June 28, 1955 J. H. FRIEDMAN 2,711,660

DESCALING APPARATUS

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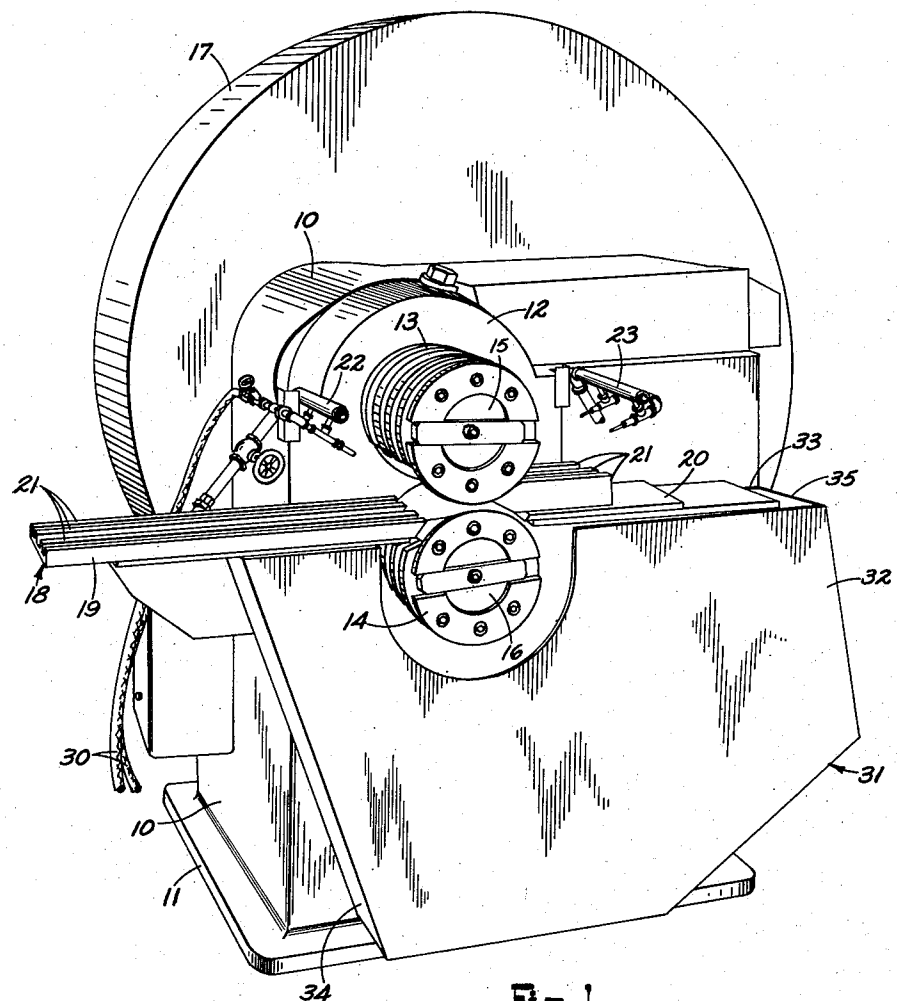

Fig. 1

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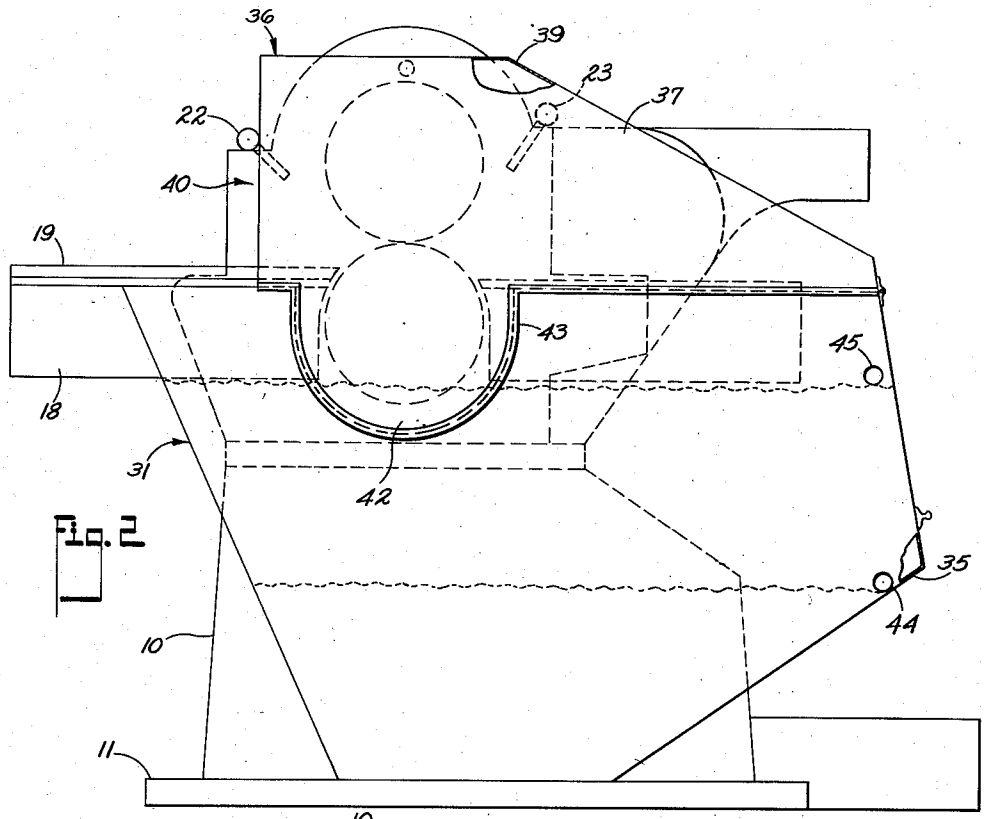

Fig. 2

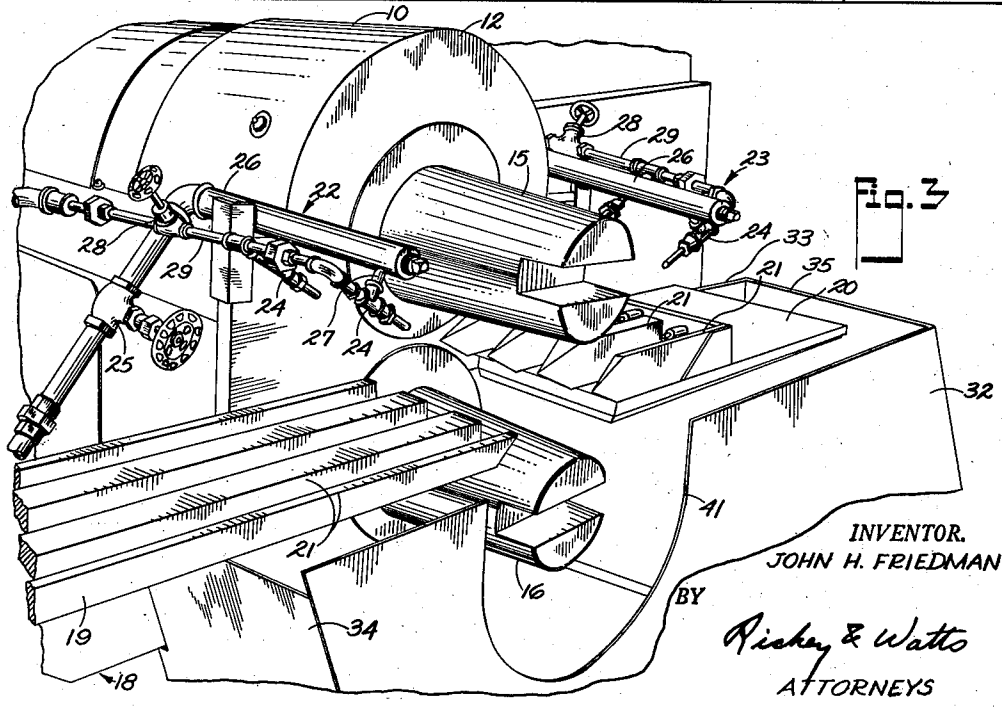

Fig. 3

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2,711,660

DESCALING APPARATUS

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Application April 14, 1951, Serial No. 221,043

1 Claim. (Cl. 80—1)

This invention relates to apparatus for rolling metal and, more particularly, to descaling apparatus for die rolling mills.

In application Serial No. 168,218, filed June 15, 1950, there is described a die rolling mill for hot rolling utilizing gap rolls of relatively small diameter. The rolls are mounted upon contra-rotating shafts which project beyond the end of a frame, the frame and shafts being so designed as to minimize the deflection of the roll shafts. A massive, continuously rotating fly wheel and an associated clutch arrangement enable the rolls to be driven one revolution at a time, together with precise control of drive period. The mill is characterized particularly in that large reductions of the blank may be effected in each pass as compared with the mills of the prior art, and the overall cost of rolling is greatly reduced. The said application Serial No. 168,218 filed June 15, 1950, has been issued as Patent No. 2,364,144. Portions of the said original application have been divided therefrom and appear in Patent No. 2,615,355 and in co-pending application Serial No. 294,176, filed June 18, 1952.

It is, of course, known that scale on hot blanks can be cracked loose from the blank by water which, of course, flashes into steam and crackles the scale loose from the blank or sheet. The applicant, however, has discovered that in gap mill rolling as distinguished from continuous or flat rolling the grip of the rolls in starting the blank can be greatly increased by directing a high pressure spray of water and air into the gap of the mill to loosen and blow away the scale on the surface of the blank. The metal surface which is exposed below the scale has a much higher co-efficient of friction with the rolls than does the scale itself since the outer layer of oxide composing the scale is extremely hard and brittle and acts like a lubricant on the blank being rolled.

The present invention is concerned with the provision of novel apparatus facilitating greater reductions and longer die life with the type of mill above-described by the prevention of roll skid relative to the blank and for the removal of scale from the blank. It is essential in such rolling apparatus to maintain the predetermined registration between the blank and the dies in the rolls so that the rolls impress the blank at the proper location in the length of the blank. Any slippage between the rolls and the blank changes the selected portion in the length of the blank to be impressed by the rolls thereby producing a defective piece. The descaling apparatus of the present invention is particularly efficient for the purpose of descaling in conjunction with such a gap mill operation. In accordance with one embodiment of the invention, a container or tank is attached to the mill frame below the lower roll and so as to enclose at least a portion of the roll. Ejectors, which are supplied with compressed air and water or other fluid, are mounted above the plane of juncture of the rolls and direct a continuous spray of water of relatively high velocity upon the work piece as it enters and leaves the rolls. The lower roll may run in a continuous bath of water in the lower

tank while an extension of the lower tank serves as a hood to confine the spray from the ejectors.

As will be understood from the disclosure of the above-referenced co-pending application, the small diameter roll mill having the characteristic of one revolution operation effects a sharp reduction at the start of the rolling operation so as to insure the starting of the blank between the rolls. In rolling certain blanks, such as for instance, an automobile crank shaft blank, there is a wide variation throughout the length of the blank as to the reduction effected. It is important that where a sharp increase in the percentage of reduction takes place, that roll slippage or skid with respect to the blank be prevented. Accordingly, it is among the objects of my invention to provide a mill having small diameter gap rolls and operated in a cyclic one revolution manner with a liquid spray to increase the co-efficient of friction between the roll and the blank whereby sharp reductions may be effected intermediate the ends of the blank.

An object of the invention is the prevention of skidding of the roll relative to the blank in die rolling mills.

An object of the invention is the provision of means for the rapid removal of scale in gap mills.

Another object of the invention is the improvement of the precision and rapidity of operation of gap-type die rolling mills in which the rolls turn a single revolution at each pass.

A further object of the invention is the reduction of operational costs of die rolling mills.

Further objects, features and advantages of the invention will be apparent from a consideration of the following detailed specification and claim taken in connection with the appended drawings, in which:

Fig. 1 is a perspective view of a rolling mill made according to the invention;

Fig. 2 is an end view of the rolling mill showing the tank and the hood in position; and

Fig. 3 is a perspective view showing the relative position of the roll shafts and the ejectors of the invention.

Referring first to Fig. 1, the rolling mill comprises a frame **10** mounted upon a base **11** and having an end portion **12**. A pair of gap rolls **13** and **14** are mounted upon roll shafts **15** and **16** which are mounted in the frame and project from the end **12**. The rolls are driven by a massive rotating fly wheel enclosed in a housing **17** and through a clutch arrangement which permits precise control of the rotation of the rolls **13** and **14**.

A work support **18**, having a front portion **19** and a rear portion **20**, is mounted upon the end portion **12** of the mill frame and includes spaced guide bars **21** between which the work pieces may slide during the operation of the mill. The rolls **13** and **14** are provided with a series of cooperating dies, each die being formed so that sequential operations upon a blank will produce the finished rolled blank desired. The design and operation of the rolling mill is described in detail in my co-pending application previously referred to.

In accordance with the invention, a plurality of sets of ejectors are provided for directing a high pressure stream or spray of water toward the juncture of the rolls so that the space between work supports **19** and **20** drains the water and scale down into the tank **31**. The ejector assemblies **22** and **23** each comprise a set of ejectors **24** supplied with water through a valve **25** and a pipe **26** having branches **27** leading to the ejectors. Similarly compressed air is supplied to the ejectors **24** through valves **28** and pipes **29**. Flexible connections **30** are provided for connecting the air and water valves to suitable sources of compressed air and water. The ejectors **24** convert the water into a fine spray and drive the spray into the roll juncture with the air line pressure.

In accordance with the invention, a tank **31** is provided to serve as a receiver for spray from the ejectors,

loosened scale, and when necessary or desirable, to hold sufficient water to provide a continuous bath for the lower roll 14. The tank 31 comprises an outer end wall 32 and an inner end wall 33, generally trapezoidal in shape, and joined by a front wall 34, rear wall 35 and a bottom wall. The tank may be fabricated in any suitable fashion, as by welded sheet metal construction.

The tank 31 is supported by the end portion 12 of the mill frame and by the base 11 and is arranged to fit closely under the work support 18. Cooperating with the tank 31, is a cover 36 arranged to cover the rolls and ejectors and form a generally water-tight enclosure with the tank. The cover includes an outer end wall 37 and a similarly shaped inner end wall, forming extensions of the inner and outer end walls of the tank, and joined by top and back walls 39. The cover 36 is open at the front end 40 to provide operational access to the work bed and rolls, such access being sufficient for the present type of mill.

The cover 36 is connected to the tank 31 by means of hinges to facilitate servicing and adjustment of the rolls. Further, in order to provide a ready access to the lower roll 14 and to the interior of the tank 31, an arcuate opening 41 is formed in the end wall 32 of the tank. A portion 42 of the outer end wall 37 of the cover is contoured to match the opening 41. A sealing strip 43 is utilized to provide a water proof joinder of the components while any suitable clamping means may be utilized to hold the cover in position.

In operation, the ejectors may be utilized to direct spray upon the work piece as it enters the rolls or leaves the rolls or both. The ejectors may operate continuously so as to provide a constant spray adjacent the rolls or alternatively, the supply of water and compressed air to the ejectors may be controlled in synchronism with the actuation of the clutch which controls the driving of the rolls. An opening 44 in the tank 31 is provided for use as a drain where it is desired to keep a relatively low level of water in the tank. Where it is desired to maintain a sufficient water level to allow the lower roll 14 to run in a continuous bath of water, the lower opening 44 may be closed and an upper opening 45 utilized as a drain.

In either event the spray directed upon the work piece loosens and removes scale. The water striking the work piece flashes into steam lifting and cracking loose the scale and the force of the air and water spray blows loosened scale from the work piece. Thus the rolls press into the descaled metal without slippage insuring proper and accurate registration of the blank with the dies of the rolls.

It is to be understood that the specific nature of the present disclosure is not intended to be restrictive or confining and that various rearrangements of parts and modifications of design may be resorted to without departing from the scope or spirit of the invention as herein claimed.

What is claimed is:

In a gap rolling mill for rolling hot metal blanks including a pair of gap rolls, means for increasing the starting grip of the rolls upon a blank positioned between the gaps of the rolls to prevent roll slippage and thereby start the rolling with proper register of roll and blank, comprising nozzle means directed toward the pass of said rolls and into the space between the aligned gaps of said rolls, pipes supplying water to said nozzle means and pipes supplying high pressure compressed air to said nozzle means to force a high pressure spray of water and air against a blank in the pass of said rolls to loosen and remove scale from the blank, whereby the starting grip of the rolls upon the blank is increased.

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