

April 17, 1934.

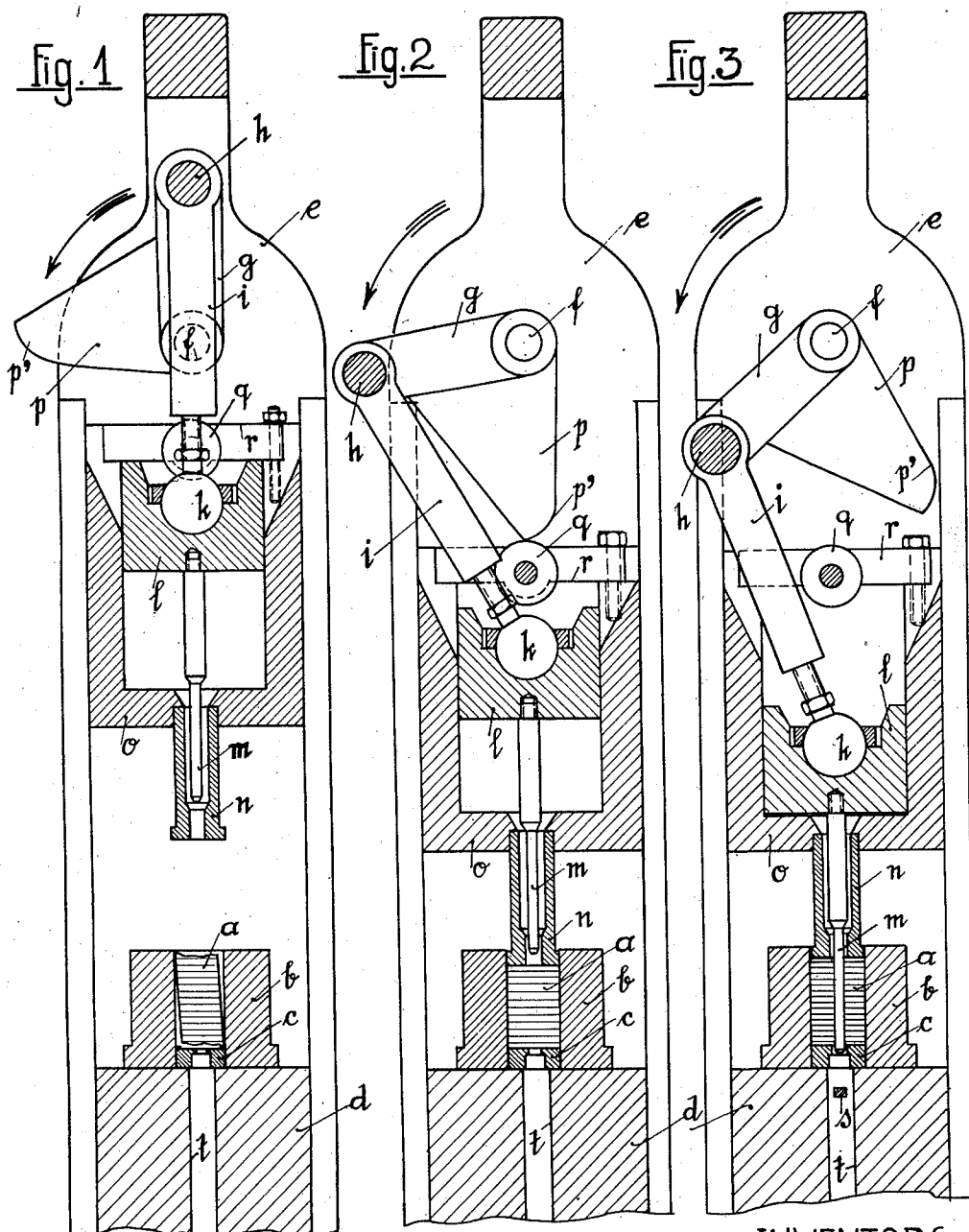
A. LIEBERGELD ET AL

1,955,243

METHOD OF PRODUCING SEAMLESS TUBES BY EXTRUSION

Filed Jan. 9, 1926

2 Sheets-Sheet 1



INVENTORS:

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Alfred Liebergeld

April 17, 1934.

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2 Sheets-Sheet 2

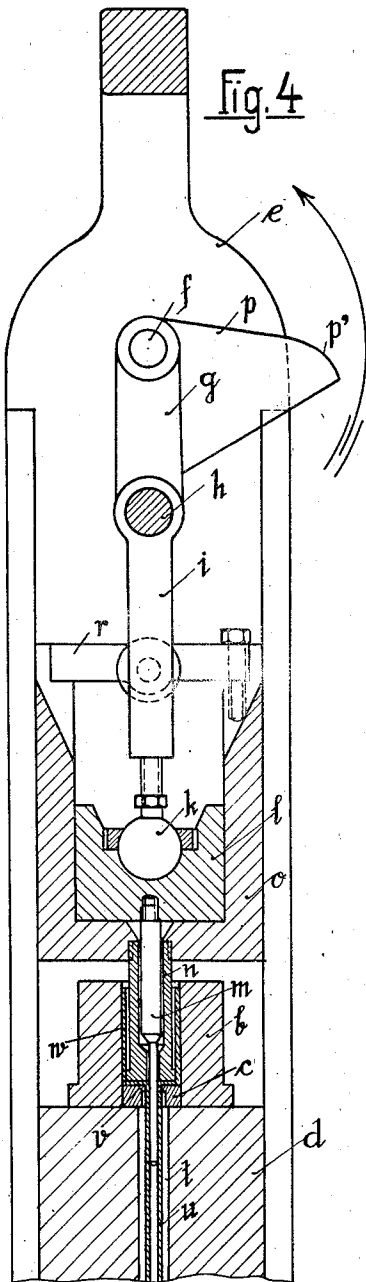
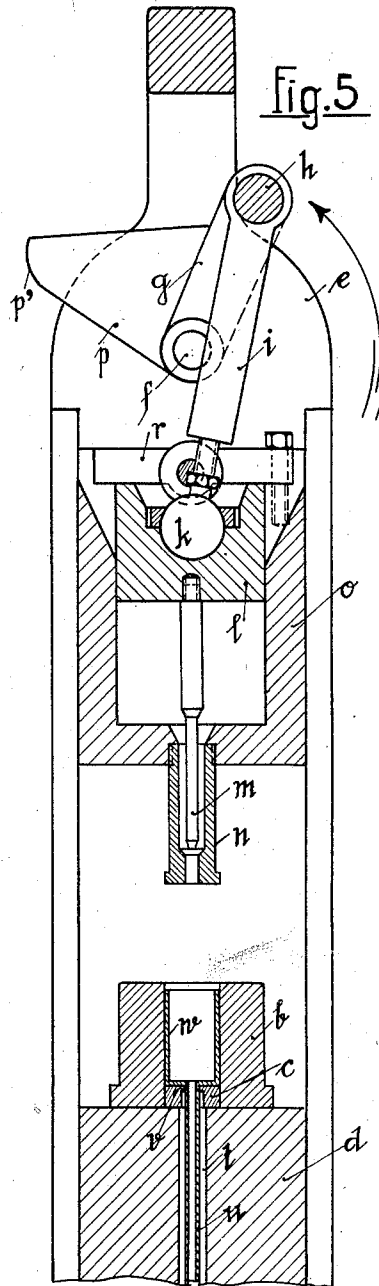
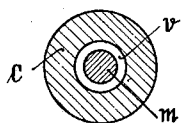


Fig. 4a

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UNITED STATES PATENT OFFICE

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METHOD OF PRODUCING SEAMLESS TUBES
BY EXTRUSION

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In Germany January 12, 1925

1 Claim. (Cl. 207—10)

The invention relates to the production of seamless tubing by extrusion. While it is applicable to tubing made from various metals, it has special applicability to tubing made from heated billets of ferrous or ferrous base metals such as iron, steel and steel base alloys.

In the practice of the invention a heated billet is placed in the bore of an extrusion press container which is preferably vertically disposed. Prior to extruding it as a tube, the billet is subjected to an initial pressure to avoid the formation of cracks in the metal which might otherwise occur when a mandrel is passed through the billet, and to gain other advantages. When the billet is solid, as it is herein illustrated, the mandrel is passed through it while the billet is under its initial pressure, and the mandrel thus effects the entire piercing operation. In all cases, the initial pressure is sufficient to cause the billet to fill the container as much as possible prior to the beginning of the extrusion operation, and to cause the billet to remain in a fixed position while the mandrel passes through or pierces the billet.

The invention will be further understood from the following description of the construction and operation of a mechanical extrusion press which is highly advantageous for the extrusion of seamless tubing from heated billets of ferrous metals, among other reasons, on account of the more rapid starting of such a press and the higher speed of the press ram as compared to the starting and ram speed of a hydraulically driven press.

In the drawings, Fig. 1 is a vertical section of the press, and Figs. 2 to 5 are similar views showing the parts in different operating positions.

Referring to Fig. 1, the cylindrical blank *a*, heated to the necessary temperature, is inserted into the bore of the support *b*, the bottom of which is provided with a die *c*. This support *b* is fixed on the table *d* of the upright *e* of the press, which is shown as a vertical frame.

The crank mechanism of the press, for which an eccentric mechanism might be substituted, comprises a crank shaft *f*, a crank *g*, a connector *h*, a connecting rod *i*, a ball and socket joint *k*, which may be constructed as a pivot joint and a reciprocating guide-piston *l* for guiding the connecting rod. A perforating mandrel *m* is fixed in the bottom of the piston *l* and its diameter corresponds to the inner diameter of the tube to be extruded.

The punch *n*, which is hollow and concentrically surrounds the perforating mandrel *m*, is fixed

in the end face of a freely movable plunging piston *o*, the inner surface of which serves to guide the piston *l*, said plunging piston being guided in the uprights *e* on its outer surface. The guiding piston *l* with the mandrel *m* is positively moved from the crank mechanism. The plunging piston *o* with the punch *n* is positively moved by means of driving devices in the same axial direction as the piston *l* and intermittently controlled in accordance with the operations.

Special mechanical means and the movement of the material to be perforated serve as driving means. The mechanical driving means consists of a cam disk *p* keyed on the crank shaft and having a contact face *p'* which acts upon a roller *q* mounted in a transverse bridge *r*. The bridge is fixed in the open end of the plunging piston *o* so that said roller can be easily rotated. Instead of the cam disk mechanism described a toggle lever mechanism or a controlling grooved disk gear can be used.

The press operates as follows:—

Fig. 1 shows the position of the driving mechanism, the pistons and the rams prior to the starting of the press in the upper dead center position. The piston *o* is suspended by its bridge *r* on the piston *l* and descends with the same. After the punch *n* comes in contact with the blank *a* the piston *l* alone continues the descent. The contact face *p'* of the cam disk *p* comes in contact with the roller *q* and lowers the same and the piston *o* with the punch at slow speed until the blank has completely filled the gap between the punch and the die *c*.

The preliminary pressing of the blank *a* is completed at the moment at which the cam disk *p* moves away from the roller *q*. The punch *n* rests for a moment on the preliminarily pressed blank *a* without exerting any movement and without exerting any further pressure.

As shown in Fig. 3 the mandrel *m* which continues its descending movement now perforates the blank. The material displaced by this step makes the blank *a* longer whereby the punch *n* together with the plunging piston *o* are pushed slightly upward. Only a small portion of the material displaced by the mandrel *m* drops as a slug *s* through the bore *t* of the working table *d* which is designed to receive the finished tube *u*.

As shown in Fig. 4 the guide piston *l*, continuing to descend, directly contacts, after the perforating has been completed with the bottom plate of the plunging piston *o*, so that the two pistons *l* and *o* and the two punches *m* and *n* will, from this moment, descend together and

press out the material of the blank in the shape of a tube *u* through the ring-shaped opening *v* (Fig. 4a) which is formed between the stationary die *c* and the descending mandrel *m*. At the end of the stroke the preliminary treatment of the blank *a* and the tube extrusion are terminated and the crank *g* is at the lower dead center position.

At the return stroke crank mechanism *f, g, h, i, k, l* will move the mandrel *m* back according to Fig. 5 until the guide piston *l* which guides the connecting rod contacts with the bridge *r* which carries the roller so that from this moment the plunging piston *o* with the punch *n* is drawn along and returns into the initial position to which the cam disk *p* has also returned. In Fig. 5 the elements are almost in the initial position in which they are shown in Fig. 1.

The tube *u* which is still connected with the residue *w* from extruding is then severed in a manner known per se, whereupon the tube and the residue from extruding can be removed.

Instead of the guide piston and the plunging piston engaging the one with the other, pistons may be used for the punch and the mandrel which move side by side.

We claim:

A method of extruding seamless tubes from semi-hard and hard metals, which consists in subjecting an unbored billet of metal to an initial pressure in order to fix it in a container, then piercing the billet while it is subjected to said initial pressure, and extruding the perforated billet through a die to form the tube.

FRITZ SINGER.

ALFRED LIEBERGELD.

20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150