

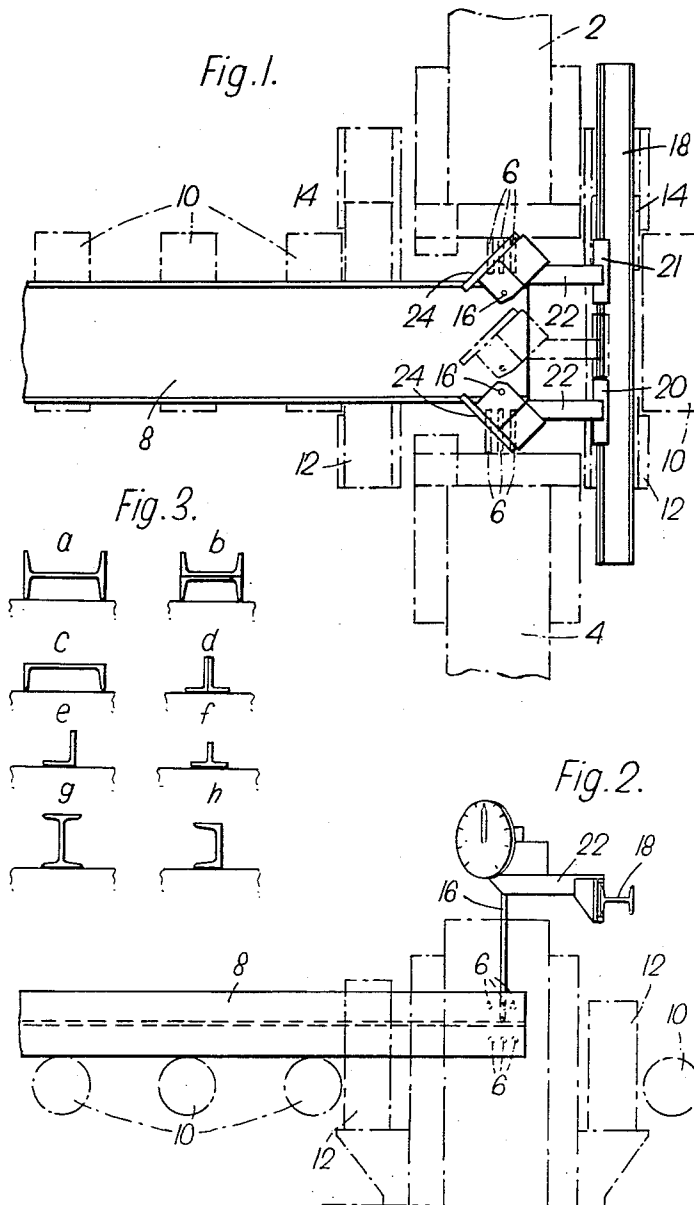
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STRUCTURAL STEEL DRILL

3,120,135

Filed Nov. 25, 1960

2 Sheets-Sheet 1



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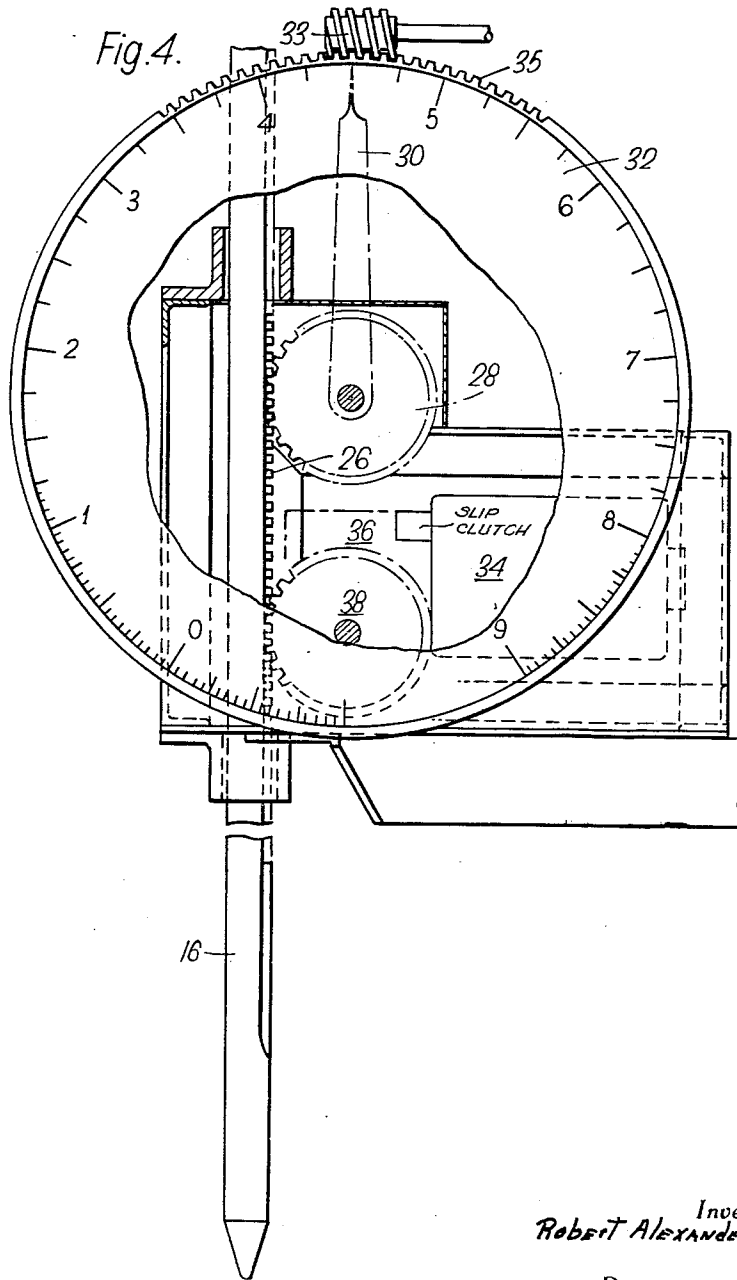
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STRUCTURAL STEEL DRILL

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Structural steel work consists largely of components which are cut to length from rolled sections and are then drilled to receive rivets or bolts for connecting them to other components. In drilling holes through the flanges it is convenient to lay the component on a horizontal support and then to drill some at least of the holes by means of one or more horizontal drills.

Now the holes should be properly located with reference to one or more datum planes in the section. For example, the holes in the flanges of an I section should be properly located in relation to a datum plane lying in the centre of the thickness of the web. There is, however, the difficulty that owing to tolerances in manufacture, the rolled section may have an outline, especially at edges, which does not lie at exactly the nominal dimensions from the datum planes. Consequently, when the component is resting on the edges of its flanges, the datum plane may not be at the expected height above the support, so if the position of the drills is adjusted with reference to the level of the support then the holes made in the flanges may be in the wrong position. Moreover, a rolled section component may be slightly curved in a vertical plane, so that the height of the datum plane above the support would vary, unless provision is made for forcing the component downwards along its length into a straight horizontal position. These are well recognised difficulties, and various crude expedients have been used to overcome them, such as the insertion of wedges between the support and the component.

According to the present invention, an apparatus for drilling horizontal holes in rolled section components comprises a horizontal support, means for horizontally clamping in position a component on the support, one or more horizontal drills which are vertically adjustable, and a feeler member which is carried by a rigid framework and can move up and down with respect to the framework so that it can register the vertical position with respect to the support of a face of a component on the support.

In use the face of the component should be that which determines accurately the position of the datum plane for the section. For example, in the case of an I section with the web horizontal it should be the top face of the web. The feeler member should engage the face of the component at a point close to the vertical part which is to be drilled. The feeler member may be connected to a visual indicator on the rigid framework so that an operator can observe the indicator and adjust the height of the drill or drills in accordance with any difference in height of the face of the component from the nominal measurement. As an alternative the feeler member may itself control the vertical height of the drills so that the height of the drills is adjusted automatically according to the height of the face of the component controlling the feeler member.

Apparatus according to this invention may include means which automatically vary the mean height of the drills in response to the horizontal width of the component in the drilling position, so that components of different sizes can be fed to the apparatus at random.

An example of an apparatus according to the present invention is shown in the accompanying drawings. In these drawings:

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FIGURE 1 is a diagrammatic plan view of the apparatus;

FIGURE 2 is a diagrammatic side view of the apparatus;

FIGURE 3 shows the positions in which various sections would be drilled; and

FIGURE 4 is a partly sectioned detail view of the feeler member and indicator.

The apparatus shown in the drawings is capable of drilling the flanges on both sides of an I section component at the same time. It includes two drill pedestals 2 and 4 each of which is equipped with six horizontal drills 6 for drilling the flanges of an I section component 8. The component 8 lies on a support in the form of a conveyor consisting of driven rollers 10. On each side of the drill pedestals there is a pair of clamping members, one member 12 being fixed and the other member 14 being horizontally movable.

As the two flanges on which the component 8 rests may have different or opposite inaccuracies, the two drill pedestals are independently adjustable vertically by any conventional means and there are two feeler members in the form of vertical rods 16 carried by a rigid framework. The framework includes a crossbar 18 supported on pillars (not shown) and lying across the conveyor in a plane parallel to, but offset from, the central plane of the drill pedestal. Thus the framework does not obstruct the drills. On the crossbar there are two carriages 20, each having a projecting arm 22 extending to the central plane of the drill pedestals and carrying one of the feeler members. The feeler members lie in the central plane of the drill pedestals and are close to the flanges of the I section component 8. The carriage 20 is adjustable a short distance along the crossbar to allow for different thicknesses of flange, and possibly also for additional plates, and the carriage 21 is adjustable a considerable distance to accommodate components of different horizontal widths. This adjustment may be manual or automatic; in the case of an I section with the web horizontal, the carriage 21 is preferably controlled automatically by a member engaging the inner face of the appropriate flange.

FIGURES 3a to 3h show the positions in which a number of sections can be drilled. The sections are as follows:

- (a) I section lying with its web horizontal.
- (b) Two channel sections placed web to web and lying with the webs horizontal.
- (c) Single channel section resting on the edges of its flanges.
- (d) Two angles back to back, resting on flanges.
- (e) A single angle resting on one flange.
- (f) A T section resting on its flange.
- (g) An I section with its web vertical.
- (h) A channel section with its web vertical.

Each feeler member is connected to a visual indicator 24. The arrangement is shown in FIGURE 4.

The upper end of the feeler member is in the form of a rack 26 which drives a pinion 28 on which there is a needle 30. A dial 32 against which the pointer moves is calibrated in terms of the height of the bottom of the feeler member from the tops of the rollers. A magnification of about 4 to 1 is provided by the rack and pinion.

The dial is movable about its axis so that it can be rotated through an angle equivalent to half the thickness of the part of a component on which the feeler acts. For example, in the case of an I section resting on the edges of its flanges, the dial would be rotated through an angle equivalent to half the web thickness of the component, so that the reading indicated by the needle would be the height of the centre of the web above the support.

Rotation is by means of a worm 33 which meshes with teeth 35 on the dial; it may be carried out manually or automatically under the control of means for sensing size of the component being drilled.

In order to control the feed member there is a small electric motor 34 which drives the feeler via a worm reduction unit 36 and a pinion 38 which meshes with the rack teeth. Between the worm reduction unit and the motor there is a slipping clutch in the form of a free-wheel which permits the motor 34 to lower the feeler member 16 but does not permit the motor to apply a heavy downward force to the feeler member. The free-wheel can however drive so as to raise the feeler member.

In use the feeler member is held well clear above the conveyor while a component is brought into position. The component is moved into position by driving the rollers of the conveyor, and its longitudinal position during drilling may be determined by a stop (not shown) which the component engages. In the case of components in which two or more series of holes are to be drilled, there may be two or more stops at different distances from the central plane of the drill pedestals. As soon as a component reaches the position for drilling, the component is clamped and at the same time the electric motors 34 are energised so as to allow the feeler members to descend. The motors continue to run for long enough to bring the lower ends of the feeler members down to the level of the conveyor, but in fact as soon as the feeler members touch the web of the component (in the case of an I section component) the free-wheels start to slip. Thereupon the indicating dials can be read, and the necessary vertical adjustments can be made in the positions of the drill pedestals. The electric motors are operated in the opposite direction to raise the feeler members as soon as the reading has been taken, so that the component can be moved as soon as drilling has been completed. At the top of their travel the feeler members engage limit switches which cut out the electric motors.

I claim:

1. Apparatus for drilling rolled section components comprising a plurality of rollers forming a horizontal support, means for horizontally clamping a component in position on the support, at least one horizontal drill adjacent to the said clamping means, a rigid framework adjacent the support, said drill being mounted for vertical adjustment with respect to the framework and with respect to the support and for horizontal movement towards and away from a component held by said clamping means, a feeler member, means mounting the feeler mem-

ber on the framework to move up and down with respect to the framework, substantially in alignment with the drill, so that it can register the vertical position with respect to the support of a face of a component on the support, a reversible motor unit, and means coupling the motor unit to the feeler member so that the feeler member can be lifted by the motor so as to be clear of the drill before drilling takes place, and, can be lowered again onto the component after the component has been moved into a new drilling position.

2. In an apparatus according to claim 1, a visual indicator on the framework, and means connecting the feeler member to the indicator for actuation thereof.

3. In apparatus according to claim 1, the feeler member comprising a vertical rod mounted to slide vertically with respect to the framework.

4. In apparatus according to claim 1, a visual indicator on the rigid framework, a pinion connected to said visual indicator, the upper part of the feeler member comprising a rack engaging said pinion.

5. In an apparatus according to claim 1, a motor, means including a slipping clutch operatively connecting the motor to the feeler member, and means to drive the motor in opposite directions, whereby in one direction the motor raises the feeler member to permit a component to be put in position or removed, and in the other direction lowers the feeler member so that the feeler member will not be forced hard against the component.

6. In apparatus according to claim 5, the motor comprising an electric motor, a worm reduction unit between the motor and the feeling member, said clutch being located between the motor and the worm reduction unit.

7. In an apparatus according to claim 1, at least two drill pedestals on opposite sides of said support, a horizontal crossbar carried by said framework, a second feeler member, said two feeler members being carried by said crossbar, at least one of said feeler members being adjustable in position along the crossbar.

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