Jan. 14, 1930. N. A. ROBERTSON 1,743,687

RAM FOR METAL EXTRUSION PRESSES

Filed April 8, 1926

Fig. 1.

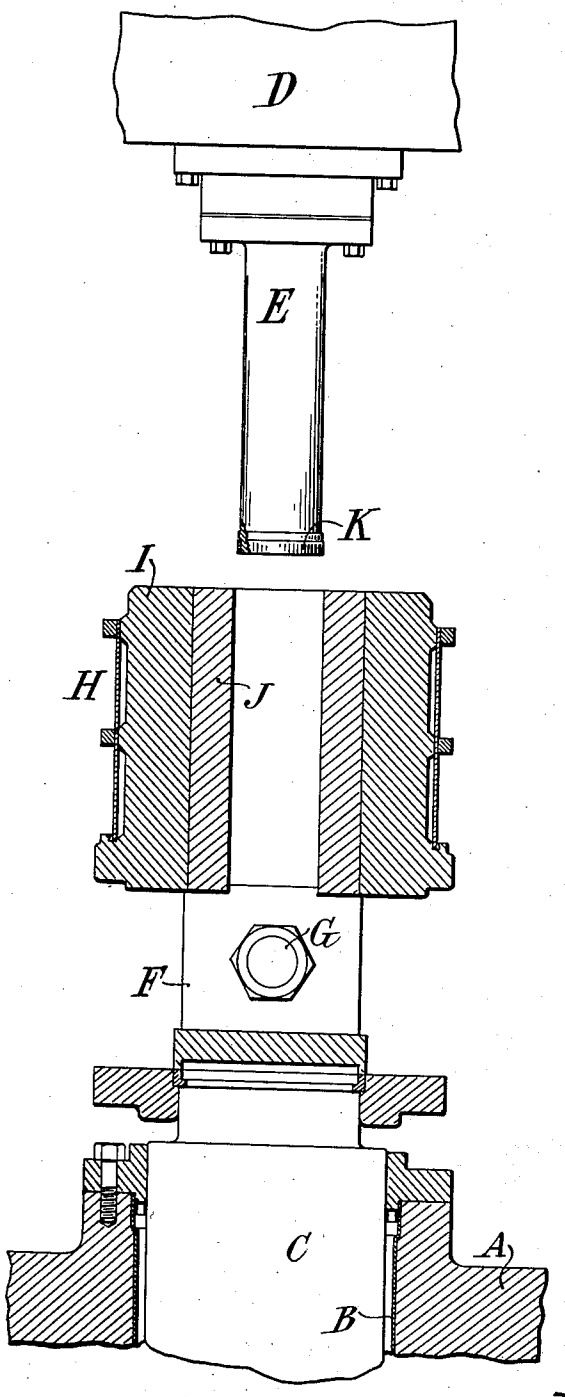


Fig. 2.

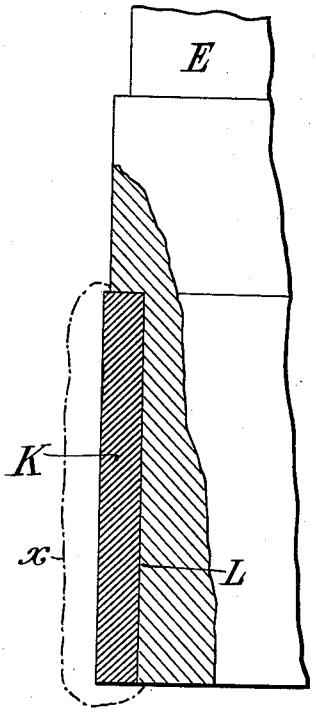
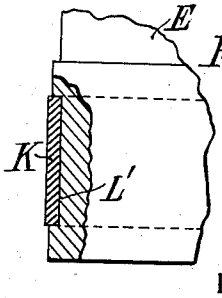


Fig. 3.



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UNITED STATES PATENT OFFICE

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RAM FOR METAL-EXTRUSION PRESSES

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This invention relates to hydraulic presses used for extruding metals, such as lead, in the form of continuous rods or tubes.

In such lead presses the molten lead is poured into the extrusion cylinder at about 700–750° F., and when cooled to approximately 500° to bring it to the plastic state, pressure is applied to the extrusion ram to cause the lead to flow out through the extrusion die.

In such presses difficulty is encountered because of the cutting or tearing of the metal of the cylinder lining or the ram, or both, when they are forced into intimate contact either during the power or extruding stroke, or the return stroke. It is customary to make the hydraulic extrusion cylinder with a liner of very hard metal, and to make the ram also of very hard metal, and to make the ram head, which acts as a piston within the cylinder, of as close a working fit as is practicable. The cutting or abrasion referred to (which is most pronounced while the parts are new) greatly reduces the effective life of both the ram head and the cylinder liner.

The present invention in great measure avoids these difficulties. The ram head is provided with a contact ring of metal different from the metal of the cylinder liner. The cylinder liner is preferably made of a heat-treated alloy steel, and the ring may be of any metal which is so different from the metal of the liner and of such characteristics that on its making forcible contact therewith it will be free from destructive effect upon the surface of the liner. In other words, the metal used for the ring must have no mechanical "affinity" for the metal of the liner in the sense known to engineers (being a meaning wholly different from that used by chemists) as indicating a molecular or grain structure such that on their being forced together with great pressure during movement, the one will carry away a portion of the surface of the other. The cylinder liner being of steel, the ring metal should preferably be non-ferrous. It must be of such hardness as to resist the destructive effect of the high pressures used. A hard aluminum bronze is suitable, but the best metal thus far ascertained is Monel metal (about 70 per cent nickel and most of the remainder copper, with small proportions of certain other metals).

The accompanying drawing shows the preferred application of the invention.

Figure 1 is a vertical mid-section of a portion of a lead press, parts thereof being shown in elevation.

Fig. 2 is a fragmentary section on a much larger scale, of the lower portion of the extrusion ram (being the portion of the ram head shown in section in Fig. 1).

Fig. 3 is a similar fragmentary view on a smaller scale than Fig. 2, showing a modification.

A conventional type of lead press is shown in the drawing simply by way of illustration. Fig. 1 shows a fragment of the press bed A forming the hydraulic cylinder B in which moves the hydraulic plunger C. Connected with the bed A through the usual upright tie-rods (not shown) is the fixed press head D, beneath which is rigidly mounted the extrusion ram E. On the hydraulic plunger C is mounted in usual manner the die block F carrying the die G, and above this the lead cylinder H having the usual outer member or jacket I made of metal of great tensile strength to resist bursting, and having the usual liner J made of metal of suitable hardness to resist abrasion. These parts and their customary accessories are all of the usual construction, except for the head of the ram E.

The ram head, which ordinarily is made a close working fit with the cylinder liner, is provided with a ring K of Monel metal or other suitable metal or alloy, which has sufficient hardness to resist abrasion under

the high pressures used. This ring projects very slightly beyond the head and makes as close a fit with the liner as is practicable. While it is conceivable that this ring might be applied to the ram head in some mechanical manner, and efforts in that direction have had a certain degree of success, the best means for uniting the ring to the head, and which has been found to be practical under conditions of use, is by the welding or fusing of the ring in place on the ram head. For this, the ram head is slightly reduced at L, where the ring is to be applied, and the metal for the ring is fused on under high heat, preferably by means of the oxy-acetylene flame or by electric arc welding. This operation is performed by directing the flame or arc against the reduced portion L of the head (which may first be preliminarily heated to advantage), whereby it is raised to a high temperature, and the pencil of the alloy to be used is applied so that the alloy is fused and coated onto the metal of the head in a mass which is gradually built up as the operation proceeds, to a thickness somewhat greater than that of the ring in its ultimate form. By this means the two metals are united with extreme intimacy by a welding or fusion at their connecting portions such that they are so strongly joined as to enable the ring to hold its place notwithstanding the extreme stresses to which it will be subjected in the operation of the press. The ring metal thus fused or welded on may form an externally irregular mass such as indicated by the dotted line *x* in Fig. 2, and is afterward turned down and ground to the precise external diameter required for making a proper fit. The projection of the ring beyond the diameter of the head should be very slight; for example, in a head approximating ten inches in diameter, the ring may project .02 inch to .03 inch radially beyond the head, and its diametral clearance within the cylinder liner may be .01 inch. This close clearance diminishes to the minimum any up-leakage of lead between the ram and cylinder.

In the use of presses of this character the extrusion head and cylinder liner are subjected to strains of great severity. The initial clearance is inevitably increased by the effect of the pressure required for rapid extrusion, so that the cylinder and its liner yield to this pressure, and thereby the clearance becomes too great for the effectual guiding of the ram head within the liner around its entire circumference, and under the longitudinal pressure the ram springs somewhat, so that its head may be thrust to one side and into metallic contact on that side with the liner. This contact under severe pressure has produced the cutting or scoring which prior to this invention has greatly reduced the life of both these parts of the press. This cutting occurs most when the parts are new, and gradually diminishes as the surfaces glaze over in course of use. This cutting occurs both during the working stroke and the return stroke; on the return stroke it is due to some lead having worked up into the clearance, and this as the motion is reversed extrudes back again, wedging the ram to one side. These difficulties are successfully overcome by the present invention. The ring may be made of any suitably hard metal sufficiently diverse from the metal of the liner. An alloy should be used which will be unchanged in consequence of the fusion incidental to welding it on, as certain bronzes otherwise suitable are found to be deteriorated by the burning out of some of their elements during welding. It is possible to apply the ring by casting it on instead of welding.

In the use of the press the ring prevents cutting or scoring of the liner at the first, when the metal of the liner is most liable to injury; later on this metal becomes hardened by the heat and pressure, so that it receives a glass-like surface of great hardness, after which it is much less liable to be injured by scoring; the metal of the ring will gradually wear away from the ram head, and eventually it may be so reduced that it has no longer any projection beyond the ram head itself, or its metal may be distributed along the surface of the ram head, and in either case the press will continue to function successfully.

The contact ring or bearing ring K is preferably applied at the extreme end of the ram head, so that it directly receives the thrust of the lead, and this thrust transmitted through the ring is resisted by the shoulder at the upper limit of the reduced portion L.

It is within the invention, however, to apply the bearing ring K above the bottom end of the ram head, as shown in Fig. 3. In this case the reduced neck L′ does not extend to the bottom end of the ram head, but terminates somewhat above the bottom, as shown.

What I claim is:—

1. In an extrusion press comprising a ram and cylinder, the ram head having an annular recess at its end, a contact ring welded into said recess, said ring of a non-ferrous alloy, and exposed at the end of the ram to receive directly its proportional part of the extruding thrust.

2. In an extrusion press comprising a ram and cylinder, the latter having its interior of steel, the ram head having an annular recess, and a contact ring of non-ferrous alloy of high melting point welded into said recess.

3. In an extrusion press comprising a ram and cylinder, the latter having its in-

terior of steel, the ram head having an annular recess, and a contact ring of an alloy consisting mainly of nickel with a smaller proportion of copper welded into said recess.

4. In an extrusion press comprising a ram and cylinder, the latter having its interior of steel, the ram head having an annular recess, and a contact ring in said recess of Monel metal.

5. An extrusion press comprising a ram and cylinder, the latter having its interior of steel, the ram head having attached to it a contact ring of Monel metal.

In witness whereof, I have hereunto signed my name.

NORMAN A. ROBERTSON.