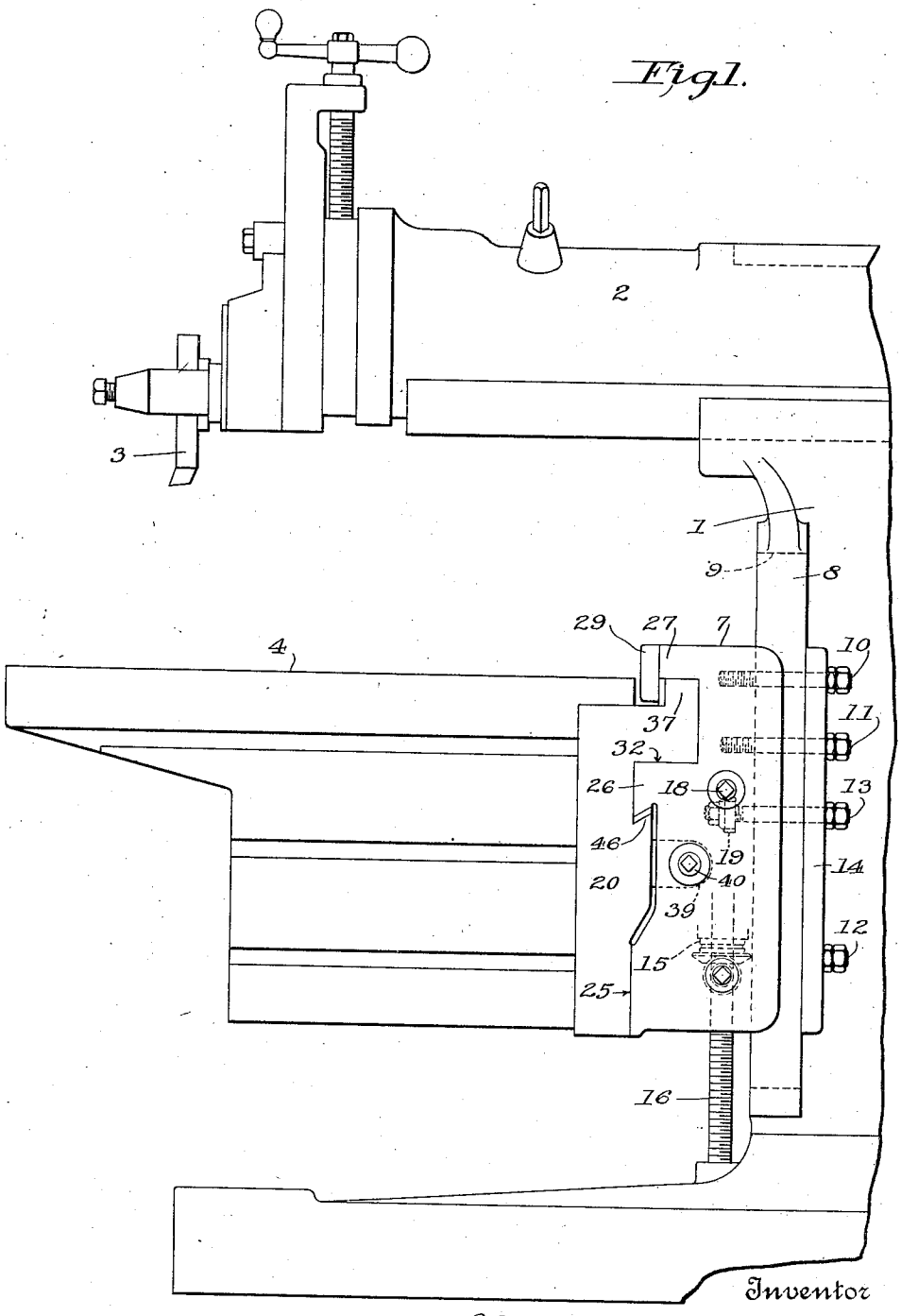
April 1, 1930. W. F. ZIMMERMANN 1,753,143

SHAPING MACHINE WORK TABLE CROSS RAIL GUIDE

Filed Oct. 29, 1927 3 Sheets-Sheet 1

Fig 1.



Inventor

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By Attorneys

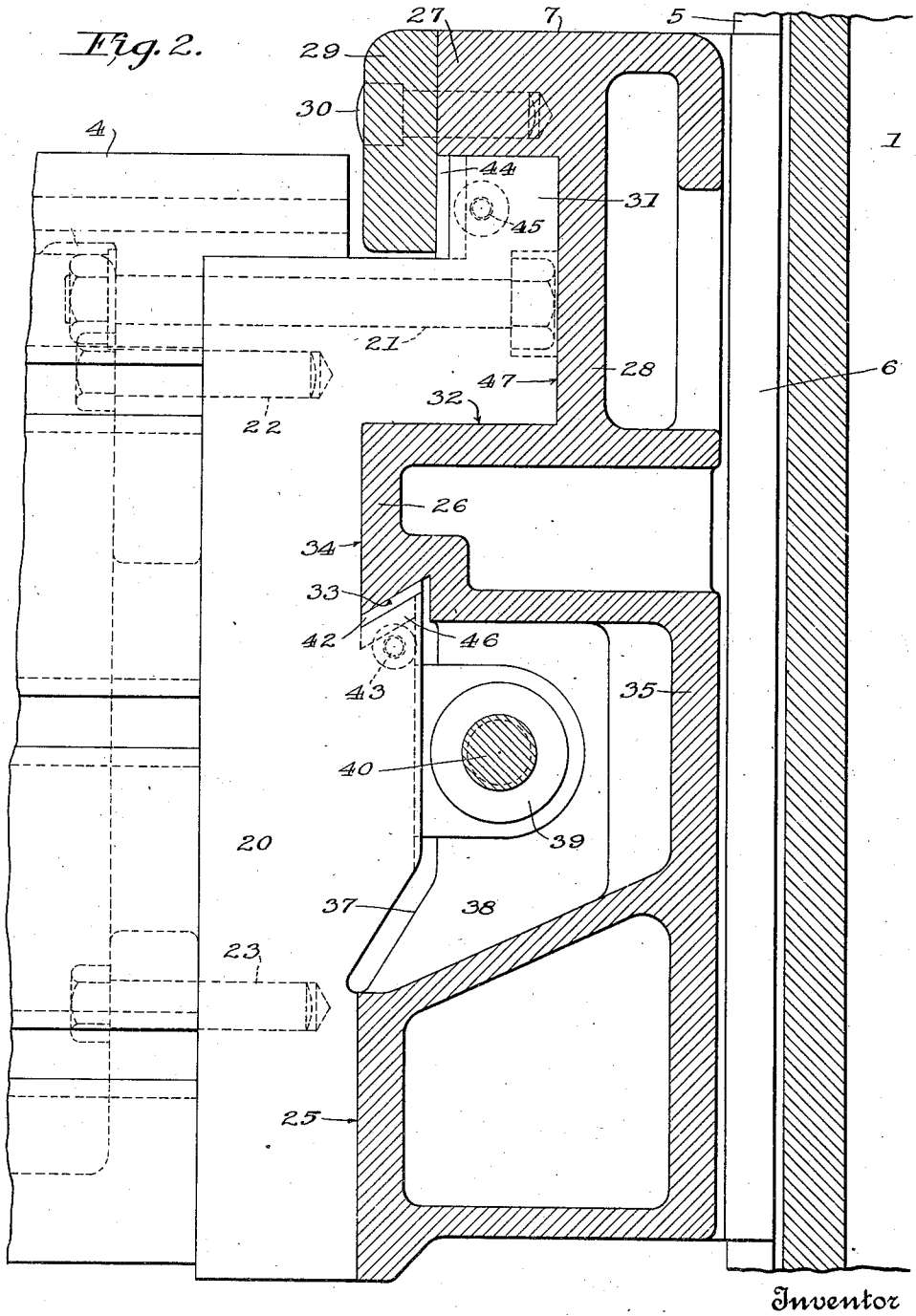
Nathan & Bowman

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SHAPING MACHINE WORK TABLE CROSS RAIL GUIDE

Filed Oct. 29, 1927 3 Sheets-Sheet 2

Fig. 2.



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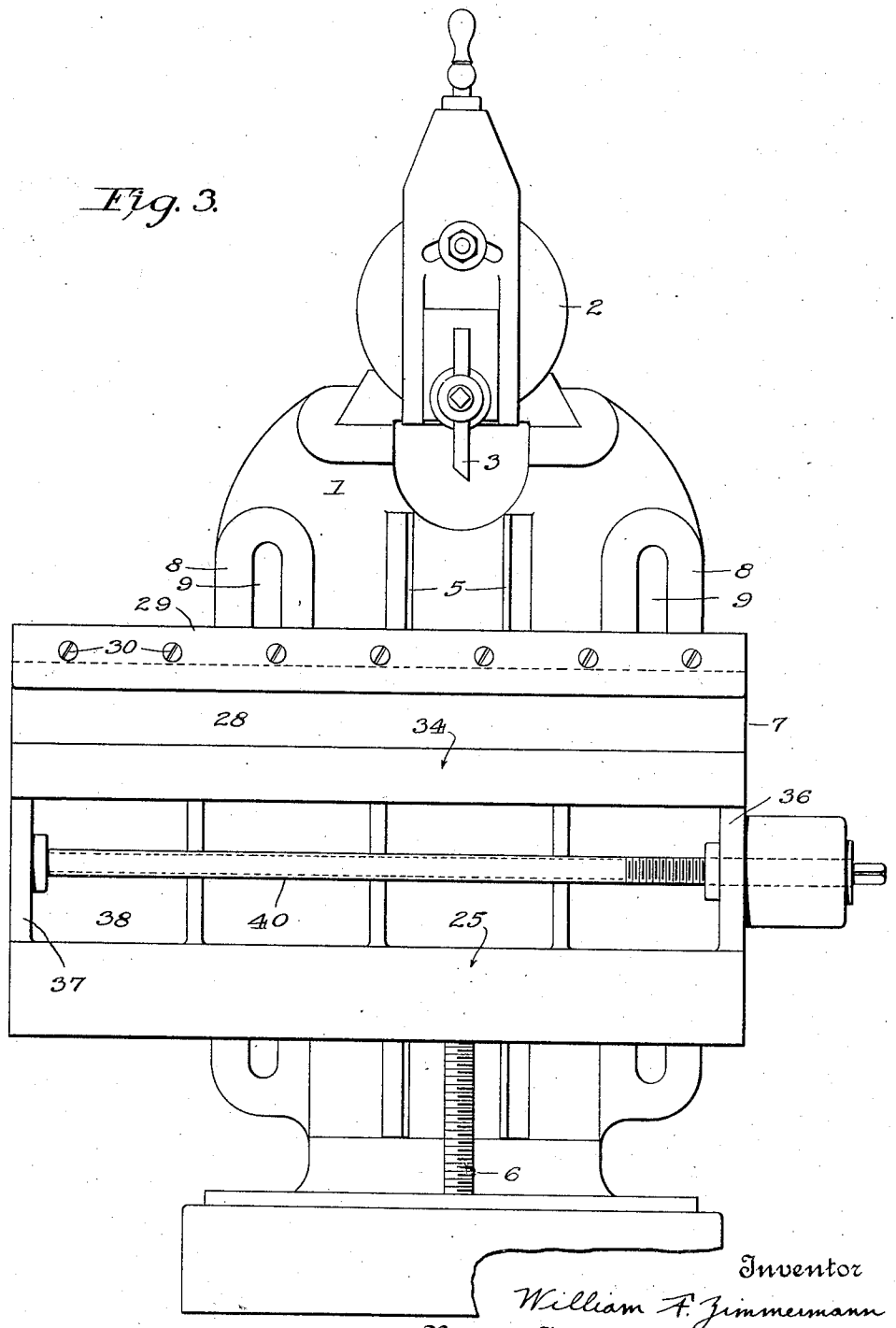
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SHAPING MACHINE WORK TABLE CROSS RAIL GUIDE

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Fig. 3.



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UNITED STATES PATENT OFFICE

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SHAPING-MACHINE WORK-TABLE CROSS-RAIL GUIDE

Application filed October 29, 1927. Serial No. 229,542.

This invention is concerned with the provision of improved means for supporting a movable element, such as the table of a shaper machine tool on a horizontally extending cross-rail.

The usual construction of a standard shaper includes a frame having a ram reciprocably mounted on the upper portion thereof, the forward part of the frame having vertical ways upon which a cross-rail is mounted for vertical adjustment therealong, the cross-rail in turn having a table saddle mounted thereon for horizontal adjustment; the whole resulting in a large overhanging or cantilever construction for which the cross-rail must be so constructed as to adequately provide guiding and supporting surfaces. In addition to the weight of the elements, the operation of the tool upon the work results in extremely large forces being exerted upon the cantilever construction in the same direction as those resulting from the weight of the parts. More explicitly, the cutting tool in the standard construction performs its working operation on the outward stroke, the cutting tool exerting a downward and outward force which results in a turning moment which is necessarily transmitted to the cross-rail. Outer supports and guide rails are commonly resorted to, to assist in the support of the overhanging structure but such auxiliary means does not obviate the necessity of providing rigid supporting and guiding means for the inner end of the table.

As a further feature of the standard shaper having the general structure outlined above, the means for translating the saddle along the cross-rail include usually a long screw mounted in the cross-rail and adapted to coact with a projecting nut portion integral with the saddle, or these elements may be reversed, but in either form result in a long opening in the face of the cross-rail extending longitudinally thereof.

In the early constructions of cross-rails, a common form was to provide a lower bearing plate and an upper guide member with the screw receiving opening between the two and an additional guide against vertical movement being located at the lower portion of the lower bearing. Later constructions include a lower bearing plate, an upper guide portion similar to the first construction noted and with an additional guide portion located between the two adapted to resist any lifting force transmitted to the table. In this construction the adjusting screw is located between the two upper guides.

In either of these constructions noted, the two projecting surfaces adapted to serve as guides for the saddle were separated by the opening necessitated by the screw adjusting means; the guide means being connected at the ends by flanged members but owing to the relatively long cross-rail in machines of this type these web bracing members were widely separated with the result that the middle portions thereof and especially the top guide member were distorted by the extreme forces imparted thereto. While this distortion or bowing was seemingly rather slight yet it was sufficient when carried to the table to result in substantial and material misalignment of the work in its relation to the cutting tool.

Improvements have been discovered and designed which were found to remedy these faults to a large extent, such improvements including in the main the idea of providing an upper guiding plate and a lower bearing plate; the upper plate being designed to act as a vertical guide also, the screw adjusting means being inserted between the two plates mentioned. With such construction no large unsupported opening was left between the two guide portions and the relation between the two was not destroyed by any flexure or bowing on the guide surface. Such improvements have been found extremely advantageous and broadly form the subject-matter of a co-pending application by the same inventor, Serial Number 1,384 filed January 9, 1925.

As a result of further study and experimentation, additional and further improvements have been conceived and form the subject-matter of the structure described herein.

The invention which is specifically disclosed herein includes the advantages of the single integral projecting guiding plate but

differs from prior constructions in that the cross-rail is provided with an overhanging or hook portion adapted to partially receive and enclose a bearing member having an upturned inner end engaged by the hook portion of the guiding element, this construction differing from the common prior practice of forming the saddle with a portion adapted to hook over the cross-rail.

Such a construction affords advantages not heretofore accomplished. The projecting ledge furnishing the guide surfaces for the saddle includes an under surface engaged by a portion of the saddle to provide for lifting forces, a right angled portion of the saddle resting on the upper surface of the projecting ledge, the right angled portion being secured in position by a removable plate attached to the upper projecting portion of the rail; the whole providing a very solid and compact guiding means for the saddle. With such a construction any turning moments resulting from vertical forces on the outer end of the table or from the outward forces as the tool engages the work are resisted by the aforesaid plate whereby the right angle portion of the saddle would tend to spring back into engagement with the upper surface of the ledge and the two surfaces on opposite sides of the ledge would be more firmly brought into contact therewith.

The objects further include the provision of a guiding surface on the under face of the projecting ledge, which surface is inclined upwardly and inwardly whereby any tendency, as noted above, of the two bearing surfaces to be drawn together acts in such a manner along the inclined guide surface as to more firmly draw the upper part of the saddle backwardly and into engagement with the guide member.

The objects also contemplate the provision of a construction co-operative with the above features such that a longer lever arm is employed to resist the turning moment of the table; i. e. such turning moment is resisted by the upper plate engaging the right angled upturned portion of the table constituting a force acting with a lever arm equal to the distance therefrom to a fulcrum located near the bottom edge of the lower bearing plate. A further resistance to the turning moment of the table is afforded by the inclined surface on the end face of the projecting ledge.

Other objects and advantages will be in part indicated in the following description and in part rendered apparent therefrom in connection with the annexed drawings.

To enable others skilled in the art so fully to apprehend the underlying features hereof that they may embody the same in the various ways contemplated by this invention, drawings depicting a preferred typical construction, have been annexed as a part of this disclosure and, in such drawings, like characters of reference denote corresponding parts throughout all the views, of which:—

Figure 1 is a side elevation of a shaper, such portion only of the shaper being shown as is necessary to a complete disclosure of the invention. Fig. 2 is a partial elevational view showing the cross-rail and a portion of the frame in vertical section and Fig. 3 is a front view of the shaper and cross-rail and with the table removed to better illustrate the position of the adjusting screw means with relation to the bearing and guiding surfaces.

In the drawings depicting a practical embodiment of this invention, 1 indicates the frame of a standard shaper having the ram 2 reciprocably mounted on the upper portion thereof with the cutting tool 3 mounted thereon adapted to act upon the work mounted on the table 4 exerting its cutting stroke thereon during the outward movement of the cutting tool 3 in the usual manner. The frame 1 is provided with the vertical guides 5 between which slides the projecting portion 6 of the cross-rail 7. The forward face of the frame has also formed thereon the bearing plates 8 having the slotted openings 9 therein, through which pass the securing bolts 10, 11 and 12 and also the clamping bolts 13 having nuts screwed thereon, engaging the plates 14 bearing against the rear of the bearing plates 8.

Vertical adjustment of the cross-rail along the vertical ways is accomplished by means of rotation of the nut 15 mounted in cross-rail 7 to engage the screw shaft 16, such nut 15 being operable by the application of any well known means, either manual or automatic; a squared end 17 adapted to receive a wrench for manual operation being illustrated herein. Clamping of the cross-rail in vertically adjusted position is accomplished by means of a wrench applied to the squared end 18 whereby nuts 19 on the bolts 13 are firmly drawn into clamping position.

The table 4 is secured to the saddle portion 20 by means of bolts 21, 22 and 23, or such table and saddle may be made integral as desired. The construction thus far described is that of a common standard shaper and it is to be understood may be varied in various details without departing from the spirit of this invention.

The forward face of the cross-rail is provided with the lower bearing plate 25 and the upper guide portion including the projecting ledge 26 and the upper projecting portion 27 overhanging the ledge member 26 and made integral therewith by means of the web 28 extending the full length of the cross-rail. The outer end of the projecting portion 27 has integral therewith or, as shown, removably secured thereto a plate 29, held in place by the countersunk screw bolts 30, thereby resulting in a right angled opening adapted

to receive a similarly shaped right angled projecting portion 31 on the saddle, such right angle portion closely fitting therein to receive a bearing on all sides.

The projecting ledge 26 has an upper bearing surface 32, the lower bearing surface 33, and the outer guide face 34. The lower face 33 is, as may be observed, inclined upwardly and inwardly for a purpose to be later described. The ledge 26 and the lower bearing plate 25 are secured together by the rear wall 35 and the end web portions 36 and 37 leaving a relatively long open space 38 within which the nut 39 integral with the saddle 20 is adapted to reciprocate; such reciprocation being accomplished by rotation of the screw shaft 40, rotatively but non-axially mounted in the web members 36 and 37.

A gib member 42 is adjustably mounted to engage the surface between the saddle 20 and the lower bearing surface 33, adjustment of the gib being accomplished by the screw means 43 in any well known manner. A similar gib 44 and an adjusting means 45 is provided to engage the inner face of the plate 29.

With the construction described and disclosed in the drawings, it is apparent that a very compact and rigid means is provided for guiding the cross-rail, such means being a single integral member extending the full length of the cross-rail. The positioning of the long open space required by the screw adjusting means between the lower bearing plate and the guiding means rather than between the various guides prevents distortion of the guiding surfaces relative to each other. Any turning moment imparted to the saddle by vertical force or upward horizontal force as a result of the working stroke of the tool tends, by reason of the overhanging hook portion, to draw the right angled portion 31 into tighter engagement with the bearing surface 32 and also as a result the projecting portion 46 of the saddle into tighter engagement with its corresponding bearing surface 43 forming a very rigid lock; the inclined surface 33 simultaneously tends to draw the saddle rearwardly into engagement with the vertical surface 34 and 47, thereby forming what may be termed a compound gripping means for securely holding the saddle in position on its guide.

The hook portion of the saddle, including the members 27 and the plate 29, results in a long lever arm adapted to resist the turning force acting upon the vertical table; such lever arm consisting of the distance from the plate 29 where it engages the vertically projecting portion 31 of the saddle having as its fulcrum a point near the bottom of the bearing plate 25.

A feature of prime importance in this radially new type of guide and support resides in the unusually wide horizontal surface 32 which offers an extensive and sturdy support for horizontal forces. The construction, by reason of this broad integral ledge, is thereby peculiarly adapted to support the heavy suspended structure forming an inherent characteristic of certain types of machines.

Because of the construction and operation peculiar to shapers having a long cross-rail and its overhanging table subjected to extreme force, the improvements disclosed herein are peculiarly adapted to such a type machine. It is to be understood, however, that the novel construction disclosed herein may be applied to great advantage in similar situations and tools wherein the nature of the support required is such as to make it particularly advantageous to resort to a construction having the inherent qualities of rigidity, compactness and simplicity of design, possessed by the present structure.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge, readily adapt it for various utilizations by retaining one or more of the features that, from the standpoint of the prior art, fairly constitute essential characteristics of either the generic or specific aspects of this invention and, therefore, such adaptations should be, and are intended to be, comprehended within the meaning and range of equivalency of the following claims.

Having thus revealed this invention, I claim as new and desire to secure the following combinations and elements, or equivalents thereof, by Letters Patent of United States:—

1. A shaper combining a frame; a cross-rail translatably mounted thereon having a projecting portion extending lengthwise thereof and affording at its upper side a relatively wide horizontally disposed saddle seat and at its underside an upwardly extending saddle bearing surface; a saddle mounted on said rail having a first bearing portion engaging said bearing surface to prevent outward movement of the saddle and a second bearing portion slidingly supported on said seat said second portion having a vertically extending flange; and securing means on said rail comprising means adapted to hook over said flange.

2. A machine tool combining a cross-rail; a table horizontally adjustable therealong, said rail comprising a lower substantially vertical bearing plate, a horizontally projecting ledge affording above the centerline of said table a relatively wide table seat, and an overhanging member projecting downwardly toward said ledge; a portion on said table engaging said bearing plate, said table also having portions adapted to rest upon said table seat and to project upwardly behind and engage said overhanging member.

3. A shaper table and cross-rail therefor combining, means on said rail for support-

ing the table for horizontal adjustment therealong; means to feed said table; a lower vertical bearing plate; a ledge member provided by said cross rail and located above said feed means, said ledge member affording a relatively wide table seat and a lower bearing surface said lower bearing surface being inclined upwardly and inwardly, an overhanging member having a portion projecting downwardly toward said ledge member; means on said table for engaging said bearing plate and surfaces; a projection on said table extending behind and contacting with said downwardly projecting portion; and an adjustable gib means positioned along said inclined surface.

4. A machine tool combining a frame, a cross-rail mounted thereon; and means for supporting a table horizontally adjustable therealong comprising a projecting ledge on said rail affording on its top a horizontal table seat and on its bottom an upwardly extending bearing surface, an overhanging hook portion integral therewith, an angled portion projecting from said table adapted to fit within the opening formed by said hook portion and having a bearing surface seated upon the table seat afforded by said ledge, and a bearing surface on said table engaging the upwardly extending surface of said ledge.

5. A shaper combining a frame, a cross-rail mounted thereon, and means for supporting a table adjustable along said rail comprising a projecting ledge affording a table seat and an upwardly extending bearing surface, a second projecting portion on said rail arranged parallel to and above said ledge and rigidly connected thereto by a rear wall, a member extending downwardly from said second projection to form a substantially hook shaped guide means adapted to receive an extending portion of the table shaped to conform with said opening, a bearing surface on said table adapted to rest upon said table seat and another bearing surface on said table adapted to engage the under side of said ledge.

6. A shaper combining a frame; a cross-rail mounted for vertical movement thereon; a saddle; means for adjustably mounting said saddle on the rail comprising a lower bearing plate, a projecting ledge member thereabove having bearing surfaces on the upper and lower sides thereof, an upper projection integral with said ledge, a removable member thereon extending toward said ledge to form a substantially right angled opening adapted to receive a similarly shaped portion of said saddle, faces on said saddle engaging said bearing plate and bearing surfaces; and means positioned in a horizontal opening between said ledge and bearing plate for adjusting the saddle along the rail.

7. A machine tool combining a frame; a cross-rail movably mounted thereon; a saddle; means for securing and guiding the saddle on the cross-rail comprising a horizontally extending projection, said saddle adapted to bear against the underside of said projection, adjustable gib means therefor and means forming an opening in said rail above said projection adapted to receive a projecting portion of said saddle having an upwardly turned inner end; and means positioned below said horizontally extending projection for adjusting the saddle along said cross-rail.

8. A shaper combining a frame; a cross-rail translatably mounted thereon; a saddle; and means on the cross-rail for securing and guiding the saddle thereon comprising a horizontally extending ledge having a lower bearing surface inclined upwardly to the rear, an upper outwardly extending projection, a plate removably secured thereon extending toward said ledge to form an angled opening adapted to receive a similarly shaped portion of the saddle, and adjustable gibs coacting with said lower bearing surface and said plate and the respective adjacent portions of said saddle.

9. A shaping machine combining a frame; a cross-rail secured thereto and providing, adjacent its lower edge, a vertically disposed bearing plate, said cross-rail also affording, above its center line, a horizontally disposed portion formed with a relatively wide horizontally disposed supporting surface and a relatively narrow bearing surface, and at its upper edge an outwardly and downwardly projecting hook portion; a work-table translatably mounted on said cross-rail and comprising a lower portion bearing against said bearing plate, a horizontally projecting portion seated upon said supporting surface, an upwardly projecting portion arranged below, behind and in contact with said hook portion and a portion engaging said relatively narrow bearing surface; a feed screw journaled in said cross rail intermediate the horizontally disposed portion and the bearing surface; and a nut carried by said table and having a threaded engagement with said feed screw.

10. In a machine tool, a cross-rail comprising a lower bearing plate, a horizontally extending ledge located above said bearing plate and affording at its upper and lower sides, respectively, a substantially horizontal table supporting surface and an upwardly extending bearing surface adapted to resist outward movement of a table; a table slidably mounted on said cross-rail and having surfaces complemental to, and in contact with, said bearing plate, supporting surface and bearing surface, said table also having a portion extending upwardly above the table supporting surface of said cross rail, said cross rail also having a hook portion engaging over the upwardly extending portion of the table

and serving to prevent outward movement of the upper portion of the table.

11. A machine tool combining a cross rail providing a horizontally disposed table supporting surface, a first bearing surface beneath said supporting surface and adapted to resist outward movement of a table, a second bearing surface beneath the first bearing surface, and an overhanging hook portion at the top of the cross-rail; a table translatably mounted on said cross rail and supported upon said table-supporting surface of the cross rail, said table also having a portion abutting said second bearing surface, a portion engaging the first bearing surface and an upwardly extending portion fitted within the hook-portion of said cross-rail; and means between the first and second bearing surfaces to translate said table on said cross-rail.

12. A machine tool combining a frame; a cross rail mounted thereon and a table translatably mounted on said rail, said cross rail providing a horizontally disposed supporting bearing surface, a substantially vertical bearing surface arranged below said horizontal surface, an inclined bearing surface between said supporting bearing surface and said vertical bearing surface, and a member overhanging and projecting downwardly toward said horizontally disposed bearing surface, and said table having a portion shaped to rest on said horizontal bearing surface and to project upwardly behind and engage said overhanging member, a portion engaging said inclined bearing surface, and a portion engaging said vertical bearing surface.

In witness whereof, I have hereunto subscribed my name.

WILLIAM F. ZIMMERMANN.