April 6, 1937. R. W. DINZL ET AL 2,075,803

HORIZONTAL EXTRUSION PRESS

Filed Sept. 6, 1935 2 Sheets-Sheet 1

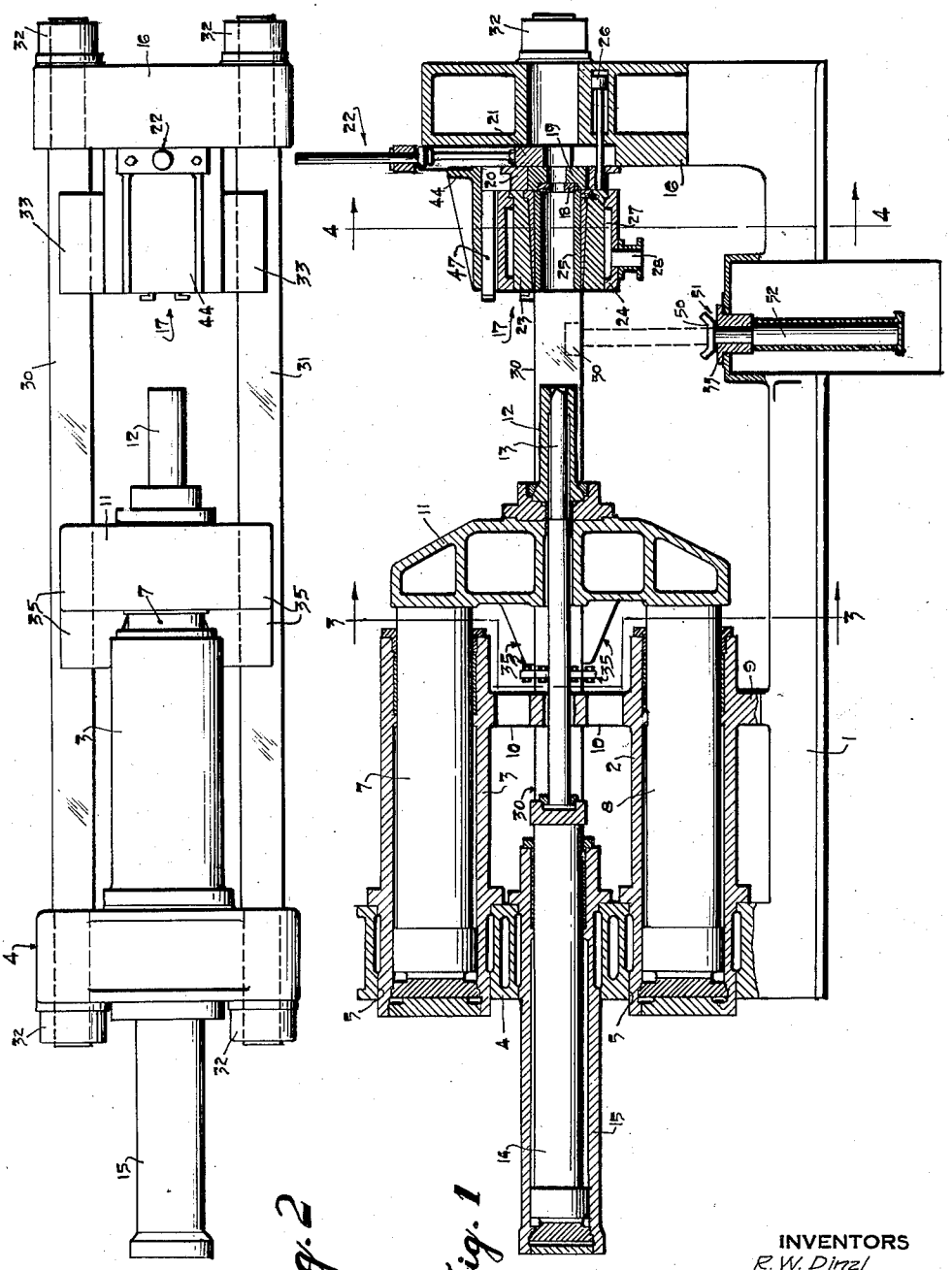


Fig. 2

Fig. 1

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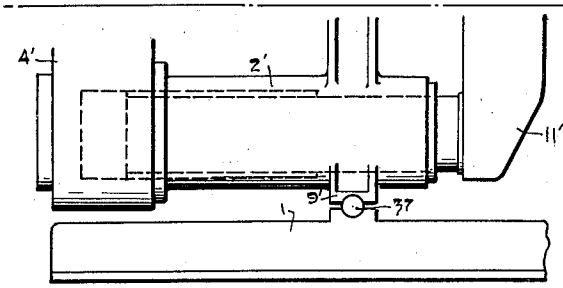


Fig. 6

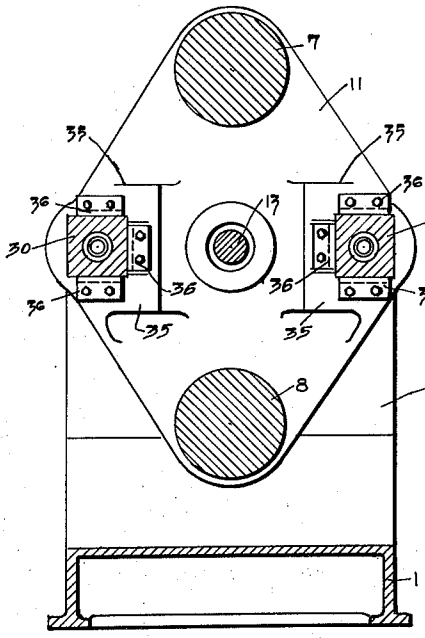


Fig. 3

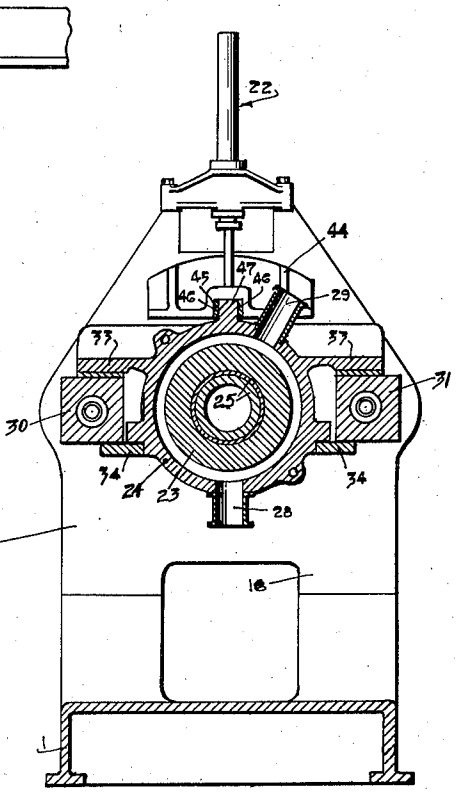


Fig. 4

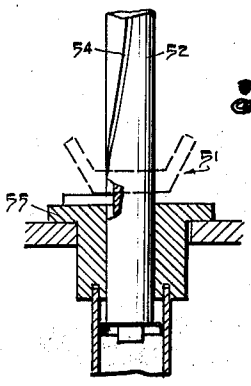


Fig. 5

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2,075,803

HORIZONTAL EXTRUSION PRESS

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Application September 6, 1935, Serial No. 39,438

12 Claims. (Cl. 207—3)

This invention relates generally to horizontal extrusion presses and more particularly to an improved combination of elements for maintaining the die and plunger in alignment during expansion or contraction of those parts of the press which are subjected to considerable heat during extruding operations, although the invention also relates to features for improving the efficiency and operation of the press.

The extrusion of hot metals in horizontal presses has long presented the problem of maintaining the die and plunger in substantially precision alignment during expansion of those parts of the press which are necessarily subjected to heat during extruding operations. This has long been recognized as a very important problem in view of the tremendous operating forces involved together with the large size of the press, particularly in horizontal presses wherein expansion would normally take place in an upward direction with respect to the foundation. Such vertical expansion may vary widely at longitudinally spaced points of a horizontal machine depending upon the extent of localized heat. Various devices and arrangements have heretofore been proposed in an attempt to provide a satisfactory solution to the foregoing problem, but such prior arrangements have been deficient in one respect or another. In certain of these prior arrangements, it is attempted to maintain a fixed or non-varying elevation of the axis of the die during heating of the die container. Such an arrangement thus requires a non-varying axis for a particular part in order to be fully effective in maintaining alignment between the plunger and die and further assumes that no other part of the machine will expand or distort.

It is one object of our invention to provide an improved combination for bringing all parts of the press into such cooperative relation that the press has a self-contained axis of alignment whereby the elevation or inclination of this axis may vary due to temperature changes but without disturbing the alignment of parts. As a result of our improved arrangement, it is seen that temperature changes of varying degrees and in known or unknown locations of a machine will be automatically taken care of without any additional devices, arrangements or provisions therefor.

A further object is to provide improved details of construction for laterally aligning the die holder regardless of the floating action of the machine axis and to provide improved billet loading means.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a vertical longitudinal section of an extrusion press embodying the principles of our invention;

Fig. 2 is a plan view of Fig. 1;

Figs. 3 and 4 are transverse sections taken respectively on lines 3—3 and 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary sectional view of one portion of the billet elevating means;

Fig. 6 is a partial longitudinal sectional view of modified means for supporting the main rams.

In the particular embodiments of the invention which are shown herein merely for the purpose of illustrating certain specific forms among possibly others that the invention might take, I have shown in Fig. 1 a bed 1 extending for substantially the full length of the press. Supported upon one end of the bed are a pair of superimposed main operating cylinders 2 and 3. These cylinders may be supported in fixed relation to each other by any usual means although for purposes or illustration a main cylinder pedestal or column 4 is provided and is so arranged as to receive the cylinders in suitable openings 5. This pedestal may be supported in various manners on base 1 and suitably secured thereto by bolts or transverse keys. Side rods hereinafter described will resist reaction forces during operation of rams 7 and 8, and hence the cylinder pedestal does not have to be secured to the base with sufficient strength to resist the entire reaction forces. Hence securing of the pedestal to the base may be of a nominal nature so as not to interfere with a varying elevation of the axis of the die and its plunger in the manner to be described later. A supplemental supporting member 9 of comparatively small dimensions may be interposed between base 1 and cylinder 8 to support the outer end thereof. This support may be merely an unsecured surface contact or lightly secured if desired. The outer ends of the two cylinders may be supported with respect to each other by a suitable yoke 10. The outer ends of rams 7 and 8 carry a platen 11 while a die plunger 12 is supported in any usual manner on the front of platen 11. A piercing tool 13 is operated by an axially located ram 14, the cylinder 15 therefor being supported in pedestal 4.

Supported at the other end of base 1 is a die pedestal 16 upon which is supported a die and preheating container generally indicated at 17. This container may be of any usual type, and hence its construction will be described only gen-

erally. It comprises a die 18 supported in a holder 19, this holder in turn being supported within a suitably recessed member 20 and held against longitudinal movement by a vertically movable locking block 21. This block is operated by a suitable operating ram and cylinder generally indicated at 22. A billet container 23, supported within an annular casing 24, is adapted to be provided with one or more filler sleeves 25 depending upon whether a tube or rod is to be extruded. Such sleeves, however, seat against die 18 to provide a tight joint therewith and prevent leakage of material during the extruding operation. Annular casing 24 and all of the associated parts including sleeve 25 are axially movable by one or more rams 26 in order to effect a sealing contact between sleeve 25 and die 18. Casing 24 has an annular recess 27 provided with a hot gas inlet 28 and an outlet 29, Fig. 4, for the purpose of preheating the die parts and container before commencing the extruding operation. The tremendous heat at this part of the apparatus is transmitted in part to pedestal 16 to cause expansion thereof vertically. Die 18 moves therewith with the result that its axis has a varying elevation.

To prevent misalignment between the axis of die 18 and the die plungers due to expansion of pedestal 16, we have provided the following improved arrangement. A pair of horizontal side rods 30 and 31 preferably of square cross-section extend through openings in pedestals 4 and 16 and are secured thereto in any suitable manner such as by nuts 32. The side rods are preferably disposed with their axes in a common horizontal plane containing the axis of the die and plunger, and they function not only as tension rods but also as part of the means for providing the self-contained axis of alignment. Platen 11 is supported upon said rods, as is shown more clearly in Fig. 3, by the provision of outwardly and longitudinally projecting wings 35 in which suitable openings are provided to receive upper, lower and lateral bearings plates 36, these bearings slidably engaging said rods and each being adjustable by any usual form of tapered gib construction. The platen can thus be laterally and vertically adjusted for purposes of initial alignment.

The heater container 24 as shown more clearly in Fig. 4 is also supported upon rods 30 and 31 through a pair of upper lateral flanges 33 and a pair of lower keeper plates 34 bolted to the container. Interposed between flanges 33 and the rods are any usual form of adjustable tapered gibs to permit vertical adjustment of the die although lateral clearance is provided between side rods 30 and 31 and container 24 to permit free lateral expansion movement thereof. The flanges 33, 33 slide laterally on the flat upper surfaces of the side rods during such expansion.

A simple and effective means for laterally adjusting die holder 19 and container 24 comprises a guide member 44 bolted to the face of pedestal 16 and projecting over container 24. A longitudinal slot 45, formed in member 44, is provided with tapered gibs 46 engaging a pin or lug 47 projecting upwardly from container 24, said gibs being adjustable in any usual manner so as to effect lateral adjustment of container 24 and the die housing 19. From the foregoing it is seen that the die can be laterally and vertically adjusted for purposes of initial alignment and also during lateral expansion of the die and die container upon heating thereof, the lug 47 and slot 45 comprises means for laterally maintaining said die in an axial position.

Die 18 and its holder 19 by being supported directly against pedestal 16 as shown in Fig. 1 will rise and fall during expansion and contraction of pedestal 16. Expansion is caused by heat transmitted to the pedestal during the preheating operation of the die and sleeve as well as during the extruding operation, and such expansion may cause the die axis to vary in elevation or inclination as much as one-eighth inch or more for a large size press. However, the side rods 30 and 31 are of sufficient strength to vertically support the die and plunger and cause the die container and platen 11 to move vertically as a unit, thus maintaining the die and die plungers in alignment. The rods will also cause flexure of the cylinder pedestal or base if such flexure should be required to maintain said alignment, but if the press if of such construction or minimum length, or if for any reason it is desired to avoid said flexure, then the cylinders may be pivotally or otherwise movably or flexibly supported by base 1 in any suitable manner. One such means is shown in Fig. 6 as comprising a pivot pin 37 interposed between the bottom of a cylinder pedestal 9' and base 1. In this form the cylinders may, if desired, be disposed symmetrically with respect to pedestal 9'. It is seen that notwithstanding any relative movement between the cylinders and base 1, still the die and die plungers will be maintained in alignment due to the plunger platen 11 and die 18 being positively supported by the rods 30 and 31. It is seen that there can be a wide variation in the elevation or inclination of the die and die plunger axis without possibility of misalignment thereof and without the necessity of taking into consideration any stress or temperature variations which may occur in known or unknown locations of the press. Hence I have provided an extremely effective means self-contained with the press for maintaining the die and its plunger in axial alignment during variations in elevation thereof caused by expansion of any part of the press particularly the pedestal upon which the die is supported.

If desired, the rods 30 and 31 may be partially bored adjacent pedestal 16 and water circulated therein to maintain the same cool so as to minimize or avoid unnecessary initial clearance between the rods and the adjustable tapered gib bearing plates 36, Fig. 3.

As shown in Figs. 1 and 5, a billet is inserted into sleeve 25 by being placed upon a holder 50 when in its lower position 51. This holder is simply a longitudinal recessed member which when in its lower receiving position is turned at right angles to its upper position. The holder is supported upon the upper end of a ram 52 which projects down into a suitable casing 53 formed preferably as part of the base 1. A spiral keyway 54 is formed in plunger 52 while a suitable cooperating key held fixed in a sleeve 55 is adapted to cause rotation of the plunger during upward or downward movement thereof. Pressure is supplied to the plunger cylinder from any suitable controlled source. A billet may be placed in holder 50 and then raised into alignment with sleeve 25, whereupon platen 11 together with rams 7 and 8 are moved forwardly to cause plunger 12 to move the billet into sleeve 25. In accordance with usual extrusion press operations, if a hollow tube is to be extruded, then piercing plunger 13 is forced through the billet by pressure supplied to operate ram 14. The piercing

tool 13 is then held in spaced relation to die 16 to define an annular extruding space. Forward movement of the sleeve plunger 12 under the power of rams 7 and 8 will then extrude the billet through the annular space just described. On the other hand, if a solid rod is to be extruded, then piercing tool 13 and plunger 12 are removed and a solid plunger substituted for plunger 12. However, during any of the foregoing operations, the die and its plungers are maintained in alignment notwithstanding material variations in the elevation or inclination of the die axis.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

We claim:

1. A horizontal extrusion press comprising, in combination, a horizontal die and die plunger, power means for effecting relative movement between said die and its plunger, means for laterally maintaining said die in an axial position during lateral expansion thereof, a vertical pedestal, and means supported by said pedestal for vertically supporting said die and plunger in axial alignment while at the same time permitting said lateral die expansion and allowing the axis of the plunger and die to have a varying elevation upon occurrence of expansion of said pedestal.

2. A horizontal extrusion press comprising, in combination, a die and plunger therefor, a pedestal for supporting one of the same and a movable platen for supporting the other, side rods supported by said pedestal substantially in a horizontal plane containing the die and plunger axis, said rods having flat horizontal surfaces, and and means for slidably supporting said platen on said rods, whereby the flat surfaces of said die and its plunger are maintained in axial alignment during variations in elevation of their axis caused by vertical expansion of said pedestal and during lateral expansion of said die.

3. The combination set forth in claim 2 further characterized by the provision of hydraulic ram mechanism for operating said die plunger, means for supporting said ram mechanism, and means whereby said side rods are supported in operative relation to said ram mechanism.

4. A horizontal extrusion press comprising, in combination, a horizontal base, a pedestal at one end thereof, a die supported by said pedestal, a preheater container for said die, cylinder and ram mechanism supported by said base at the other end thereof, a platen operable by said ram mechanism, a die plunger carried by said platen, means for laterally maintaining said die in a central position during expansion thereof, and means for vertically supporting said die and its plunger in axial alignment during said lateral die expansion and while the elevation of said axis varies in accordance with expansion of said pedestal.

5. A horizontal extrusion press comprising, in combination, a horizontal base, a pedestal at one end thereof, a die supported by said pedestal, cylinder and ram mechanism supported by said base at the other end thereof, a platen operable by said ram mechanism, a die plunger carried by said platen, means for laterally maintaining said die in an axial position during expansion thereof, and means supported by said pedestal and operatively connected to said platen for maintaining the plunger and die in axial alignment during variations in elevation of the axis thereof.

6. A horizontal extrusion press comprising, in combination, a horizontal base, a pedestal at one end thereof, a die supported by said pedestal, a preheater container for said die, cylinder and ram mechanism supported by said base at the other end thereof, a platen operable by said ram mechanism, a die plunger carried by said platen, side rods disposed substantially in a horizontal plane containing the die and plunger axis and supported at one end by said pedestal and at the other end by said cylinder construction, said rods having horizontal flat supporting surfaces, and means for supporting said die container and platen on said side rod surfaces whereby said platen and die container and rods move vertically during expansion of said pedestal thereby to maintain the plunger and its die in axial alignment at all times.

7. A horizontal extrusion press comprising, in combination, a base, pedestals supported by said base at opposite ends thereof, a die container supported by one of said pedestals, cylinders supported by the other of said pedestals, rams in said cylinders, a platen operated by said rams, a plunger carried by said platen, horizontal side rods disposed substantially in a horizontal plane containing the die and plunger axis and supported by said pedestals, said rods having horizontal flat supporting surfaces, and means for supporting said die container and plunger on said side rod surfaces whereby the plunger and die are maintained in alignment during variations in elevation thereof caused by expansion of said die pedestal.

8. A horizontal extrusion press comprising, in combination, a base, pedestals supported by said base at opposite ends thereof, a die container supported by one of said pedestals, two superimposed cylinders supported by the other of said pedestals, rams in said cylinders, a platen operated by said rams, a plunger carried by said platen, horizontal side rods disposed substantially in the horizontal plane containing the die and plunger axis and supported by said pedestals with said cylinders located between said side rods, said rods having horizontal flat supporting surfaces, and means for supporting said die container and plunger on said flat surfaces, whereby the plunger and die are maintained in alignment during variations in elevation thereof caused by expansion of said die pedestals.

9. The combination set forth in claim 7 further characterized in that the platen is operated by two cylinders and rams disposed in superimposed relation and located between said side rods, a piercing tool, and an operating cylinder therefor interposed between said cylinders.

10. A horizontal extrusion press comprising, in combination, a horizontal base, a pedestal at one end thereof, a die supported by said pedestal, a preheater container for said die, cylinder and ram mechanism supported by said base at the other end thereof, a platen operable by said ram mechanism, a die plunger carried by said platen, means for laterally maintaining said die in a central position during expansion thereof including a bracket supported by said pedestal and overlying the die container, means cooperating with said bracket for effecting lateral adjustment of the die container to bring the die into lateral alignment with the die plunger, and means for vertically supporting said die and its plunger in axial alignment with each other during said lateral die expansion and while the elevation of the

die and plunger axis varies in accordance with the expansion of said pedestal.

11. A horizontal extrusion press comprising, in combination, a base, pedestals supported thereon, a die container supported by one of said pedestals, die plunger operating mechanism supported by the other of said pedestals, and a billet loading mechanism including a vertically movable member provided with a spiral key and groove for rotating said member during upward movement thereof and fluid pressure means for moving said member, whereby said member when lowered is in a receiving position and when moved upwardly is rotated to a loading position.

12. A horizontal extrusion press comprising, in combination, a base, pedestals supported thereon, a die container supported by one of said pedestals, die plunger operating mechanism supported by the other of said pedestals, and a billet loading mechanism having means formed as a part of said base and including a vertically movable member provided with a spiral key and groove for rotating said member during upward movement thereof and fluid pressure means for moving said member, whereby said member when lowered is in a receiving position and when moved upwardly is rotated to a loading position.

RICHARD W. DINZL.
JOHN C. GRAF.

CERTIFICATE OF CORRECTION.

Patent No. 2,075,803. April 6, 1937.

RICHARD W. DINZL, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 37, claim 2, strike out the word "and"; line 39, same claim, for "said rods, whereby the flat surfaces of said die" read the flat surfaces of said rods, whereby said die; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of August, A. D. 1937.

Leslie Frazer

(Seal) Acting Commissioner of Patents.