 and 17 respectively in the chocks. The rolls are provided with circumferential grooves 19 which are shaped in accordance with the cross section desired for the stock. Each chock 11 is provided with a pair of oppositely projecting lugs 20 which overlie the adjacent side walls of the housing 10, as shown in Figs. 2 to 4. The lower surfaces of these lugs are slightly inclined and they rest upon wedges 21 which in turn are supported upon the housing. Each wedge is provided with an upwardly projecting ear 22 through which a stud 24 extends into the adjacent lug 20, each stud having a pair of nuts 25 thereon located upon opposite sides of the ear. The lugs and wedges are provided with elongated openings through which vertical studs 27 extend into the housing 10 therebeneath, these studs having nuts 28 on their upper ends to hold the lugs firmly down upon the wedges. It will be apparent that the wedges 21 provide means whereby the chocks 11 may be raised or lowered independently, not only to bring the grooves 19 into proper registration but also to effect alignment of the grooves with the pass line of an adjacent roll stand.

The chocks 11 are independently adjustable horizontally in the plane of the roll axes, and for this purpose each chock is engaged by a pair of horizontal screws 30 extending through nuts 31 mounted in the end walls of the housing 10. The four screws are all mounted in the vertical plane defined by the axes of the rolls. Lock nuts 32 are provided on the screws to retain them in a desired position of adjustment. In order that the two screws in each pair can be adjusted in unison, gears 34 are mounted on the outer ends of the screws, and a gear 35 is provided between each pair of gears 34 and in mesh therewith. Each gear 35 is mounted on a horizontal stud 36 carried by the housing. It will be apparent that the chocks 11 will be forced apart by the pressure exerted by the stock against the rolls, and that the screws 30 will support the chocks in opposition to this pressure. By rotating one of the screws 30 a similar rotation will be imparted to the other screw of the same pair through the connecting gears, and the corresponding chock 11 will be adjusted accordingly in a horizontal direction

In order that the pass line of the mill may be shifted horizontally to bring it into alignment with a particular set of roll grooves in an adjacent horizontal mill, means is provided to move the entire housing 10 in a lateral direction. For this purpose there is provided a frame 38 shaped as a hollow rectangular structure which surrounds a shallow open pit 39 in the foundation 40. The lower portion of the housing 10 is mounted within the frame 38 and extends downwardly therethrough into the pit 39. Flanges 42 extend laterally from opposite sides of the housing and rest upon the upper edges of the side walls of the frame, as shown in Fig. 2, these walls forming rails along which the housing may slide. A horizontal screw 44 is supported in a thrust bearing 45 (Fig. 1) in one end wall of the frame, and extends through a nut 46 secured to the adjacent end of the housing. The screw 44 can be rotated, either manually or by any suitable source of power, to effect the desired horizontal sliding movement of the housing 10.

The construction of the driving mechanism for the rolls is best shown in Fig. 1. Beneath each

roll and in substantial alignment therewith I have provided a vertical hollow shaft or quill 48 which is rotatably mounted in an upper bearing 49 and a lower bearing 50, these bearings being supported in the housing 10. The upper bearings 49 are surmounted by a cap member 52 apertured for the upper ends of the quills 48 and provided with upwardly extending annular flanges 53 coaxial with the quills. Each lower roll neck 15 is formed with a downward extension 55 which is externally screw-threaded to receive a coupling member or sleeve 56 having an annular skirt 57 projecting downwardly therefrom in surrounding relationship to the corresponding flange 53. Within the lower end of each quill 48 there is mounted a coupling member 59 which is operatively connected to the corresponding upper coupling member 56 by means of an upright spindle 60 extending through the quill. Universal connections are provided between the ends of the spindles and the adjacent coupling members, and for this purpose the spindle ends are enlarged and formed with external gear teeth 61 which engage internal gear teeth on the coupling members, in the manner disclosed in the patent to Morgan No. 2,136,947 granted November 15, 1938. The lower ends of the quills 48 are enlarged and shaped to provide bevel gears 63 which mesh with bevel gears 64 formed on the inner ends of two horizontally aligned hollow shafts or quills 65. Each quill 65 is rotatably supported in an inner bearing 67 and an outer bearing 68, these bearings being mounted in the lower portion of the housing 10. A horizontal drive shaft 70 extends through the two quills 65 and is slidably keyed thereto. This shaft is driven by a suitable source of power (not shown).

The operation of the invention will now be apparent from the above disclosure. The shaft 70 drives the quills 65, which in turn transmit power through the gears 64 and 63 to the vertical quills 48. The rotation of the vertical quills is transmitted to the rolls 12 through the medium of the coupling members 59, spindles 60, and coupling members 56. Slight horizontal adjustments of the chocks 11, to vary the spacing of the rolls, can be effected by means of the screws 30, such movements merely resulting in a slight change in the angular position of the spindles 60 without affecting the transmission of power to the rolls. Similarly, independent vertical adjustments of each chock 11 can be obtained by means of the wedges 21 to bring the two roll grooves 19 into correct registration, such adjustments likewise having no effect on the driving of the rolls, since the coupling members 56 are free to slide vertically relative to the spindles 60 by reason of the telescopic connection afforded by the gear teeth 61. To shift the pass line of the mill horizontally it is merely necessary to actuate the screw 44, thus causing the housing 10 to slide along the frame 38, and the horizontal quills 65 to slide along the drive shaft 70. Since the rolling pressure is directly resisted by the screws 30 which are mounted in the housing, the rolls are firmly and rigidly supported. The construction is very compact and the overall height is much less than with other vertical mills. Any required amount of power can be applied to the rolls, and since the driving mechanism is entirely below the rolls they are more accessible and the entire machine is more stable. The skirts 57 cooperate with the flanges 53 to exclude water and scale from the bearings and the driving gears.

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

1. Driving means for a pair of vertical rolls which are independently adjustable horizontally in the vertical plane defined by their axes comprising a coupling member mounted on the lower end of each roll, a vertical rotatable quill beneath each roll, an upper and a lower bearing for each quill, means to rotate said quills, a coupling member on the lower portion of each quill, an upright spindle extending through each quill, each of said spindles having a universal connection at its ends with the corresponding coupling members, whereby the said adjustment of the rolls may be accomplished without disturbing the quills, and a depending annular skirt on each of the first-mentioned coupling members arranged to form a shield for the said bearings therebeneath.

2. Driving means for a pair of vertical rolls which are independently adjustable horizontally in the vertical plane defined by their axes comprising a coupling member mounted on the lower end of each roll, a vertical quill rotatably supported beneath each roll, the lower end of each quill having a bevel gear thereon, a coupling member mounted on the lower portion of each quill, an upright spindle extending through each quill, each of said spindles having a universal connection at its ends with the corresponding coupling members, whereby the said adjustment of the rolls may be accomplished without disturbing the quills, a pair of horizontally aligned bevel gears in mesh with the first-mentioned gears, and a horizontal shaft connected to said aligned gears to drive the same.

3. A rolling mill comprising a stationary frame, a housing supported on the frame, a pair of vertical rolls mounted within the housing and independently adjustable relative to the housing horizontally in the vertical plane defined by their axes, means to slide the housing horizontally on the frame in the said vertical plane, a vertical quill rotatably supported in the housing beneath each roll, the lower end of each quill having a bevel gear thereon, an upright spindle extending through each quill, means providing a universal connection between the lower end of each spindle and the lower portion of the corresponding quill, means providing a universal connection between the upper end of each spindle and the lower end of the corresponding roll, whereby the said adjustment of the rolls may be accomplished without disturbing the quills, a pair of horizontally aligned bevel gears rotatably supported in the housing and meshing with the first mentioned gears, and a horizontal shaft extending through said aligned gears and slidably keyed thereto to drive the same.

JOSEPH M. O'MALLEY.