May 30, 1933. F. SINGER 1,912,015

METHOD OF TREATING BILLETS PRIOR TO EXTRUSION

Filed June 2, 1932 3 Sheets-Sheet 1

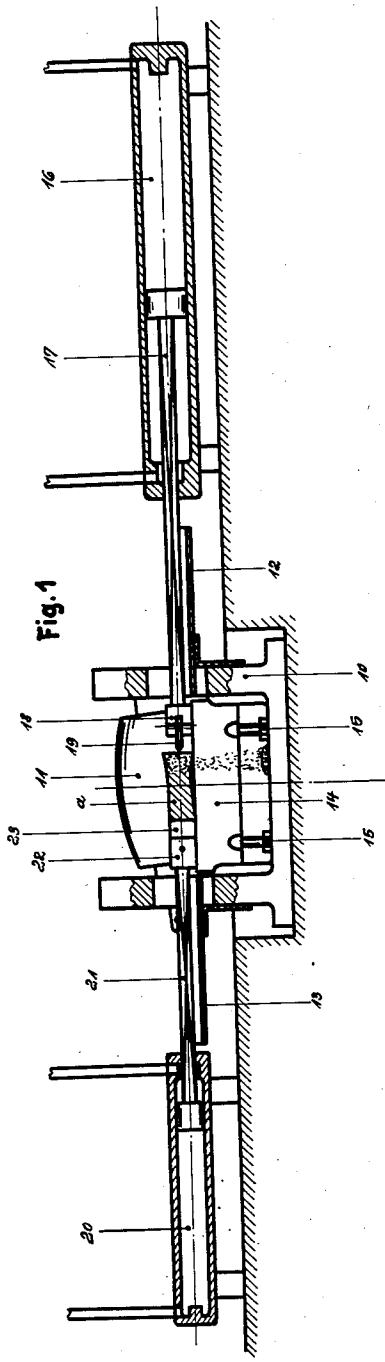


Fig. 1

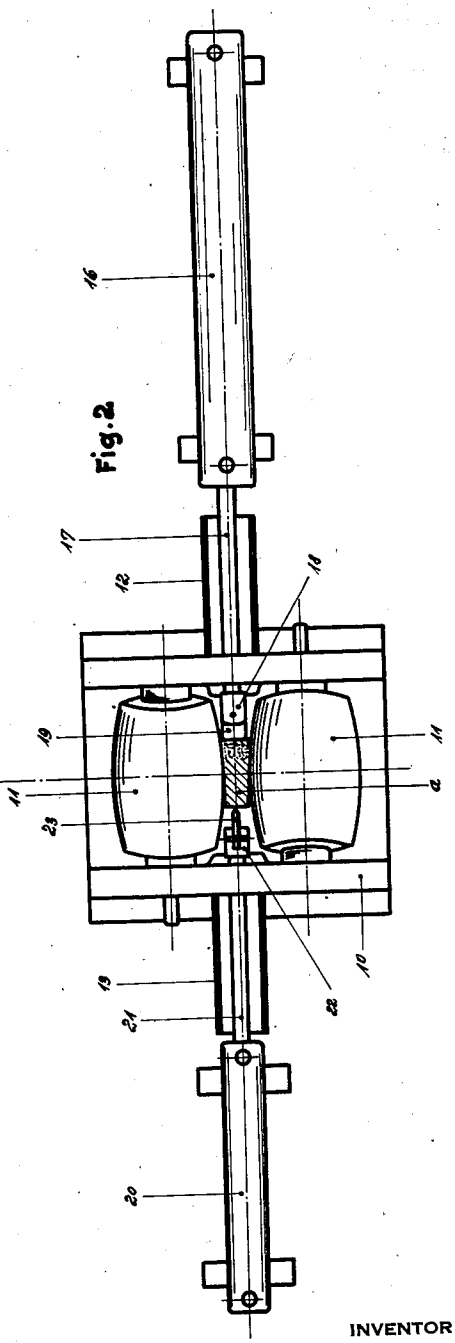


Fig. 2

INVENTOR

Fritz Singer

By

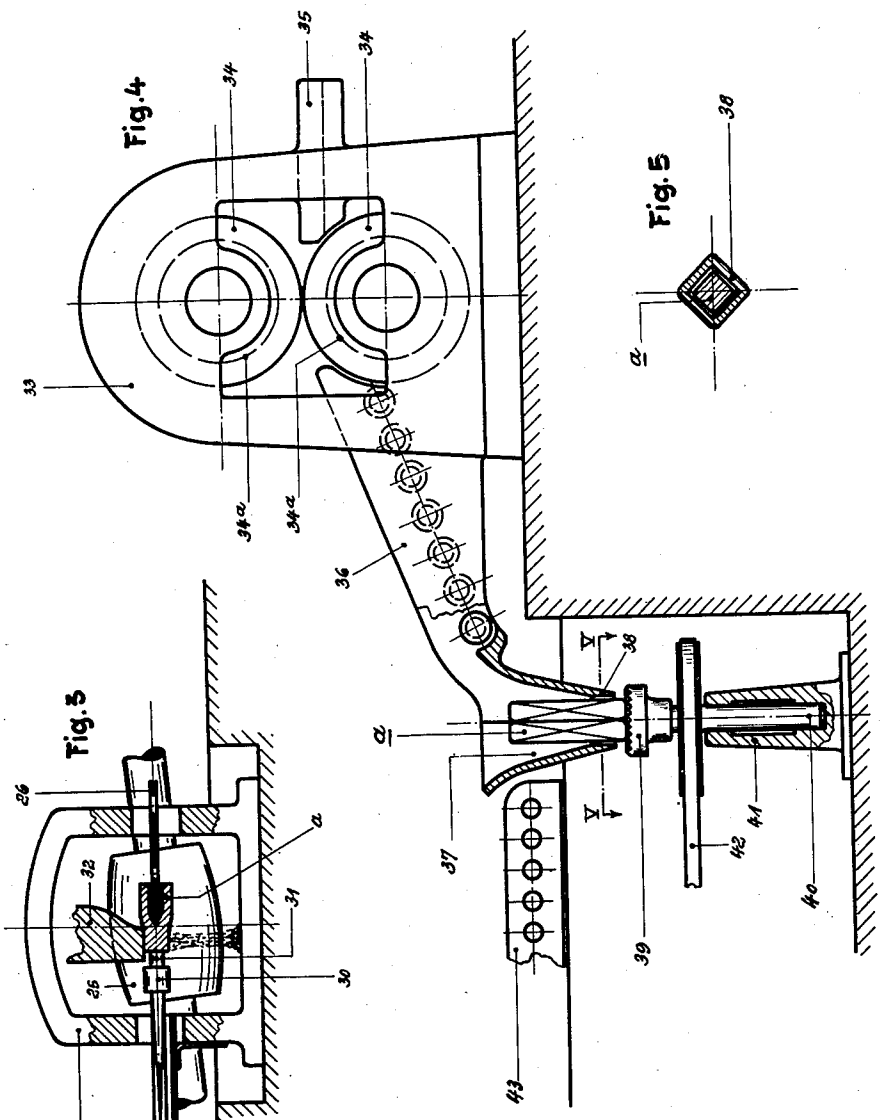
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METHOD OF TREATING BILLETS PRIOR TO EXTRUSION

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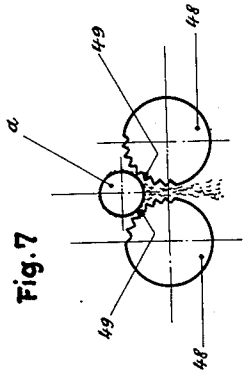


Fig. 7

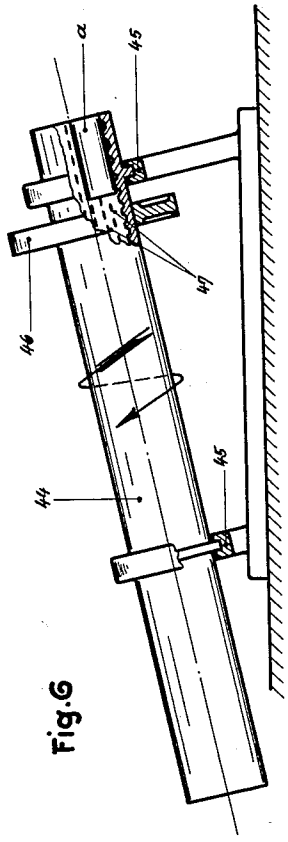


Fig. 6

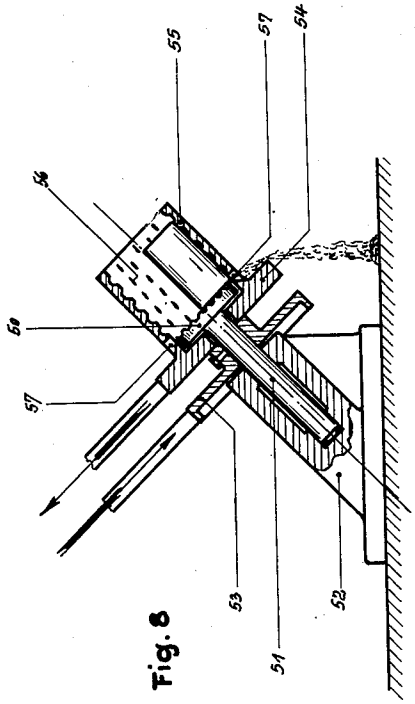


Fig. 8

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UNITED STATES PATENT OFFICE

FRITZ SINGER, OF NUREMBERG, GERMANY

METHOD OF TREATING BILLETS PRIOR TO EXTRUSION

Application filed June 2, 1932, Serial No. 614,959, and in Germany July 4, 1928.

My invention pertains to the treatment of billets, especially of iron and steel, preparatory to the extrusion operation, and to a method of, and apparatus for, conducting such treatment.

In making solid and hollow articles, especially from iron and steel, by the hot extrusion process, the heated billets, immediately before introducing them into the container of the press, must be accurately freed from scale, in order that the extruded articles may have smooth surfaces as well as to avoid undue wear and tear of the extruding tools. It is an object of my invention to provide an improved method of thus freeing the lateral surfaces of the billets from scale, and apparatus for carrying out such method, which object I attain by subjecting the lateral surface or surfaces of the billet to the action of rotating members acting on the billet in such a manner as not to distort or bend its axis.

The rotating members may be the grooved rolls of an ordinary bar mill, or they may be helically-acting rolls such as are employed in piercing, reeling, etc. The rolling pressure may be moderate, so as to result only in a strong treatment of the lateral surface of the billet, with but slight reduction of diameter. Or the rolling pressure may be heavy enough to reduce the diameter of the billet considerably, in addition to removing the scale. The use of bar mills has the advantages that a material reduction of the diameter of round billets can be obtained, concurrently with the removal of the scale, without piercing the billet, or leaving its core spongy, one of which latter effects would result from using cross-rolls applying heavy pressure, and that billets of other than round cross-section can be treated.

It is a further object of my invention to effect the desired removal of scale from the lateral surface of round billets whilst at the same time transforming the billet into a tubular blank,—which will be especially suitable for extrusion into a tubular article, since most, if not all, of the penetrating work ordinarily done by the central mandrel of the extrusion press is eliminated, and the waste of material, taking the form of a plug driven out by such mandrel, is avoided. I obtain this object by subjecting the billet to the action of a cross-roll piercing mill equipped with the usual piercing mandrel, so that the billet is simultaneously freed of scale, brought to the required diameter, and pierced.

It is still another object of my invention to remove the scale from either or both of the end surfaces of the billets, and this is accomplished by subjecting the billets to the action of scrapers operating on one or both of the ends of the billets and having relative rotation with respect thereto.

Various forms of apparatus, constructed in accordance with my invention, for practicing my improved method are described in the following specification and shown in the accompanying drawings. My method, however, may be carried out by other apparatus than that described and shown, and changes may be made in the particular forms of apparatus illustrated, without exceeding the scope of my invention, as defined in the appended claims.

In the drawings:

Figs. 1 and 2 are a side elevation and a plan, respectively, each partly in section, of a cross-roll apparatus for removing the scale from the lateral surfaces of the billets, with scrapers for removing the scale from the end surfaces.

Fig. 3 is a sectional elevation of a cross-roll apparatus for removing the scale from the lateral surfaces of the billets and at the same time piercing the latter;

Fig. 4 is a side elevation, partly in section, of an apparatus combining a bar mill for removing the scale from the lateral surfaces of non-circular billets, with a rotating device for removing the scale from the ends thereof;

Fig. 5 is a section on the line V—V of Fig. 4; and

Figs. 6, 7, and 8 show three other forms of rotating devices for removing the scale.

Referring now to Figs. 1 and 2, 10 designates a frame having mounted therein, for lateral adjustment, suitably driven cross-rolls

11. A feed trough, 12, is disposed at one side of the frame and a delivery trough, 13, on the other. A support, 14, for the billet,—designated *a* throughout,—is disposed between the rolls and is slidably mounted, in suitable guides, upon adjustable studs 15.

Beyond the feed trough 12 is an air cylinder 16, the piston rod 17 of which is square, and is provided, at its outer end, with a head 18 carrying a scraper 19. Beyond the delivery trough 13 is an air cylinder 20, of smaller diameter than the cylinder 16, the piston rod 21 of which is likewise square, and is provided with a head, 22, carrying a scraper 23.

In the operation of the apparatus, the piston is withdrawn in the cylinder 16 away from the cross-rolls, and the piston in the cylinder 20 is advanced towards the cross-rolls until the scraper 23 is at or beyond the throat of the rolls,—i. e., somewhat to the right of the position shown in Fig. 1. A billet having then been placed in the feed trough 12, air is admitted into the cylinder 16 in such direction as to move its piston to the left. The scraper 19 engages the end of the billet and pushes the latter along the support 14 into the cross rolls until the opposite end of the billet engages the scraper 23. Since the diameter of the cylinder 16 is greater than that of the cylinder 20 (the air pressure being the same) the scraper 19 will press upon the billet with greater force than the scraper 23, and the billet will move through the cross-rolls in accordance with the usual action of the latter, the scale being removed and falling away in the manner indicated. Since the billet is rotated by the action of the cross-rolls, and the scrapers are held against rotation by reason of the square shape of the piston rods, the scrapers will remove the scale from the ends of the billet.

Referring now to Fig. 3, the form of apparatus for carrying out my method, shown therein, comprises a frame 24 having mounted therein a pair of piercing cross-rolls 25 (of which only one is shown) into the throat of which a mandrel 26 is adapted to be introduced, in the manner well understood in the art of billet piercing. At the entry side of the frame is mounted a trough 27 for receiving the billet, and beyond this is an air cylinder 28, which may be similar to the air cylinder 16 described in connection with the apparatus shown in Figs. 1 and 2. The piston rod 29 of the cylinder is provided at its end with a head 30 carrying a scraper 31. In the particular form of apparatus shown, the billet is fed to the cross-rolls in a plane above the narrowest part of the throat of the latter, so that the cross-rolls themselves will support the billet, and a guide, 32, above the billet, is all that is necessary.

The billet is placed in the trough 27, whereupon the operator introduces air to the cylinder 28 to cause the scraper 31 to engage the rear end of the billet and push the latter into the cross-rolls. The cross-rolls themselves will forward the billet through the pass, and, the air pressure being properly proportioned, the scraper will remain in contact with the rear end of the billet, removing the scale therefrom in the manner described above. The billet will emerge, pierced, upon the mandrel 26, whence it may be removed for insertion into the container of the press.

Scale on the end of the billet which is uppermost in the container of the extrusion press does not have any material injurious effect, as it retains its position and is ultimately taken away with the extrusion residue. Therefore it is frequently sufficient to remove the scale from one end only of the billet. In the present instance, the flow of the metal, incident to the piercing operation, will cause a material part of the end scale to fall away, so that the fact that the leading end of the billet is not scraped is of particularly small importance, though this end may be separately scraped if, for particular reasons, it is found desirable. Because of the flow of the metal, during the piercing operation, and the consequent loosening of the scale at the ends of a billet, the scraper 31 may frequently be omitted, and an ordinary feeding ram substituted therefor.

Referring now to Figs. 4 and 5, the apparatus, for carrying out my method, shown therein, comprises a bar rolling mill 33 having rolls 34*a* formed with grooves 34 suitably shaped to reduce slightly a billet of non-circular shape, in this case of square cross section. At one side of the mill is a feed trough 35 from which the billet is introduced between the rolls 34, and on the other side of the mill is a delivery roller table 36 leading to an upwardly flared cone-shaped receptacle 37, the lower end 38 of which is open and of substantially the same shape as the billet. Below the open end of the receptacle is a head 39, the upper face of which is formed with integral or attached scraping projections as shown, mounted on a shaft 40 carried by a vertical bearing stand 41. The shaft is suitably driven, as by means of a belt 42.

The billet is delivered from the mill over the roller table 36 and falls into the receptacle 37, the shape of which causes it to occupy the vertical position shown in Figs. 4 and 5, with its lower end resting upon the rotating head 39. The billet is held against rotation because of the shape of the lower end of the receptacle, so that the head will scrape the scale away from the end of the billet. If the apparatus is used in connection with billets of circular cross section, the axis of the head 39 will be placed eccentric to the axis of the receptacle 37,—so as to prevent rotation of the billet with the head, to permit the scraping action to oc-

cur. As has been said, the scraping of one end of a billet will frequently be sufficient. In cases where it is desired to scrape both ends, the billet will be removed from the receptacle by the attendant, and replaced in an inverted position. After being subjected to the action of the scraping head 39, the billets are withdrawn from the receptacle and deposited on a feed table 43 which carries them to the extrusion press.

The apparatus shown in Fig. 6 comprises a hollow roll 44 supported in bearings 45 so as to occupy a position inclined to the horizontal, and adapted to be rotated, as by means of a belt pulley 46. The interior of the roll is formed with either integral or attached scraping projections 47, which may be advantageously arranged in helical lines. The billet is introduced at the upper end of the roll, in the manner shown, and, during the rotation of the roll, will travel towards the lower end thereof, by gravity and the action of the helically arranged projections. However a feed ram, secured against rotation and equipped with a scraper at one end, may be provided, as shown in connection with Figs. 1 and 2. The hollow roll can be placed between the furnace and the extrusion press so as to exercise, in addition to its function of removing the scale, the further function of conveying the billet from the furnace to the press.

In the form of apparatus shown in Fig. 7, a pair of rolls 48 are disposed with their axes parallel but inclined to the horizontal, so that an inclined trough is formed between the rolls. The surfaces of the rolls are provided with integral or attached scraping projections 49, so that the lateral face of the billet will be scraped clean of scale as the billet rotates in the trough formed between the two rolls.

In the form of apparatus shown in Fig. 8, a scraper head 50 is mounted at one end of a shaft 51 rotatably supported at an angle of 45° by a bearing stand 52, the shaft being rotated by means of a pulley 53 secured thereto. Rotatably mounted on the shaft 51 is a pulley 54 carrying a cylindrical container 55, the inner face of which is provided with integral or attached scraper projections 56, the arrangement being such that the scraper head 50 forms the bottom of the container 55. Holes 57 are formed at the lower part of the wall of the container 55 to permit egress of the scales. The container 55 is rotated in the opposite direction to the head 50 so that the lateral surface and the one end of the billet will be simultaneously scraped. If it is desired to scrape the other end of the billet, the latter is reversed in the container.

I claim:

1. The method of producing articles of iron, steel or the like by hot extrusion, which comprises subjecting a billet, heated at least to the temperature required for extruding the same, to the action of rotating members applied to the lateral surface of the billet to knead such surface without distorting the billet axis, thereby to remove scale from the billet, and thereupon, without further heating thereof, inserting said billet into the container of an extrusion press and extruding said billet.

2. The method of producing articles of iron, steel or the like by hot extrusion, which comprises subjecting a billet, heated at least to the temperature required for extruding the same, to the action of rotating rolls applied to the lateral surface of the billet so as to reduce the billet in diameter without disturbing the axis thereof, whereby scale is removed from the billet, and thereupon, without further heating thereof, inserting said billet into the container of an extrusion press and extruding said billet.

3. The method of producing articles of iron, steel or the like by hot extrusion, which comprises subjecting a billet, heated at least to the temperature required for extruding the same, to the action of rotating members applied to the lateral surface of the billet to knead such surface without distorting the billet axis, thereby to remove scale from the billet, and subjecting an end surface of said billet to the action of a member having relative rotation with respect thereto to remove scale from such end, and thereupon, without further heating thereof, inserting said billet into the container of an extrusion press and extruding said billet.

4. The method of producing articles of iron, steel or the like by hot extrusion, which comprises subjecting a billet, heated at least to the temperature required for extruding the same, to the action of rotating members applied to the lateral surface of the billet to knead such surface without distorting the billet axis, thereby to remove scale from the billet, and simultaneously subjecting an end surface of said billet to the action of a member having relative rotation with respect thereto to remove scale from such end, and thereupon, without further heating thereof, inserting said billet into the container of an extrusion press and extruding said billet.

5. The method of producing articles of iron, steel or the like by hot extrusion, which comprises subjecting a billet, heated at least to the temperature required for extruding the same, to the action of a rotating member applied to the lateral surface of the billet so as to remove scale therefrom without disturbing the axis of the billet, and thereupon, without further heating thereof, inserting said billet into the container of an extrusion press and extruding said billet.

6. The method of producing articles of iron, steel or the like by hot extrusion, which comprises subjecting a billet, heated at least

to the temperature required for extruding the same, to the action of a rotating member applied to the lateral surface of the billet so as to remove scale therefrom without disturbing the axis of the billet, simultaneously subjecting an end surface of said billet to the action of a member having relative rotation with respect thereto to remove scale from such end without disturbing the axis of the billet, and thereupon, without further heating thereof, inserting said billet into the container of an extrusion press and extruding said billet.

In testimony whereof, I hereunto sign my name.

FRITZ SINGER.