May 17, 1932. H. KURZ 1,858,860

APPARATUS FOR THE MANUFACTURE OF RAILS WITH HARDENED HEADS

Original Filed July 7, 1928 2 Sheets-Sheet 1

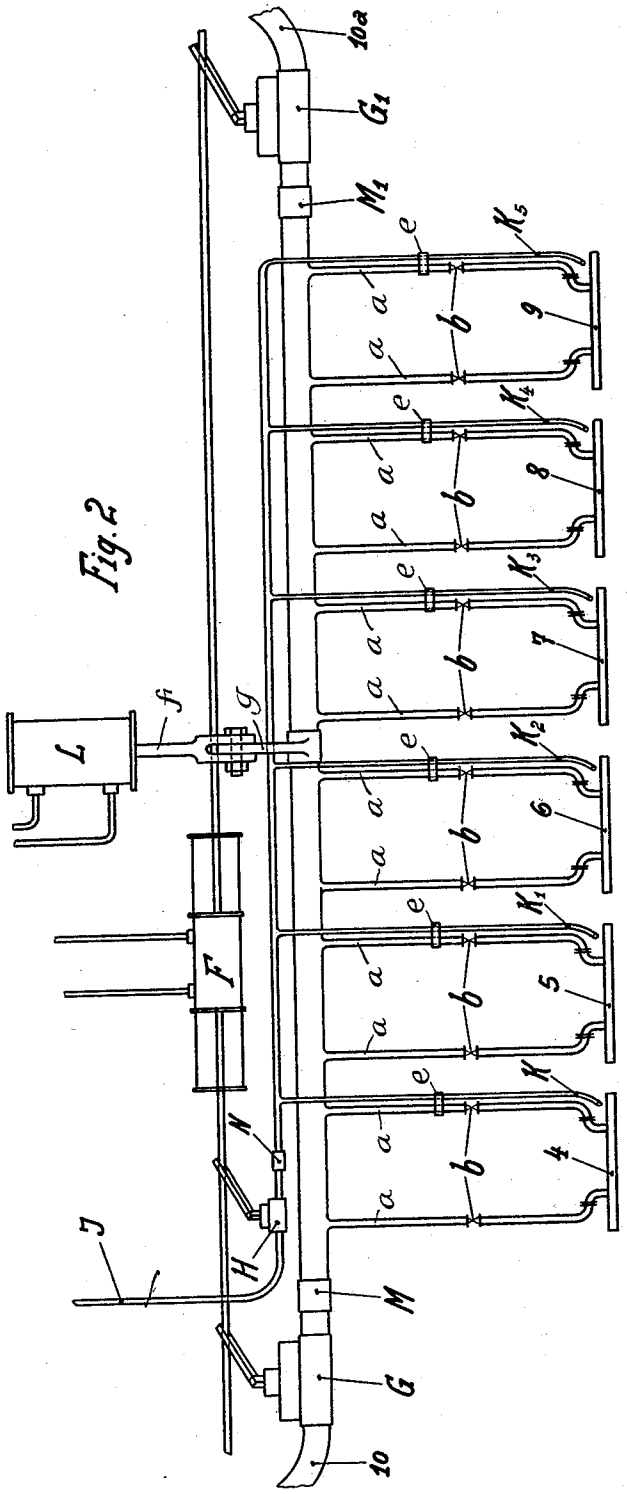


Fig. 2

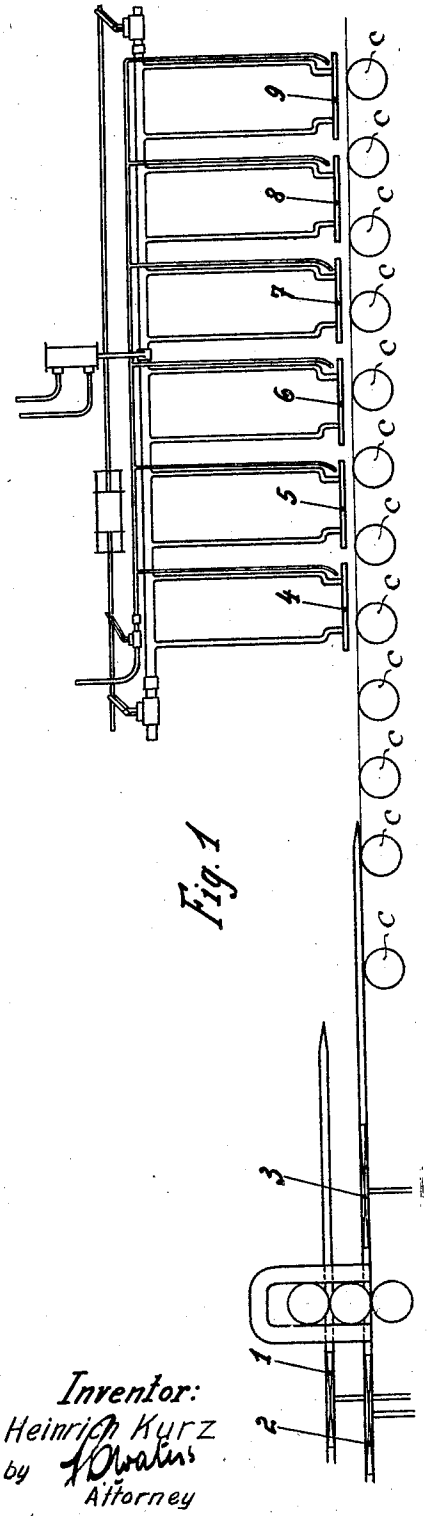


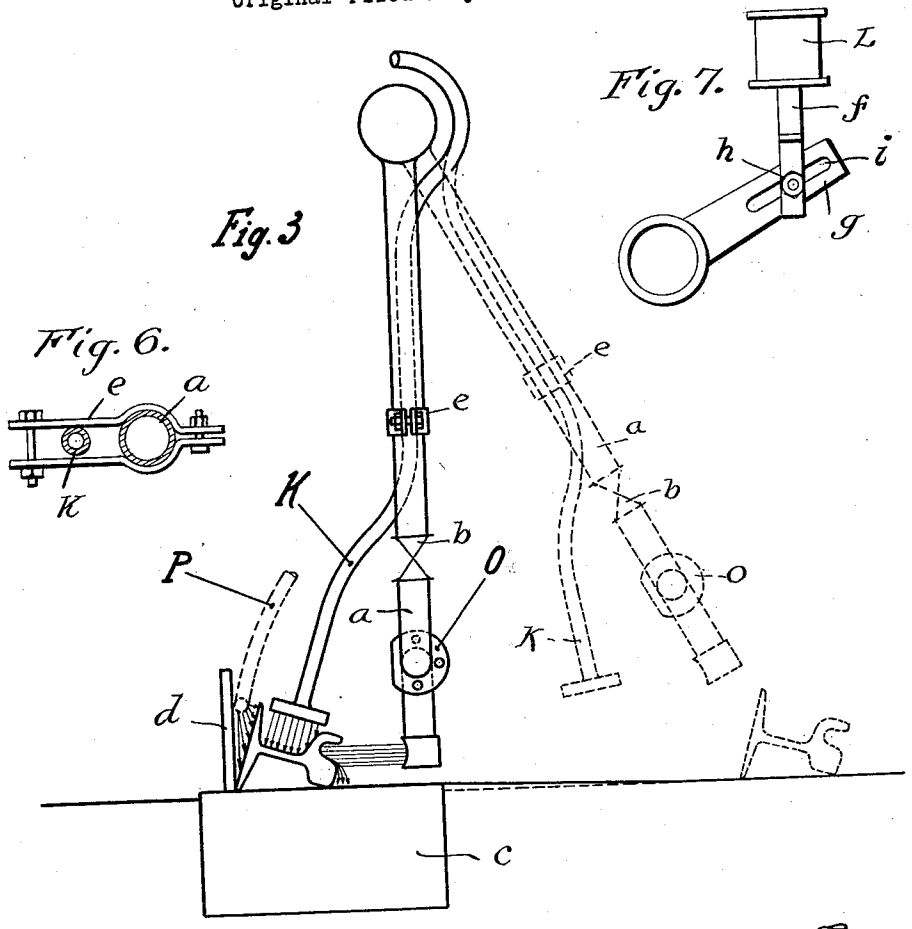
Fig. 1

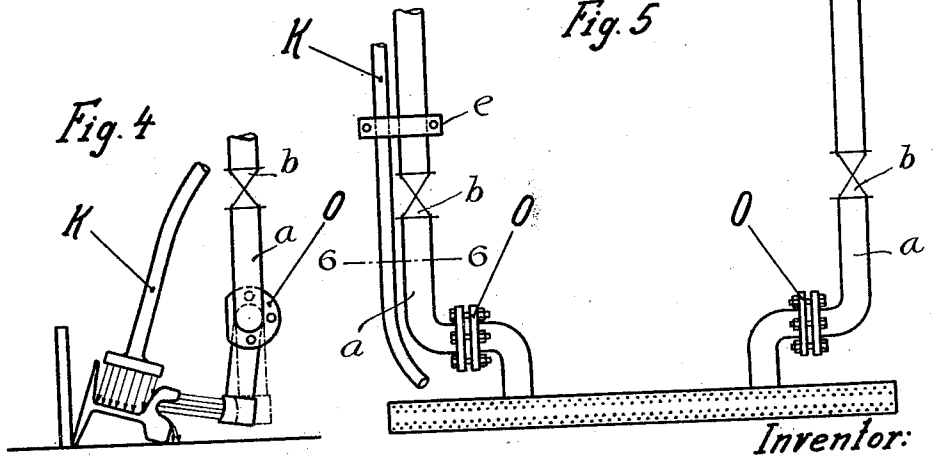
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APPARATUS FOR THE MANUFACTURE OF RAILS WITH HARDENED HEADS

Original Filed July 7, 1928 2 Sheets-Sheet 2





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UNITED STATES PATENT OFFICE

HEINRICH KURZ, OF DUISBURG-RUHRORT, GERMANY

APPARATUS FOR THE MANUFACTURE OF RAILS WITH HARDENED HEADS

Original application filed July 7, 1928, Serial No. 291,036, and in Germany August 22, 1927. Divided and this application filed June 13, 1929. Serial No. 370,699.

The invention has reference to an apparatus for the manufacture of rails with hardened heads especially such as are of unsymmetrical cross-section like grooved rails and rolled articles of a similar kind where certain areas or zones are to be hardened. The apparatus according to the invention is especially adaptable to the most varied cross-sectional shapes and dimensions in the rolled material, as well as to the most varied processes of improving or hardening.

These possibilities are created especially by reason of the fact that horizontal groups of hardening jets or sprays for the production of a substantially horizontal veil of the cooling medium are arranged alongside the path travelled by the material leaving the rolls. These groups of hardening jets or sprays are adapted to be brought into or out of their operative position separately. Further cooling nozzles or jets for the cooling medium are so arranged that the rolled material, when travelling past the above mentioned nozzles or jets, is subjected to an additional cooling treatment of the sole of the rail foot.

By combining the various hardening jets or nozzle into groups that can be brought into or out of action individually, the construction and operation of the apparatus are greatly simplified, whereas by reason of the fact that said hardening jets or nozzles can be each separately regulated, opened or shut, the improved apparatus has the necessary flexibility of regulation. This flexibility of regulation is further increased when orientation of each single hardening nozzle or jet of a group can be separately set, by swivelling said single jet in relation to the piping forming the other jets of said group.

A blast of air or steam is directed against the top side of the web of the overturned or prone rail through blow pipes, each of which is attached to a hardening spray.

A very simplified operation of the whole apparatus is ensured by the fact that, on the one hand the mechanism for controlling the supply of cooling medium to the hardening nozzles or jets is coupled to the mechanism for controlling the supply of the air or steam under pressure impinging on the top side of the rail web, so as to provide a common control for both supplies, and, on the other hand, that a common control mechanism is provided for bringing simultaneously into or out of action all the hardening nozzles or jets forming a group and all the blow pipes for the air or steam under pressure corresponding to said group. In a corresponding manner it is finally possible to connect the mechanism for controlling the supply of cooling medium used for cooling the rail foot with the above first mentioned common control.

The accompanying drawings illustrate an embodiment of the apparatus according to the invention.

Figure 1 represents the improving or hardening apparatus which is connected to a rolling mill;

Figure 2 shows the same apparatus on an enlarged scale;

Figure 3 is an end view of the apparatus;

Figure 4 is a view similar to Figure 3, but in this case the hardening nozzles are shown in an inclined position which enables them to harden directly the check flange of a channel-head rail; while the running surface of the head of said rail is hardened only indirectly by convection.

Figure 5 is a front view of a separate hardening nozzle about a metre long.

Figure 6 is section of part of Figure 5 on line 6—6.

Figure 7 is a side view of a few members in the upper central portion of Figure 2, revealing their respective positions.

Through the views, the same reference characters refer to the same or like parts.

In Figure 1, known jets or nozzles 1, 2 and 3 are arranged in front and behind the rail and serve to rapidly cool the running surface of the rail or to lower its temperature during rolling; without this cooling the rail would leave the rolls at about 1100° C. and would therefore be at a temperature too high for the subsequent treatment. After leaving the rolls the rail on live rolls passes the hardening spray-nozzles 4, 5, 6, 7, 8 and 9 at a speed which is adjusted according to the cross-sec-

tion and the temperature of the rail head. Said rolls may form parts of rail conveying means of known construction and are designated *c*, *c*, etc.

Figure 2 illustrates the arrangement for supplying the cooling medium, for instance water, which by means of the pipes 10 and 10*a* enters the branch-pipes and passes through them into the hardening spray-nozzles 4, 5, 6, 7, 8 and 9. For the purpose of shutting-off one or the other of said nozzles, each branch-pipe is provided with a valve *b*. From the control platform, the main pipe can be shut-off by means of the cocks G and G_1 for instance by means of a hydraulic pressure cylinder F. The levers of the closing cocks G, G_1 are connected with the extension of the piston rod of the above mentioned cylinder F. The same cylinder also controls cocks H, which open or close pipes J. From each of these pipes J, which supplies the air or steam under pressure, the blow pipes K, K_1 to K_5 branch off behind the cock H and act to blow the scale due to the rolling operation off the rail section and are intended to also simultaneously blow off any water that might eventually have reached the rail web and have collected there. For the purpose of permitting the lateral removal of the rail after it has been treated, the movable parts of the apparatus are brought into the position shown in dotted lines in Figure 3 by means of the control cylinder L which is also operated from the control platform. The main pipe for the water supply 10, 10*a*, as well as the auxiliary pipe *j* for steam or air are rotatably mounted in the stuffing boxes M, M_1 and N respectively in separate sections, corresponding each to a group of several hardening nozzles (6 in the embodiment shown). The hardening spray-nozzles proper can be individually swivelled somewhat by means of the flange arrangements O so that either the running surface or the check flange of a channel rail may, according to requirements, be treated. Of course it is also possible to improve simultaneously the check flange and the running surface of such a rail by setting the orientation of the successive hardening nozzles or jets 4 to 9 alternatively in the directions shown respectively in Figures 3 and 4 during one and the same travel of the rail.

The arrangement above described can be employed in various ways. Thus for instance it is possible to operate only the spray-nozzles 4, 5, 7 and 9 and to shut off the nozzle 6 and 8. If now the rail passes slowly through the inoperative space created by shutting-off the above mentioned two nozzles, then the rail can be tempered. The effect is the same as the effect of a known process of immersion wherein the rail is immersed at intervals in a water bath. Figure 3 indicates in dotted lines the lower end of one of the sprays or nozzles P that are intended to serve for cooling the sole of the rail foot. (This nozzle P is not shown entirely and in full line because it is not in the plane of the parts shown in this figure).

In order to properly concentrate the jet issuing from nozzle P the spray baffle *d* is vertically disposed on conveyer *c*, and is shown higher than the base of the prone rail beside it for which it also forms a stop.

In each case, the pipe *k*, k_1 etc. is loosely held in association with the adjacent pipe *a* by a clamp *e* in order to hold the same in general assembled relation with the respective pipe *a* as particularly made clear by Fig. 6 which is, as already indicated, a section of pipes *a* and *k* of Fig. 5 on line 6—6. The smaller pipe *k* is free to move a little within the confined space in the clamp in order to allow for both pipes having their respective pivot points arranged at a slight distance from each other so that they may be swung high up to a predetermined angle in a manner already indicated.

In Fig. 7, the connection of the piston rod *f* of control cylinder L with control lever *g* is had through a bolt or pin *h*, there being a slot *i* in the lever to adjust the differences in movement of the piston rod and lever. Said lever *g*, by means of which the spray nozzles may be swung as already described, of course has an arcuate movement while piston rod *f* merely reciprocates in a straight line, hence the slot *i* provides the sliding clearance for the bolt *h*.

Hence, with this construction, it is possible for the piston rod to move straight forward or recede and thereby move control lever *g* within certain useful limits.

The apparatus above described is to be utilized with especial advantage for carrying out the process for the manufacture of rails with hardened heads forming the subject of my co-pending application Serial No. 291,036 of which the present case is a division.

What I claim and desire to secure by Letters Patent of the United States is:

1. Apparatus for the manufacture of rails with hardened heads, comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, and hardening spraying means adapted to direct a substantially horizontal spray of cooling medium only against the rail head.

2. Apparatus for the manufacture of rails with hardened heads, comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium only against the rail head and arranged in a group along the path travelled by said rail and mechanical means to put into or out of action said groups of hardening spraying means.

3. Apparatus for the manufacture of rails

with hardened heads comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium against the rail head and arranged in a group along the path travelled by said rail, each of said hardening spraying means being swivelled to its support and mechanical means to put into or out of action said group of swivelled hardening spraying means.

4. Apparatus for the manufacture of rails with hardened heads comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium against the rail head and arranged in a group along the path travelled by said rail, each of said hardening spraying means being swivelled to its support, mechanical means to put into or out of action said group of swivelled hardening spraying means and cooling spraying means adapted to direct spray of cooling medium against the sole of the foot of the overturned rail being treated.

5. Apparatus for the manufacture of rails with hardened heads comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium against the rail head and arranged in a group along the path travelled by said rail, each of said hardening spraying means being swivelled to its support, mechanical means to put into or out of action said group of swivelled hardening spraying means, cooling spraying means adapted to direct a spray of cooling medium against the sole of the foot of the overturned rail being treated, and cleaning blow means adapted to direct a blast of pressure medium against the web of the overturned rail being treated.

6. Apparatus for the manufacture of rails with hardened heads comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium against the rail head and arranged in a group along the path travelled by said rail, each of said hardening spraying means being swivelled to its support, mechanical means to put into or out of action said group of swivelled hardening spraying means, cooling spraying means adapted to direct a spray of cooling medium against the sole of the foot of the overturned rail being treated, and cleaning blow means adapted to direct a blast of pressure medium against the web of the overturned rail being treated, said blowing means being connected to a hardening spraying means and in a group to the mechanical means controlling said group of hardening spraying means.

7. Apparatus for the manufacture of rails with hardened heads comprising means for conveying continuously at a given speed the rail to be treated overturned on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium against the rail head and arranged in a group along the path travelled by said rail, the supply pipes for said hardening spraying means being provided with valves for regulating or shutting the supply of cooling medium separately to each of said hardening spraying means and mechanical means to put into or out of action said group of individually adjustable hardening spraying means.

8. Apparatus for the manufacture of rails with hardened heads comprising means for conveying continuously at a given speed the rail treated laid on its side, hardening spraying means adapted to direct a substantially horizontal spray of cooling medium against the rail head and arranged in groups along the path travelled by said rail, each of said hardening spraying means being swivelled to its support, mechanical means to put into or out of action separately each of said groups of swivelled hardening spraying means, cooling spraying means adapted to direct a spray of cooling medium against the sole of the foot of the overturned rail being treated, cleaning blow means adapted to direct a blast of pressure medium against the web of the overturned rail being treated and a common control device for controlling at the same time the main supply of cooling medium to said hardening spraying means and the main supply of pressure medium to said blowing means.

HEINRICH KURZ.