The object of the invention is broadly to provide improvements in heddle frames for looms, and particularly in the provision of a positive cooperation between the rods, employed to separate the heddle-supporting bars by predetermined spacing, and the latches, employed to operatively position oppositely disposed pairs of said bars with respect to each other and to the adjacent portions of the frame per se.

In a copending application, Serial No. 452,180, there is described and claimed an improved type of latch of the type above referred to, and the present invention comprises a slight modification of that latch, together with a simple form of spacing rod, and the combination of one or more of said latches and said rods, whereby there is formed a normally rigid structure which, however, is adapted to be readily separated into its several component parts with the least possible effort, for the purpose of releasing the heddle-supporting bars and the replacement or adjustment of the several sets of heddles carried thereby.

The necessity of this arrangement arises from the fact that heddle frames are generally of considerable length, making it necessary to fixedly support the heddle bars with respect to the frames, intermediate of their ends, it being kept in mind that this support must be of such character as to permit the heddles to be readily shifted past said supports whenever and in such numbers as may be desired, and also having in mind the fact that the opposite sides of the said frame and the bars adjacent thereto must be maintained rigidly with respect to one another, thus requiring the presence of the spacing rods above referred to, and which too must be attached to said bars in such manner as to also permit the heddles to be shifted as and whenever required.

A further object, briefly stated, is to provide in the present invention a combined simplification of and improvement over various earlier structures of the particular art involved, making use of all those details which have proved of distinct value in prior developments, and then adding to them the operation of details which are novel in the present disclosure.

In addition to the foregoing, the present invention comprises further details of construction and operation, which are fully brought out in the following description when read in conjunction with the accompanying drawing, in which Fig. 1 is an elevational view of a heddle frame in which are employed bar-supporting latches, comprising one embodiment of the invention: Fig. 2 is an enlarged fragmentary portion of such frame, showing the major portion of one of the improved latches in side elevation; Fig. 3 is a similar view, showing the bar-retaining element of the latch in angular withdrawn position; Fig. 4 is a section on the line 4—4 of Fig. 2; Fig. 5 is a section substantially similar to Fig. 4, but upon the opposite side of the latch bolt and showing the retaining element slightly shifted into the position in which it is no longer prevented by engagement with the bolt head from angular movement with respect to said head; and Fig. 6 is an elevational view of one of the spacing rods per se.

Referring to the drawing, a heddle frame is here shown as comprising parallel oppositely positioned top and bottom rails 1 and 2, connected at their ends by any suitable means such as straps 3. Pairs of heddle-supporting bars 4 and 5 extend longitudinally of the frame parallel with and slightly spaced from the neighboring rails 1 and 2, and operatively support a series of heddles 6, only portions of which series are shown.

Each of the rails 1 and 2 is provided at one or more intermediate points with a normally vertically extending bore 7, through which extends a bolt 8, having a threaded shank, and upon its outer end being preferably provided with a thumb nut 9 or the like, which bears against a washer 10. Surrounding its inner end each bolt is provided with a nut 11, which if desired may be countersunk into the adjacent surface of the supporting rail, as clearly shown in Fig. 3. Beyond this last-named nut the bolt is surrounded by a suitable coil spring 12, which may be either cylindrical, conical, or other
wise as may be desired, and which at its outer end bears against a washer 13 also surrounding the bolt.

In the form of the device illustrated, the inner end portion of each of these bolts when operatively positioned is provided with a transversely enlarged head, such as is shown in Fig. 4, and in the preferred embodiment comprises an elongated flattened portion 14, from which extend in opposite directions pairs of wings 15 and 16, said wing pairs being spaced apart yet connected by means of a transversely narrower or reduced portion 17 of the bolt head. It is to be understood however that these wing pairs, instead of being integral parts of the bolt itself, may be originally separate therefrom and secured thereto by riveting, welding, or otherwise, one pair of such wings may be integral and the other such pair originally separate but in practice unitarily connected with the remainder of the bolt. The distance between the similarly directed wings of the two pairs is but slightly larger than the normal height of the heddle bars 4 and 5, so that these bars may enter the spaces between adjacent wings, and thereafter while in such operative position, as shown in Fig. 4, be prevented by said wings from vertical movement or vibration, and be also prevented by the narrow portion 17 of the bolt head from approaching each other.

At this point it will be noted that for each pair of the latches just described there is a spacing rod such as is shown per se in Fig. 6. Such a rod comprises a central shank 18, the opposite end portions of which are each provided with pairs of oppositely positioned cutaway regions 19, separated by necks 20 supporting transversely extending terminal portions 21. When such a rod is inserted, first edgewise and diagonally and then vertically, between the opposite pairs of heddle bars 4 and 5, and is then turned axially so as to receive said pairs of bars in the respective oppositely positioned cutaway regions 19, this rod becomes a means for positively separating the bars of each pair (in addition to the performance of that function by the latch), and also maintaining the predetermined separation of said bar pairs, to prevent them from approaching or separating more than that distance for which they are intended.

Having this construction of latch and spacing rod in mind, if the rod is placed in a position adjacent to the heddle bar portion of the latch as shown in Figs. 2 and 3, said bar further functions through the medium of said latches as a means of maintaining the proper separation of the rails 1 and 2 of the frame. It is then only necessary to maintain the end portions of the rod closely and firmly adjacent to said latch shanks. For this purpose the latch as a unit embodies a tongue 20', having an angularly directed extension 21', provided in turn with an elongated aperture 22, which extends into both the tongue and the angular extension and loosely receives the shank of the bolt 8, thus forming a relatively loose pivotal connection between said element and said bolt.

This tongue normally extends closely adjacent to the terminal portion of the spacing rod as shown in the drawing, and in order to positively maintain this relationship and the firm contact of said rod with said latch shank, said tongue upon its opposite side is provided with angularly disposed fingers 24, which are spaced away from said tongue to receive and surround the heddle bars and engage the oppositely disposed sides of said lower latch wings 16, as shown in Fig. 2. The said tongue is then yieldingly maintained in this position by means of the spring 12 pressing downwardly upon the washer 18, which in turn normally bears against the angular portion 21' of said element. As seen in Fig. 2, the fingers 24 extend across the spaces between the opposed pairs of bolt head wings and are also diagonally directed through said spaces in order that their free end portions may engage the opposite sides of said wings as above stated. Each such finger is preferably beveled upon one side, in order to facilitate its ready latch-like engagement with its adjacent wing when moved manually in one direction, similarly to the operation of a door latch, after which the tension of the spring 12 tightly maintains said fingers in operative position and prevents the latch from opening and releasing the spacer rod and heddle bars under the influence of the usual vibration of the frame. Obviously, although reference has been made herein to the upper and lower portions of the latch as viewed in Figs. 2 to 5, it is to be understood that the relative positions of the various portions of the latch are reversed when it is inverted, as when it is positioned adjacent to the lower frame rail 2, instead of being connected directly with the upper frame rail 1 as here shown.

In the operation of the device, the heddle bars are placed in the cutaway regions of the latch itself, the spacer rod is inserted between said bars and is moved into position adjacent to said latch, and the tongue 20' is moved angularly towards and against said rod, after which said tongue is manually shifted longitudinally against the tension of the spring and the shank so that the fingers pass between the latch wings upon the opposite sides of the heddle bars and then engage said wings, so that upon the release of said tongue fingers rigidly hold the several elements in firm cooperation. In order to release the latch and remove either or both the spacer rod and heddle bars for the replacement or shifting of the heddles thereon, the tongue is man-
ually shifted longitudinally against the tension of the spring and then angularly to release said fingers.

If desired, the spacer rod may be provided with an aperture 25 across which the free end of the latch tongue normally extends, thereby permitting the insertion of a suitable tool through such aperture for use in shifting said tongue as hereinbefore described. Also, it is to be understood in conclusion, that the present invention comprises the use of the spacer rod in cooperation with the heddle bars, in combination with any form of latch means which is capable of normally fixedly securing said rod in operative position, whether or not the latch also cooperates with and serves as a means for maintaining the separation of the heddle bars as is here described and illustrated.

Having thus described my invention, what I claim and desire to protect by Letters Patent of the United States is:

1. The combination of a heddle frame and heddle bars adjacent to the opposite sides of said frame, with latches carried by said frame and operatively positioning said bars with respect to said frame, and a spacer rod extending between and operatively positioning said bars with respect to each other, and positioning the opposite sides of said frame with respect to each other through the medium of said bars and said latches, said rod being normally prevented from lateral movement free from longitudinal tension.

2. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, latches operatively separating the bars of each pair and operatively positioning each pair with respect to said frame, and a spacer rod extending between and operatively positioning said pairs of bars relatively to each other, and cooperating with said latches, to prevent lateral movement of said rods free from tension and to operatively position the opposite sides of said frame with respect to each other through the medium of said bars and said latches.

3. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, latches carried by said frame and simultaneously spacing the bars of each pair apart and at predetermined distances from the frame, and a spacer rod operatively spacing apart said pairs of bars and normally gripped by said latches to operatively space apart the opposite sides of said frame.

4. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, latches carried by said frame and simultaneously spacing the bars of each pair apart and at predetermined distances from the frame, and a spacer rod detachably engaging and spacing apart the bars of each pair and also spacing apart said pairs of bars, said rod being gripped by said latches and through them operatively spacing apart the opposite sides of said frame.

5. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, latches carried by said frame and simultaneously spacing the bars of each pair apart and at predetermined distances from the frame, a spacer rod having its respective opposite end portions positioned between the bars of each pair and operatively spacing them apart and spacing apart the pairs of bars, and a tongue pivotally carried by each latch and provided with fingers normally surrounding and retaining the adjacent bars firmly against said latch and cooperating with said latch to prevent accidental displacement therefrom, said tongue when in operative position also securing the adjacent end portion of said rod in fixed relation with said latch.

6. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, latches carried by said frame and simultaneously spacing the bars of each pair apart and at predetermined distances from the frame, a spacer rod having its respective opposite end portions positioned between the bars of each pair and operatively spacing them apart and spacing apart the pairs of bars, a tongue pivotally carried by each latch and provided with fingers normally surrounding and retaining the adjacent bars firmly against said latch and cooperating with said latch to prevent accidental displacement therefrom, said tongue when in operative position also securing the adjacent end portion of said rod in fixed relation with said latch.

7. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, a rod operatively spacing apart the bars of each pair and also spacing apart said pairs of bars, and latch means carried by said frame and operative to yieldingly secure said rod to said bars.

8. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, a rod operatively spacing apart the bars of each pair and also spacing apart said pairs of bars, and latch means carried by said frame and operative to yieldingly secure said rod to said bars, and to operatively space said bars with respect to said frame.

9. The combination of a heddle frame and pairs of heddle bars adjacent to the opposite sides of said frame, a rod operatively spacing apart the bars of each pair and also spacing apart said pairs of bars, and latch means carried by said frame and operative to yieldingly secure said rod to said bars.
ingly secure said rod to said bars, said latch means also spacing apart the bars of each pair, and operatively spacing each such pair with respect to said frame.

10. In a heddle frame, the combination of a frame rail, a latch unit carried by said rail and comprising a plurality of relatively movable members, a heddle bar normally engaged and operatively positioned by said latch unit with respect to said rail, and a spacer rod also normally engaged by said latch unit between said latch members independently of said bar, and operative to positively space apart the opposite rails of the heddle frame.

11. In a heddle frame, the combination of a frame rail, a latch unit carried by said rail and comprising a plurality of relatively movable members, a pair of heddle bars normally engaged and operatively positioned by said latch unit with respect to said rail and maintained by said unit in spaced relation with each other, and a spacer rod also normally engaged by said latch unit between said latch members independently of said bars, and operative to positively space apart the opposite rails of the heddle frame.

12. In a heddle frame, the combination of the frame rails, a latch unit carried by each rail and comprising in each case a pair of relatively movable members, pairs of heddle bars normally engaged and operatively positioned by said latch units with respect to each other and to said rails, and a spacer rod also engaged by and extending between said latch units independently of said bars and operative to positively space apart said frame rails.

13. In a heddle frame, the combination of the frame rails, a latch unit carried by each rail and comprising in each case a pair of relatively angularly movable members, pairs of heddle bars normally engaged and operatively positioned by said latch units with respect to each other and to said rails, and a spacer rod also engaged by and extending between said latch units independently of said bars and operative to positively space apart said frame rails.

14. In a heddle frame, the combination of the frame rails, a latch unit carried by each rail and comprising in each case a pair of relatively angularly movable members, pairs of heddle bars normally engaged and operatively positioned by said latch units with respect to each other and to said rails, a spacer rod also engaged by and extending between said latch units independently of said bars and operative to positively space apart said frame rails, and a spring forming a part of each latch unit and operative to yeaingly maintain the members of said unit either in operative or inoperative relation.

In testimony whereof I have affixed my signature.

JOHN WALKER, Jr.