

April 6, 1943.

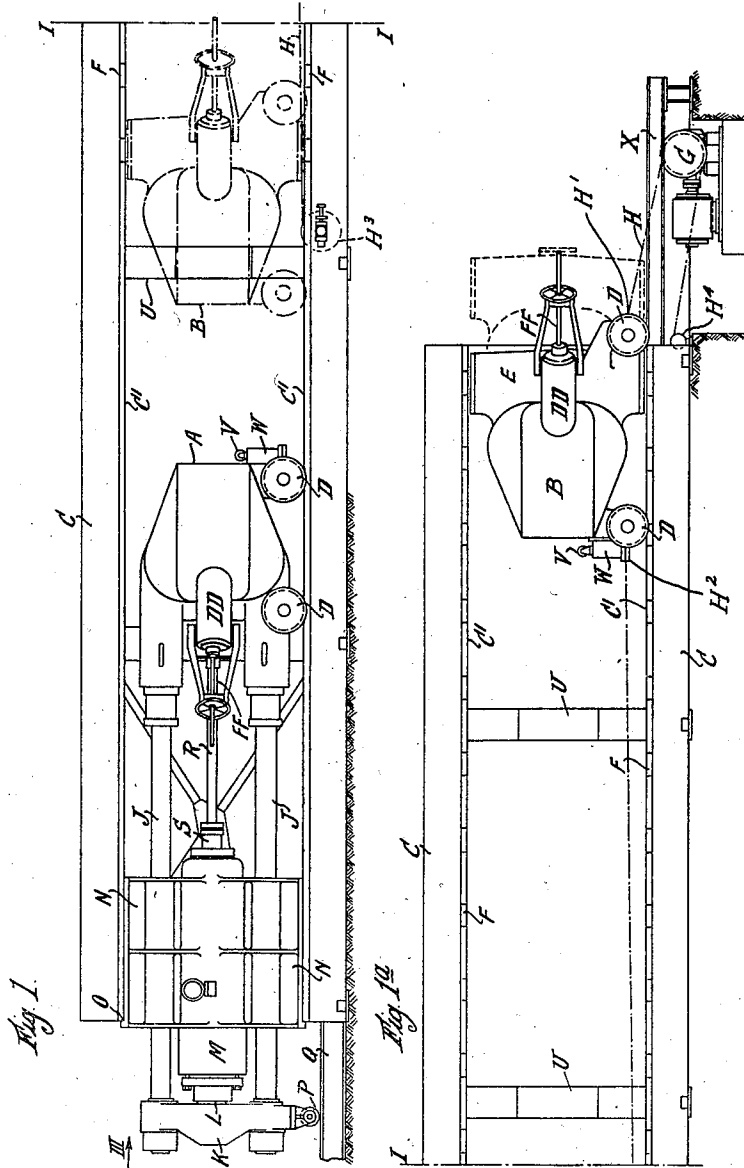
N. C. LAKE

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MACHINE FOR STRETCHING METALS

Filed June 24, 1941

4 Sheets-Sheet 1



Inventor:
 Norman Cecil Lake;
 by his attorneys,
 Baldwin & Wright

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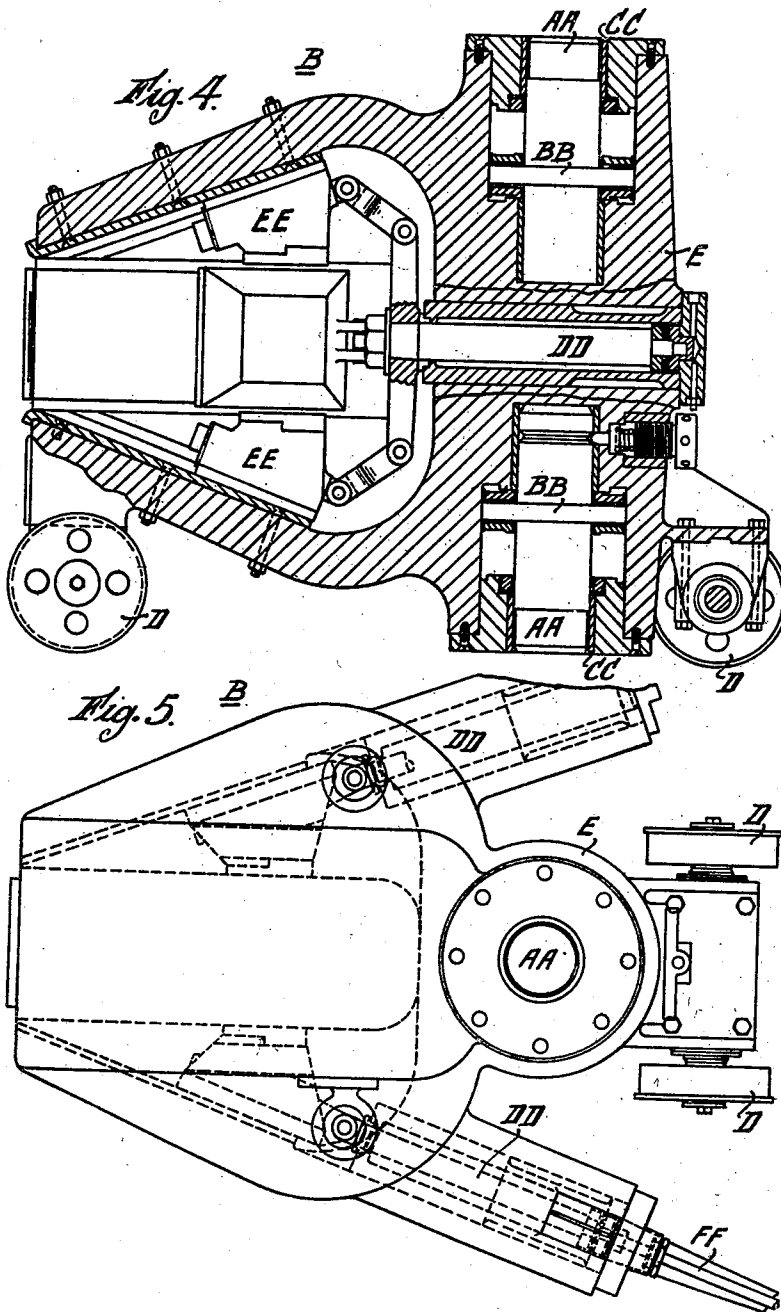
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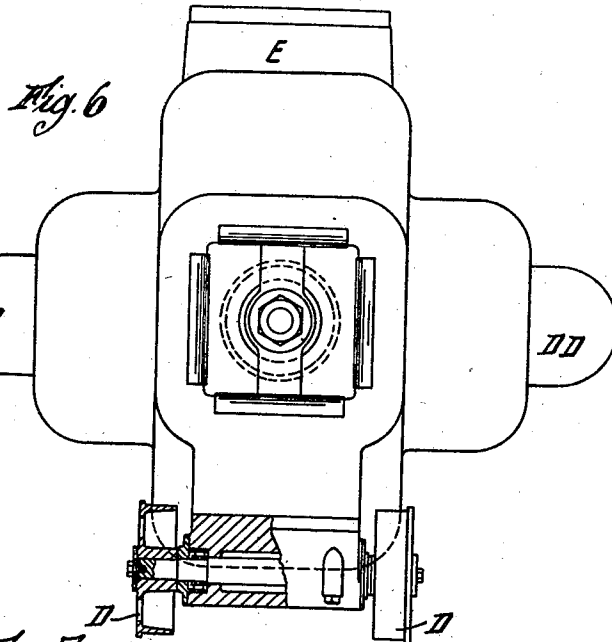
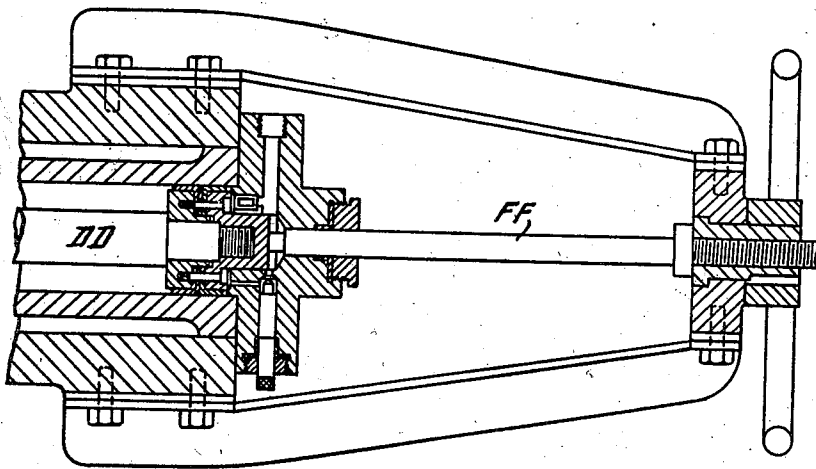


Fig. 7.



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UNITED STATES PATENT OFFICE

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MACHINE FOR STRETCHING METALS

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 In Great Britain November 13, 1939

6 Claims. (Cl. 153—35)

This invention relates to stretching machines such as are commonly employed to straighten and/or remove twists in extruded non-ferrous sections, particularly aluminium.

In carrying out the present invention a stretching machine comprises in combination a pair of gripper heads, gripper jaws on the heads to grip material, the heads being relatively movable to stretch material gripped between them and a frame to which the stretching load is transmitted from the heads, the frame being a structure which is self-contained to resist the stretching load and including longitudinal members spaced apart to receive the heads between them and engaged directly by the heads so that the load due to a stretching operation is transmitted from the heads to the longitudinal members as a compressional load at zones which are diametrically opposed about the stretching axis between the heads; the frame also includes transverse jaw or C-shaped parts which are connected to the longitudinal members at their outer jaw ends and are all located at the same side of the frame, these jaw shaped members supporting the longitudinal members against buckling under the compressional load.

Preferably two longitudinal members are employed these members being diametrically opposed about the stretching axis between the two heads. Since load is transmitted to the longitudinal members at zones which are diametrically opposed about the stretching axis, stresses which would be produced by eccentric loading of the frame are avoided and this enables the frame to be of a comparatively light construction. The fact also that the longitudinal members are subjected, during a stretching operation, to a compressional load and that the tendency of the longitudinal members to buckle under this compressional load is prevented by the jaw shaped members enables a frame to be provided which is self-contained, i. e. it does not rely upon any external structure. In addition since the load is taken directly from the heads to the frame members the heads can be mounted on large ball or roller bearing wheels the axles of which are subjected to little or no pressure. By locating the jaw shaped parts all at the same side of the machine, the structure is rendered capable of easy access for the operator.

A further feature of the invention relates to means whereby a gripper head of a stretching machine is connected to a frame so that the load due to a stretching operation is transmitted from the head to the frame to be absorbed thereby.

According to this feature of the invention the connecting means includes a pin or its equivalent which enables the head to swivel about an axis transverse to the stretching axis so that this head is enabled to be self-aligning in the frame.

The invention is illustrated in the accompanying drawings in which Figure 1 and 1a is a front elevation and Figure 2, 2a a plan of a stretching machine; each of these figures is in two parts which respectively continue on from one another at the lines I—I and II—II; Figure 3 is an end elevation looking in the direction of the arrow III Figure 1, Figure 4 is a longitudinal section of one of the heads, Figure 5 a plan view of the head and Figure 6 an end elevation thereof. Figure 7 is a longitudinal section through a cylinder back stop mechanism.

Referring to the accompanying drawings, the machine comprises a main frame having spaced longitudinal members C and gripper heads A and B of which the head B is what may be termed the fixed head and the head A the moving head. Each head is supported by large diameter ball or roller bearing wheels D, the track for which is provided by the lower longitudinal member of the frame. H or other section beams may be used for the extension tracks as shown at X. Each head is provided with gripper jaws EE which may be operated in the manner hereinafter described.

The head B at the end remote from its gripping jaws EE is formed with a transverse cylindrical boss E which extends from one side to the other of the longitudinal load line, or stretching axis between the heads A, B the axis of the boss E cutting this load line. The outer ends of this boss E which are spaced equi-distantly from the load line, have only a small clearance between plane longitudinal faces C' formed on the longitudinal bed frame members C it being understood that the faces C' oppose one another from diametrically opposite sides of the load line of the head.

To enable this head to be secured in different positions depending on the lengths of sections to be straightened, the boss E is bored and counter-bored from its opposite ends, as is shown in Figure 4, each bore and counter-bore receiving a large diameter cylindrical locking pin AA formed centrally of its ends with a collar BB received in the counter-bore; this collar is arranged to constitute a piston by providing it with cup leathers and packing and the counter-bore beyond this collar is closed by a bush CC or other suitable means of sealing, through which the out-

er end of the pin AA passes. Hence, by admitting air or other fluid under pressure to one side of the pistons or the other, the pins AA are forced inwardly or outwardly of the boss. Each of the plane longitudinal faces C' of the bed longitudinal members is formed with a plurality of longitudinally spaced holes F to receive accurately the locking pins AA and thus, by withdrawing the pins AA into the boss E, the head B can be moved longitudinally on the track to the required position and the pins AA then projected into the appropriate holes F. It will now be seen that the load to which this head is subjected during a stretching operation is taken as a shear load by the pins AA and since the end faces of the boss E fit, with only a small clearance between the faces C' of the longitudinal members C, the pins are relieved of practically all bending load; this location of the gripper head B by these cylindrical pins AA reduces the possibility of even a slight eccentricity of loading, due to sections not being centrally disposed in the gripper jaws to an absolute minimum, since the gripper head B will be able to swivel on these pins AA and thus align itself up with the other head.

This gripper head B may be adjusted from one position to another by means of a motor driven winch G around the drum of which passes a wire-rope H, the two ends of the rope being secured at H', H² to the frame of the head B and the rope passing over a return pulley H³ and a guide pulley H⁴ so that when the winch is driven in one or other direction the head B is correspondingly moved in one or other direction. Control of this arrangement is effected by push-button switches located at different points on the machine.

The other head A is arranged to be moved hydraulically to effect the stretching operation; for this purpose this head is connected at its end remote from the gripper-jaws EE, to two pull rods J connected to a cross head K which bears against the outer end of a ram L working in a cylinder M, which extends backwardly between the pull rods. This cylinder M is formed with a transverse enlargement or wing N one on each side of and diametrically opposed about the centre line of loading of this head, this centre line being of course in line with the equivalent line of the other head; these two wings, which are of equal radial length, fit accurately between the longitudinal faces C' on the bed longitudinal members already referred to, the outer ends of the wings have plane faces which abut faces on the end of the longitudinal members and the wings are secured by bolts to the longitudinal members C so as to secure the cylinder in position, it being understood that the plane faces O on the enlargements are in line with one another.

When now pressure liquid is admitted to the ram L, this head A is caused, through the pull rods J to be moved away from the other head B so producing a stretching or straightening operation on a section gripped by the two heads A and B.

It may now be pointed out that the function of the cylindrical boss E on the one head B and that of the transverse enlargements N on the cylinder M is the same; i. e. to enable the load reaction to be transmitted from the heads A and B to the longitudinal members C at zones which are diametrically opposed or concentrically arranged about the load centre line or axis between the two heads, so avoiding any difficulties due to

eccentric loading. It will also be apparent that the cylinder M acts as a spacer between the bed longitudinal members C and in addition imparts lateral stiffness to the frame.

As the ram L would be required to have a long stroke the crosshead K may if desired be supported by a roller P running on a track Q formed of rolled steel joist or other suitable material. In order to return the moving gripper head A, a return ram R would be provided, this ram working in a cylinder S formed in the first ram L.

The bed frame longitudinal members C are formed by two channel or T shaped members running the full length of the machine and formed of fabricated steel or cast construction, preferably a fabricated steel construction. It will be apparent that during a stretching operation, the stretching load between the heads is transmitted to the longitudinal members C as a compressive load; these two members are supported at frequent intervals by heavy steel plates or brackets U, so designed that they support the members against their tendency to buckle under the compressive load from the stretching operation. The result of this arrangement is that the frame comprised of the longitudinal members C and the brackets U is one which is self-contained against the loads due to a stretching operation, i. e., the frame is independent of any external structure and the weight of the section is considerably reduced.

As shown, the bed members C are disposed about a vertical axis but they may be about an inclined axis, i. e., so that the parallel faces C' of the longitudinal members C engaged by the outer ends of the cylindrical boss E or by the outer ends of the extension N on the cylinder M, are at right angles to a plane which passes at an angle to the horizontal through the longitudinal load line.

The arrangement may be modified to suit local conditions but for small sections which can easily be handled by men, these longitudinal members might well be arranged about a vertical axis which arrangement would give complete freedom of access on both sides of the machine. Depending on the size of the machine, the distance from one side of the machine to sections in the machine for stretching may be kept small enough to give reasonable access, but in any case no matter what size of machine is required free access can be obtained from the other side. The operator may stand on the floor level at the base of the supporting frames or on some small stool, and in this case the section will be at normal height for the average man to adjust, and there will be clearance for the man's head beneath the main plate of the upper longitudinal member C. In this case of a vertical axis, the sections can be handled into the machine by means of a special C shaped lifting hook.

With this arrangement there is much greater freedom of access to both sides of the machine, due to the fact that the operator has to negotiate only half the width of longitudinal members in order to reach to the centre line of the machine.

The track for the head B may be extended as shown at X at one end to facilitate maintaining the adjustable gripper head, particularly the pistons and gripper jaws of that head.

In Figures 4 and 5 is shown a convenient mechanism for operating the gripper jaws of the head B, it being understood that a similar mechanism would be provided for the gripper jaws of the

other head A. The jaws are operated through links from an hydraulic or pneumatic ram and cylinder arrangement DD and one or more of these arrangements may as is shown in Figure 7 be provided with an adjustable stop FF, so as to limit the travel of the appropriate gripper blocks in order that sections may be mounted on these gripper blocks and set up in a position almost corresponding to the position in which the section will be finally gripped.

As a further aid in this respect, a roller V may be provided opposite one or more of the gripper blocks to support the section before and after gripping, that is, when the gripper blocks are withdrawn. These rollers V should preferably be mounted on a dashpot W containing a flexible pressure medium, such as compressed air, so that whilst the section is being stretched any projection of the section below the level of the gripper jaws will depress the roller so as to avoid distortion of the section.

It will be apparent that with the construction of frame referred to, that is a frame comprising the longitudinal members and the transverse C-shaped members, that the gripper heads in the frame can be completely withdrawn from the frame through the open end this being a feature of some importance for the purpose of maintenance.

What I claim is:

1. A stretching machine comprising in combination a pair of gripper heads, gripper jaws on the heads to grip material to be stretched between the heads, means to move the heads relatively apart to stretch material gripped by the heads, and a frame to which the stretching load is transmitted from the heads, the frame being a structure which is self-contained to resist the load and the frame including a pair of opposed longitudinal members spaced apart to receive the heads between them and engaged directly by the heads so that the load due to a stretching operation is transmitted from the heads to the longitudinal members as a compressional load at zones which are diametrically opposed about the stretching axis between the heads and the frame including also a plurality of transverse open jaw-shaped parts connected at their jaw extremities respectively to the longitudinal members to support them against buckling under the compressional load, all the jaw shaped parts being located at the same side of the longitudinal members with the jaw openings facing the longitudinal members to provide ready access to the heads from the other side of the longitudinal members.

2. A stretching machine comprising in combination a pair of gripper heads, gripper jaws on the heads to grip material to be stretched, means to move at least one of the heads away from the other to stretch material gripped between the heads, a frame including a pair of longitudinal members providing opposed surfaces and means connecting the heads to the frame so that the stretching load is transmitted from the heads to the frame, the said connecting means for at least one of the heads including a pair of opposed pins located at the trailing end of the gripper jaws, the said pins constituting pivots enabling the head to swivel to align itself.

3. A stretching machine comprising in combination a pair of gripper heads, gripper jaws on the heads to grip material to be stretched, a frame including longitudinal members having opposed pairs of apertures and spaced transverse open

jaw shaped members, the said members being connected respectively at their jaw ends to the longitudinal members and being arranged at the same side of the machine with the jaw openings facing said longitudinal members, power means to move one of the heads away from the other, the said power means reacting on the frame and means to locate the other head at different positions along the length of the longitudinal members, the said locating means including a pair of opposed pins carried by the head at the trailing end of the gripper jaws, and means to move the pins into different pairs of apertures in the longitudinal members.

4. A stretching machine comprising in combination a pair of gripper heads, gripper jaws on the heads to grip material to be stretched, a frame including a pair of opposed longitudinal members and a plurality of spaced transverse open jaw shaped members, the said members being connected at their outer jaw ends respectively to the longitudinal members and being arranged at the same side of the machine with the jaw openings facing said longitudinal members to provide ready access to the heads from the other side of the longitudinal members, a frame component interposed between the said longitudinal members, the said component providing a power means to move one head away from the other to stretch material gripped between the heads, and means to connect the other head in spaced relation from the first head to the longitudinal members so that the stretching load is transmitted from the heads to the longitudinal members as a compressional load, the transverse jaw members supporting the longitudinal members against buckling under the compressional load.

5. A stretching machine comprising in combination a frame having two spaced parallel longitudinal members providing two faces opposed to one another the said faces having a series of apertures arranged in opposed pairs, a pair of gripper heads, gripper jaws on said heads to grip material to be stretched, a ram and cylinder arrangement, extensions on one part of the arrangement which extend between the two faces, means connecting the said extensions to the longitudinal members, connections from the other part of the arrangement to one of the heads whereby the head can be moved away from the other head to effect a stretching operation, a pair of opposed cylindrical pins on the other head, means to thrust the pins into any one of a pair of the series of apertures in the opposed faces of the longitudinal members, the two heads thus imposing a compressional load on the two longitudinal members of the frame during a stretching operation, and spaced transverse C-shaped members connected at their outer limb ends to the longitudinal members to support them against buckling under the compressional load, the said C members being all arranged at the same side of the longitudinal members.

6. A stretching machine comprising in combination a frame having two spaced parallel longitudinal members providing two faces opposed to one another, the faces having series of apertures arranged in opposed pairs, a pair of gripper heads, gripper jaws on said heads to grip material to be stretched, a ram and cylinder arrangement, extensions on one part of the arrangement which extend between the two faces, means securing the said extensions to the longitudinal members, connections from the other part of the arrangement to one of the heads whereby the

head can be moved away from the other head to effect a stretching operation, a pair of opposed cylindrical pins on the other head, ram and cylinder means to thrust the pins into any one of a pair of the series of apertures in the opposed faces of the longitudinal members, the two heads thus imposing a compressional load on the two longitudinal members of the frame during a

stretching operation, and spaced transverse C-shaped members connected at their outer limb ends to the longitudinal members to support them against buckling under the compressional load, the said C members being all arranged at the same side of the longitudinal members.

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