Nov. 12, 1963 A. H. CROUCHER 3,110,227

METHOD OF MACHINING WELDED RAIL JOINTS

Filed Nov. 4, 1960 5 Sheets-Sheet 1

Fig. 1.

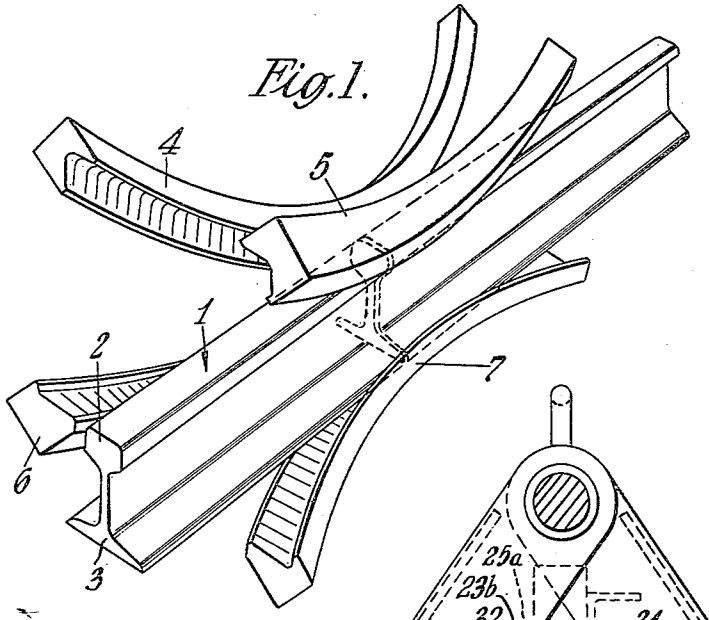
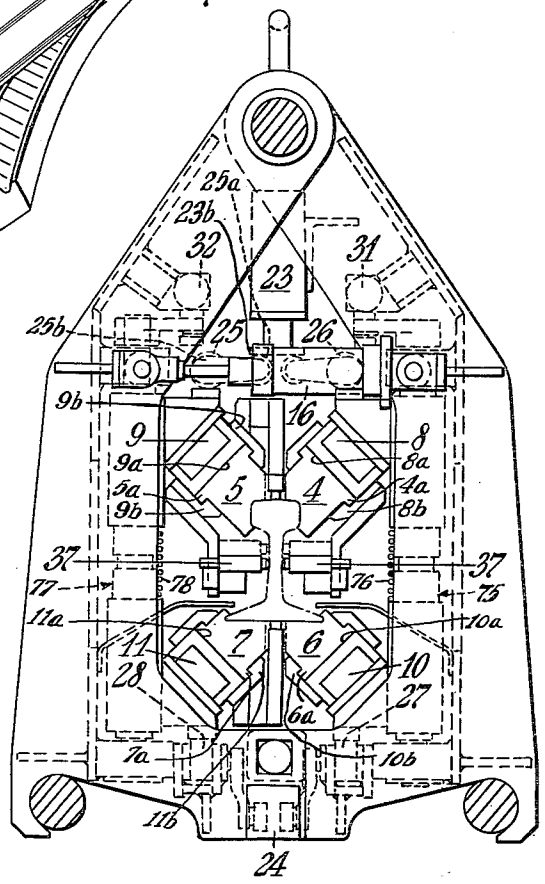


Fig. 4.



Inventor
Antony H. Croucher,
by Haller & Hinglish
Attorney.

Nov. 12, 1963 A. H. CROUCHER 3,110,227

METHOD OF MACHINING WELDED RAIL JOINTS

Filed Nov. 4, 1960 5 Sheets-Sheet 2

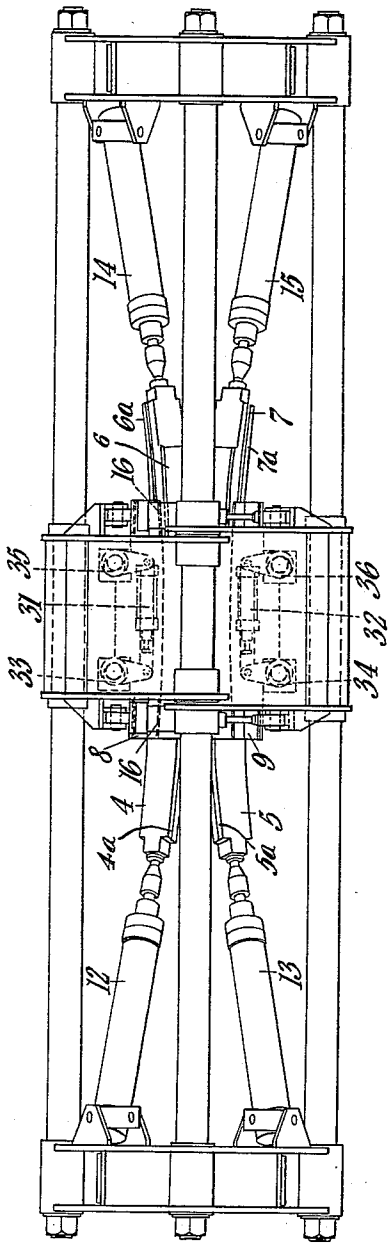


Fig. 2.

Inventor
Antony H. Croucher.
by Hall & Houghton
Attorney.

Nov. 12, 1963 A. H. CROUCHER 3,110,227

METHOD OF MACHINING WELDED RAIL JOINTS

Filed Nov. 4, 1960 5 Sheets-Sheet 3

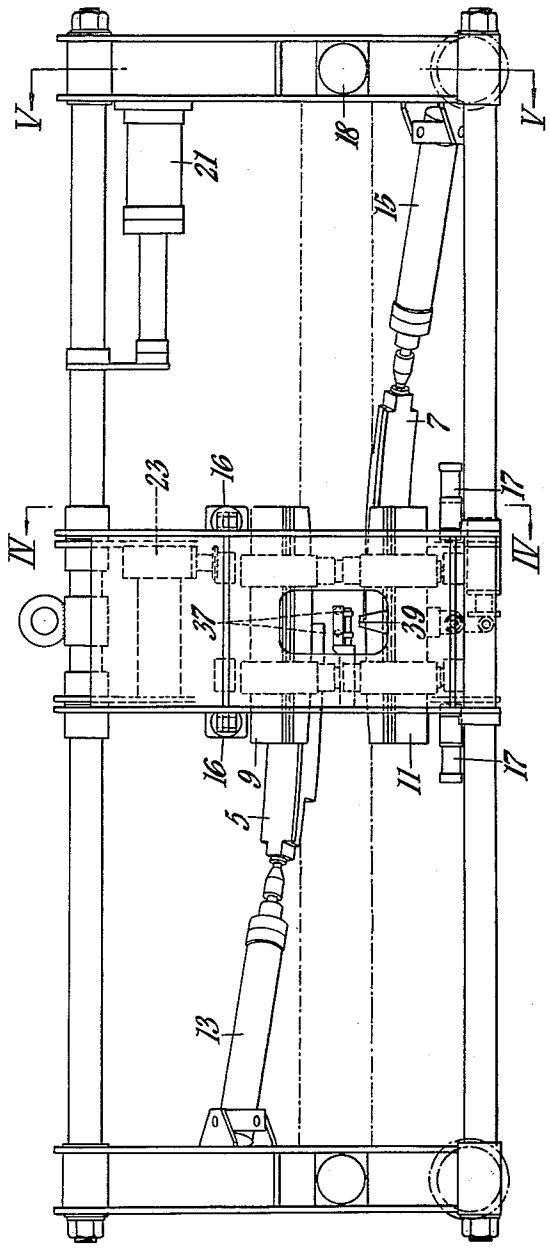


Fig. 3.

Inventor
Antony H. Croucher;
by Hall & Houghton
Attorney.

Nov. 12, 1963 A. H. CROUCHER 3,110,227

METHOD OF MACHINING WELDED RAIL JOINTS

Filed Nov. 4, 1960 5 Sheets-Sheet 4

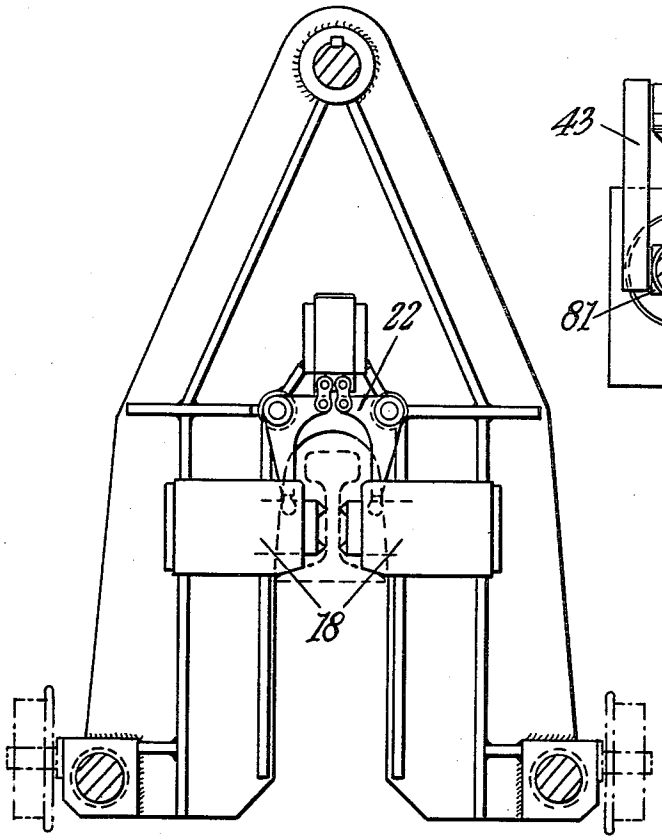


Fig. 5.

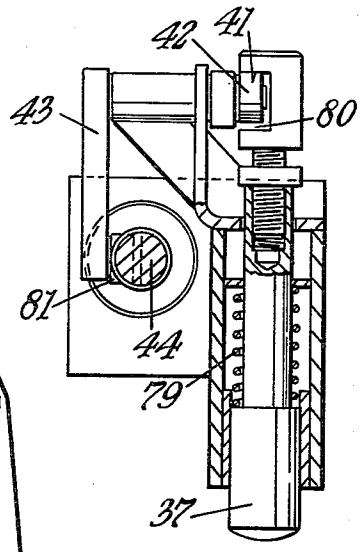


Fig. 7.

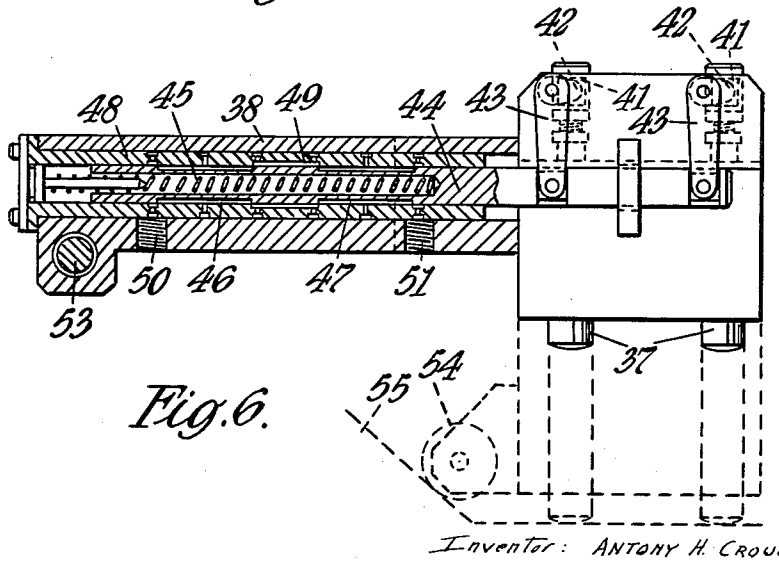


Fig. 6.

Inventor: ANTONY H. CROUCHER.

by Hall & Houghton, Attorney.

Nov. 12, 1963 A. H. CROUCHER 3,110,227

METHOD OF MACHINING WELDED RAIL JOINTS

Filed Nov. 4, 1960 5 Sheets-Sheet 5

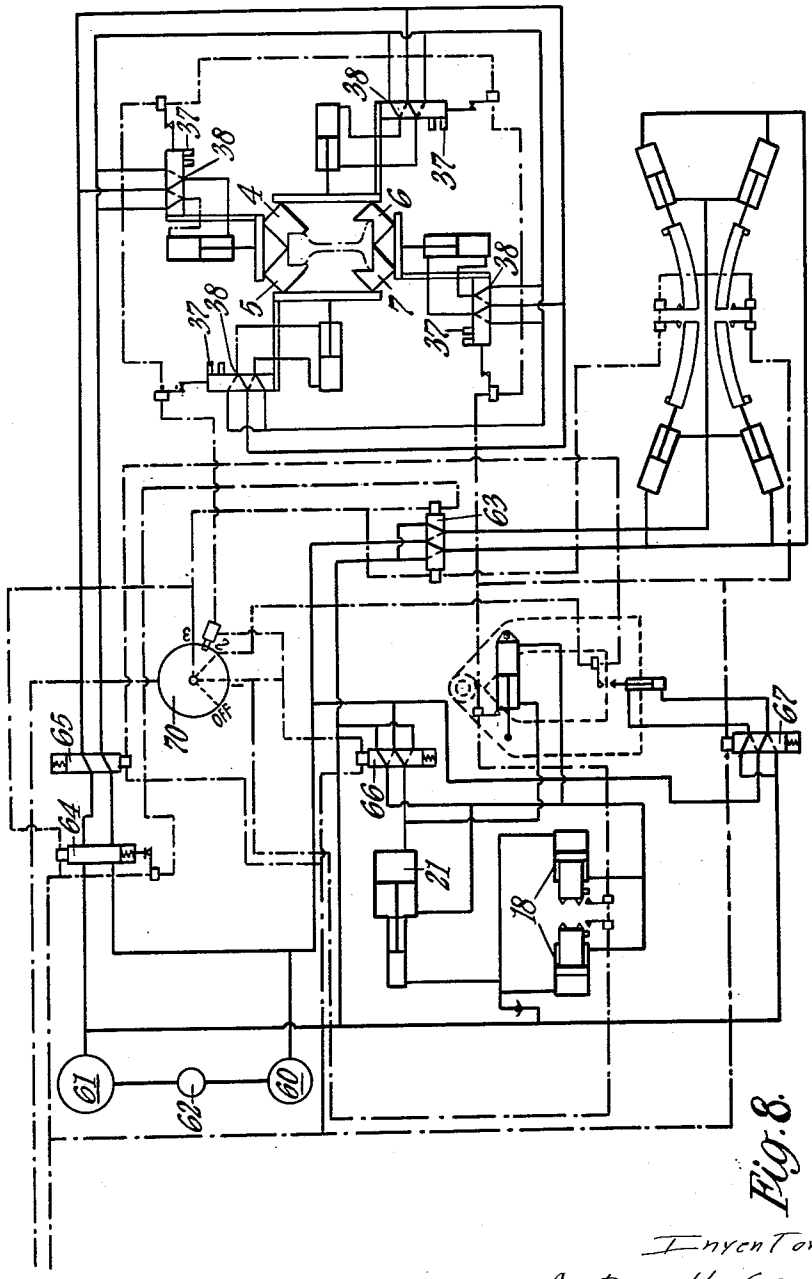


Fig. 8.

Inventor
Antony H. Croucher
by Hall & Houghton
Attorney.

United States Patent Office 3,110,227 Patented Nov. 12, 1963

3,110,227 METHOD OF MACHINING WELDED RAIL JOINTS

Antony Harry Croucher, Homewood, West End Lane, Esher, England

Filed Nov. 4, 1960, Ser. No. 67,306
Claims priority, application Great Britain Nov. 12, 1959
4 Claims. (Cl. 90—64)

This invention relates to welded rails.

The conventional butt welding of successive lengths of rail gives rise to a considerable flash around the joint, which must be removed, at least from the flanges before the rail is serviceable. Also any variations between the sections of successive rails or errors in alignment may give rise to objectionable discontinuities at the joints.

Hitherto the flash has generally been removed by manual operation and the joint finally dressed, but this is at best a rough finish in comparison with the remainder of the rail, with the irregularities being smoothed out over only a very short distance.

The invention consists in a method of smoothing the joints of butt welded rails comprising gripping the rail and applying curved broaches to smooth at least those parts of the joint at which irregularities are undesirable.

Preferably, the broaches are applied at each side of the top flange to smooth the running surface, and at each side of the lower flange to facilitate engagement with rail chairs.

Preferably, also, the relative positions of corresponding surfaces of the rail lengths on each side of the joint are sensed close to the joint and the positions of the broaches adjusted accordingly, so that irregularities due to size variation or misalignment may be smoothed out over a distance.

The invention further consists in apparatus for carrying out the method set forth above comprising means for gripping the rail adjacent the joint to be smoothed, and a set of curved broaches arranged to be guided past the joint.

The broaches are preferably hydraulically actuated, and the position of the guides may be hydraulically varied in response to signals from position sensing means. The variation may be carried out by rotation of eccentrics whereby small variations can be accurately compensated or taken up.

Conveniently means is provided for locking the position of the guides during broaching.

The invention will be further described with reference to the accompanying drawings which show, by way of example only, an embodiment of the invention.

In the drawings:

FIGURE 1 is a diagrammatic perspective view of a set of broaches and a rail in course of smoothing;

FIGURE 2 is a plan view of a complete apparatus for carrying out the invention;

FIGURE 3 is an elevation thereof;

FIGURE 4 is a section on the line IV—IV of FIGURE 3;

FIGURE 5 is a section on the line V—V of FIGURE 3;

FIGURE 6 shows a detail, partly in elevation and partly in section;

FIGURE 7 is a section through the structure of FIGURE 6; and

FIGURE 8 is a circuit diagram of the hydraulic and electrical controls.

FIGURE 1 shows a rail 1 having an upper flange 2 and a lower flange 3, and it will be seen that a pair of upper broaches 4 and 5 are arranged to finish the joint on the sides and top of the upper flange 2, while a pair

of lower broaches 6 and 7 finish the lower face and edges of the lower flange 3.

It is arranged so that the areas swept by the broaches of each of the lower and upper pairs overlap so that no transverse discontinuities occur in the upper and lower flanges.

Thus it will be seen in FIGURE 4 that the pairs of broaches 4, 5 and 6, 7 are illustrated as overlapping. This is achieved by providing intermeshing configurations on the broaches of the pairs.

From FIGURES 2 to 5 inclusive it will be seen that the broaches 4, 5, 6 and 7 are controlled by guides 8, 9, 10 and 11 respectively and actuated by pivoted hydraulic cylinders 12, 13, 14 and 15 respectively.

As best seen in FIGURE 4, each guide has a base surface 8*a*, 9*a*, 10*a*, 11*a* conforming to the shape of the reverse side of the broach to be guided. Also each guide has a pair of side members 8*b*, 9*b*, 10*b*, 11*b* which prevent lateral movement of the broaches and also, by engagement with the flanges 4*a*, 5*a*, 6*a* and 7*a* at either side of the broaches, prevent parting of the broach from the base surface. It will thus be appreciated that when the position of the guides is defined, the respective broaches must each follow a predetermined path. The guides are adjustable by means to be described more in detail hereinafter in accordance with the position and configuration of the joint to be trimmed.

The whole arrangement is carried in a frame which can be opened and closed by means of cylinders 16 and locked in closed position by operation of cylinders 17.

The rails to be finished are gripped within the frame by pairs of hydraulic grippers 18 situated at each end of the frame, as best seen in FIGURE 5, the grippers being supplied with pressurized liquid from an intensifier 21. Linkage 22 is provided to ensure that the grippers 18 are symmetrically placed.

The upper and lower pairs of broaches are vertically adjustable relative to the frame by means of adjusting cylinders 23 and 24, which operate to turn eccentrics 25, 26, 27 and 28 to change the vertical positions of the respective broach guides. In order to save space the lower vertical adjustment cylinder operates with a horizontal axis and for clarity of illustration certain details appertaining thereto have been omitted from FIGURE 4. Lateral adjustment of the broaches relative to the frame is effected by cylinders 31, 32 turning eccentrics 33, 34, 35 and 36.

The transmission of motion from cylinder 23 to the eccentrics 25 and 26 is achieved by means of an enlarged disc 23*a* on a piston rod operating in the cylinder 23 abutting rollers 25*a* and 26*a* mounted in pivotally mounted cranks 25*b*, 26*b*. The eccentrics 25 and 26 are eccentrically mounted for rotation about the pivot axes of the crank. Thus as the cranks are moved by movement of the piston in the cylinder 23 the eccentrics are rotated. The eccentrics bear upon abutments on the guides 9 and 8 to move them vertically downwards. The cylinder 24 operates similarly upon the eccentrics 27 and 28. The disc corresponding to 23*a* has been omitted from the drawing in order to show the rollers and cranks more clearly.

The guides 8 and 10 are mounted on a first horizontally movable carriage 75 and urged vertically apart by a spring 76. Similarly the guides 9 and 11 are mounted on a carriage 77 and urged apart by a spring 78. The carriages are urged apart by spring means (not shown).

As the disc 23*a* is retracted upwardly the guides 8 and 9 thus return upwardly under the biassing force of springs 76 and 78.

The eccentrics 33 and 35 are rotated from the cylinder 31 by cranks as shown in FIGURE 2. Such eccentrics

34 and 36 are operated by cylinder 32. The pairs of eccentrics extend vertically for a substantial portion of the height of the respective carriages and bear upon them when rotated by the cylinders.

The position of the rail is sensed by four pairs of sensing fingers 37 acting respectively on the upper and lower flanges and the two sides of the upright portion of the rail section. One finger of each pair acts on each side of the joint to be finished.

Each pair of fingers 37 is carried with the corresponding pair of broach guides in the vertical or lateral movement it controls.

A setting pointer 39 is provided.

The hydraulic units are connected with a pump unit by flexible pipes in an arrangement to be more fully disclosed hereinafter.

FIGURE 6 shows, on an enlarged scale, a pair of fingers 37 and the associated valve 38. FIGURE 7 is an axial section on one of the fingers 37. Each finger 37 is loaded outwardly towards the rail by a spring 79 and each has, at the end remote from the rail, a recess 41 accommodating, with a small clearance 80, albeit sufficiently large to accommodate the largest expected discrepancy between rails, a short crank arm 42 which rotates with a longer crank arm 43 co-operating, by means of a roller 81 with a valve spool 44 of valve 38 to move it longitudinally when crank arm 42 is rotated.

The valve spool 44 is urged to the right as shown in FIGURE 6 by a spring 45, weaker than springs 80, and defines annular chambers 46 and 67 within a valve sleeve 48. An annular chamber 49 in the sleeve 48 is in permanent communication with exhaust and is closed from both chambers 46 and 47 in the central position as shown in FIGURE 6. Chambers 47 and 46 are in communication with opposite ends of one of the double acting adjustment cylinders while pressurized liquid is available at inlets 50, 51.

It will be seen that if one or both of the fingers 37 are allowed to move towards the rail from the position shown then the corresponding crank arms 42 and 43 are moved clockwise and spool 44 moves to the left putting chamber 47 and one end of the cylinder in communication with exhaust chamber 49 while chamber 46 and the other end of the cylinder are put into communication with the pressurised fluid source via inlet 50. The corresponding broach guide pair are moved towards the rail, carrying the valve with them and the fingers are consequently caused to retract against the action of their springs, causing the valve spool 44 to move to the right towards the central position. Spring 45 keeps the crank arm 42 bottomed on the recess 41 of the move protruding of the fingers 37.

Thus, when the more extended of the fingers reaches the central position the valve reaches the central position and motion stops. The guides are then in correct position for finishing the joint to the level indicated by the further protruding finger, i.e. down to the rail surface further from the guides.

Similarly when the fingers are depressed by the rail the guides are moved until the less depressed finger 37 reaches the central position.

The assembly of fingers 37 and the valves 38 on at least the upper and lower guides is hinged at 53 and spring urged against a fixed stop (not shown) on the guides. A roller 54, shown dotted in FIGURE 6, is arranged to engage with a ramp 55 on the broach to retract the fingers during passage of the broach.

FIGURE 8 shows an arrangement of the controls for semi-automatic operation of the device. The operating power is supplied by a hydraulic pump 60 supplied from a tank 61 through a filter 62.

It will be seen that hydraulic power is supplied to the cylinders for operating the broaches via a reversing valve 63, to the guide adjusting cylinders via a sensing lock valve 64 and a reversing valve 65, to the closing cylinder via a reversing valve 66, to the frame lock cylinder via a reversing valve 67 and to the gripper cylinders via the valve 66 and the intensifier 21.

An electrical pilot system (shown chain-dotted) operates the valves in sequence and is controlled by a manual switch 70 having an "off" position and three "on" positions labelled 1, 2 and 3 on FIGURE 8. The correct sequence of valve operation is assured by microswitches operated by the parts operated by the hydraulic system to close the circuit to the next valve to be operated.

It will be seen that when the switch is moved to position 1, valve 66 is operated to admit pressure to the closing cylinder and intensifier for the grippers which operate, and when their operation is completed operate microswitches to close the circuit to operate valve 67 and admit pressure to the frame lock cylinder. On movement to position 2, the valve 65 is operated to admit pressure liquid to the adjustment cylinders and the sensing and adjusting is then carried out. On moving to position 3, the sensing lock 64 is closed to fix the position of the guides and then power is admitted to the operating cylinders for forward movement of the broaches. Completion of forward movement operates microswitches to initiate reverse movement.

The switch is then returned to "off" and the rail is released and the frame opened.

Various modifications may be made within the scope of the invention. Thus the frame opening, closing and locking arrangements could well be dispensed with in certain types of installation. Also, the hydraulic arrangements could be replaced by mechanical actuation of the broaches and their adjustment device, e.g. by means of screw devices.

I claim:

1. A method of smoothing the joints of butt welded rails having an upper flange to provide a running surface and a lower flange for engagement with securing means, comprising gripping the rail adjacent the joint to be smoothed and passing curved broaches against each side of the upper flange at and adjacent the joint to smooth the running surface.

2. A method as claimed in claim 1, in which the areas swept out by the broaches on either side of each flange overlap slightly.

3. A method as claimed in claim 1, in which further curved broaches are passed simultaneously against each side of the lower flange at and adjacent the joint to smooth the joint so that weld flash does not impede proper engagement of the lower flange with securing means.

4. A method as claimed in claim 3, comprising the steps of sensing the relative positions of corresponding surfaces of the rail lengths close to the joint on each side of the joint to be smoothed, and adjusting the operation paths of the broaches accordingly so that irregularities due to size variation or misalignment may be smoothed out over a distance.

References Cited in the file of this patent

UNITED STATES PATENTS

1,432,226	Wolnick	Oct. 17, 1922
2,101,624	Muller	Dec. 7, 1937
2,357,094	Edgar	Aug. 29, 1944
2,714,339	Waldschutz	Aug. 2, 1955