Feb. 10, 1931. F. JORDAN 1,792,377

PROCESS FOR ROLLING OUT SHEET AND HOOP OR BAND IRON

Filed July 16, 1928

Fig.1.

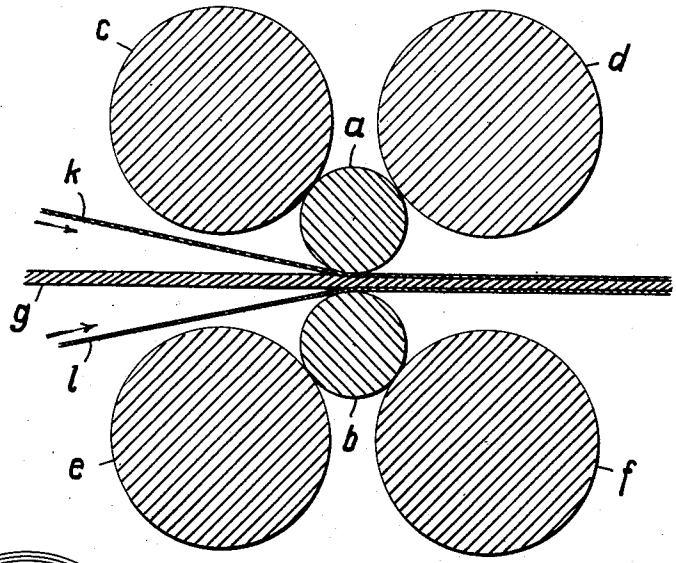
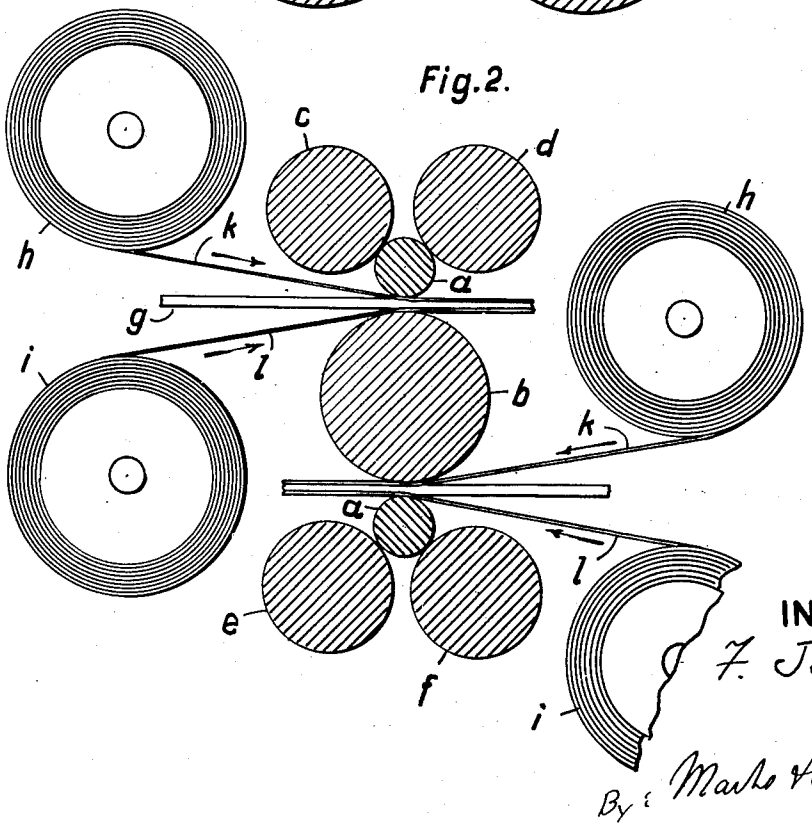


Fig.2.



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UNITED STATES PATENT OFFICE

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PROCESS FOR ROLLING OUT SHEET AND HOOP OR BAND IRON

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In rolling out iron plates or strips, either cold or heated up to about 500° C., the roll pressures employed have hitherto had to be limited. Under the conditions existing hitherto, if these maximum pressures were materially exceeded, the rolls would have slipped upon the material under treatment, and the latter would have been so severely torn at the edges that it would have been wholly or partly useless for further treatment.

Hitherto for such work there have been employed rolling mills such as the one shown in Figure 6 of United States patent specification No. 46,371. If the roll pressure were to be increased beyond a certain permissible limit, when employing this rolling mill, the rolls would bend. As a result of this the material under treatment would have been rolled out to a non-uniform thickness. Those rolling mills illustrated by the dotted lines in Figure 5 of the same patent specification do not remedy this defect. Even with these mills it is impracticable to exceed a certain limited increase of roll pressure. In order to be able to increase the roll pressures considerably, for instance to a multiple of the pressures hitherto employed for rolling out iron material, it would be necessary to have recourse to other known rolling appliances. Two forms of construction of such rolling appliances are illustrated in sectional elevation in Figures 1 and 2 of the accompanying drawings. Such a great increase would however be impossible if it is desired to prevent slipping of the rolls upon the iron plate and tearing of the edges of the iron material.

By the process according to the present invention, however, it is possible, when using the known arrangement of rolls illustrated in Figures 1 and 2 of the accompanying drawings, to employ a multiple of the pressures hitherto usual and thereby to shorten and cheapen the rolling operation without suffering from the above-mentioned disadvantages and disturbances, if the material under treatment, merely for the purpose of preventing slipping thereof between the working rolls *a* and *b*, which are supported by counter-pressure rolls *c*, *d* and *e*, *f*, is equipped with coatings which increase the friction of the material against the roll surfaces, by giving rise to an adhesive effect. Such an adhesive property is possessed by aluminium.

I have ascertained that at high roll pressures an iron core formed of iron plate and coated on both sides with thin sheets of aluminium almost completely absorbs the aluminium. Thus the aluminium penetrates under the high pressures into the numerous fine pores of the iron, in such a way that it remains as if it had grown into the depth of the iron in fine filaments through innumerable capillaries. The result of this process is firstly a considerable increase in the tensile strength and extensibility or elasticity of the iron.

In addition to this, however, the aluminum coating, under high roll pressures and the heating of the workpiece that occurs owing to the distortion of its texture, becomes plastic, and exerts, so to speak, an adhesive action. Slipping of the sheets between the rolls is therefore reliably prevented. This process renders it possible to increase the roll pressure to a degree which has hitherto been regarded as impossible in the rolling of iron plates.

Now the plating of iron plates with aluminum as an end in itself is known. In the present case, however, it is not a question of plating but of shortening the time occupied in rolling iron slab blooms into iron plates, sheets and strips, wherein a coating of aluminum, applied to the initial iron material on both sides and rolled with it serves only as an auxiliary means for preventing slipping. This auxiliary coating becomes during the rolling so thin that in the final product it only appears as a film-like skin, or entirely or almost entirely disappears. It will therefore exert no independent properties as a plating, but where it is not injurious in the final product it may remain thereon, or where it is undesirable in the final product it may be removed therefrom, by means of a brushing process for example.

The rolling of the material itself is moreover effected, according to the present inven-

tion, in a manner known in itself, either in a cold condition or heated up to 500° C. According to the thickness of the iron slab bloom employed a reduction of the material by from 1 to 5 millimetres may be obtained in a single pass, which has hitherto been unobtainable in cold rolling. Evidently the process may be employed for plates of any thickness and breadth.

The initial material, for instance an iron slab bloom *g* of from 12 to 30 millimetres in thickness, is fed to the working rolls *a*, *b* in a horizontal direction. Between the working rolls the material *g* unites with thin strips or sheets of aluminium *k* and *l* unrolling from separate reels *h* and *i*. These sheets or strips then act, during the rolling operation, as means for preventing slipping. By successive repetition of the rolling operation, wherein the material is reduced each time to a considerable extent, the first time by from 3 to 5 millimetres in the case of slab blooms from 12 to 30 millimetres thick, the desired iron plate or strip is finally obtained, which is only coated with a thin film-like covering of aluminium, which may then be brushed off or remain if it is not disadvantageous in or upon the final product.

What I claim is:

A method of shortening the time of rolling out of iron plates, sheets and bands, consisting in passing the iron through rolling mills comprising a pair of working rolls of small diameter so supported by counter-pressure rolls that the working rolls cannot yield in any direction, employing very high roll pressures, and applying to the surfaces of the iron that is being rolled, for the purpose of increasing the friction between the working material and the roll surfaces and thereby preventing slipping of the rolls, two aluminium sheets completely covering the surfaces of the iron core material and passing through the working rolls along with it, these aluminium coverings being of only such thickness that they are driven by the high roll pressures plastically and substantially completely into the pores of the iron core, so that in the final product the aluminium cannot exert independent properties as aluminium plating but leaves the surface of the iron substantially unaffected.

In testimony whereof I have signed my name to this specification.

FRANZ JORDAN.