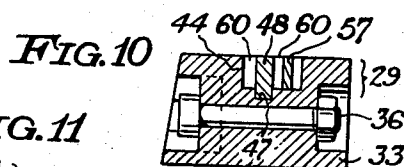
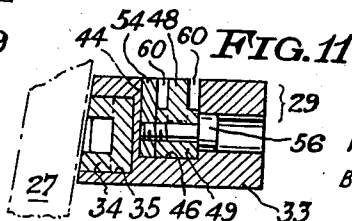
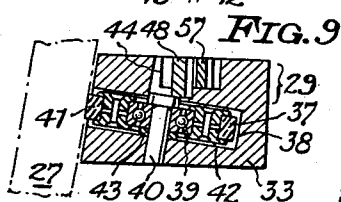
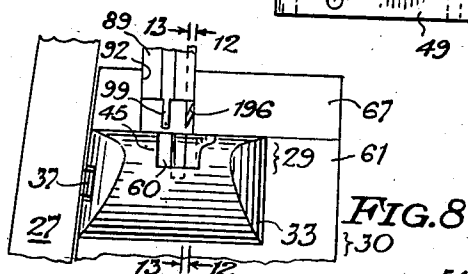
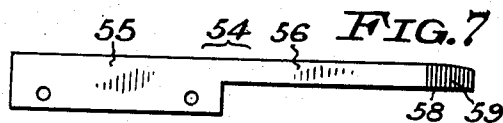
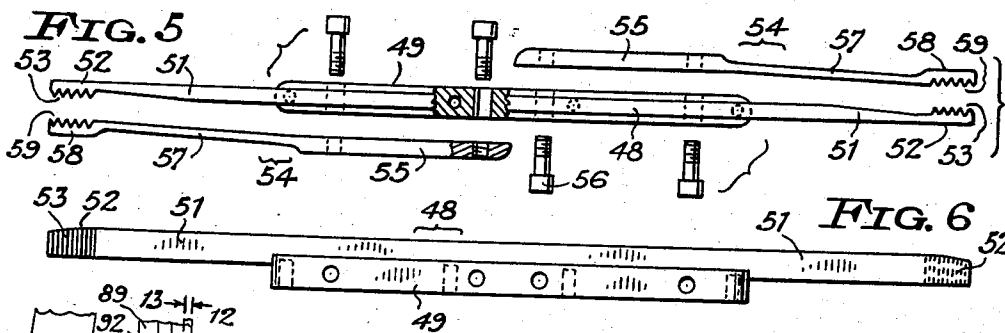
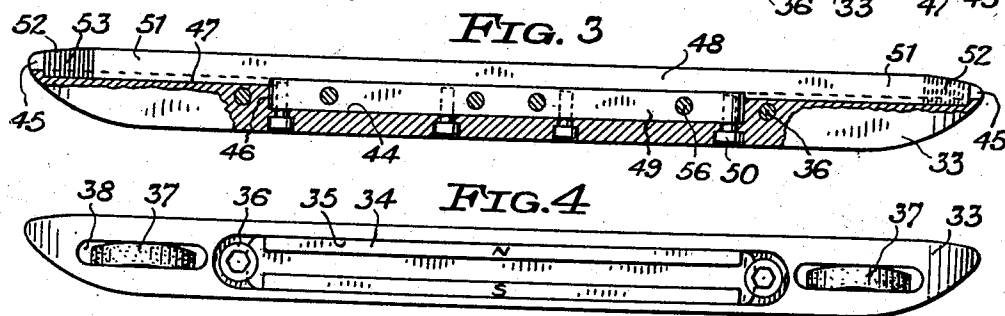
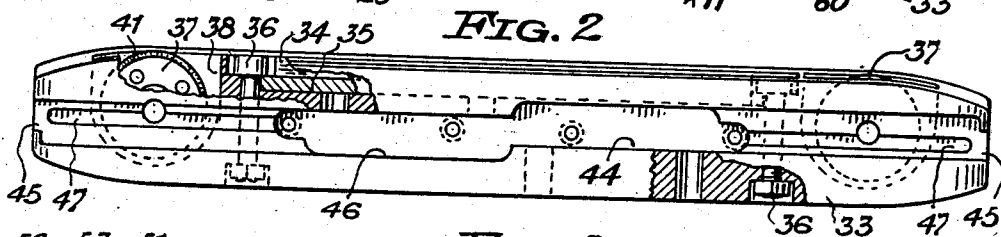
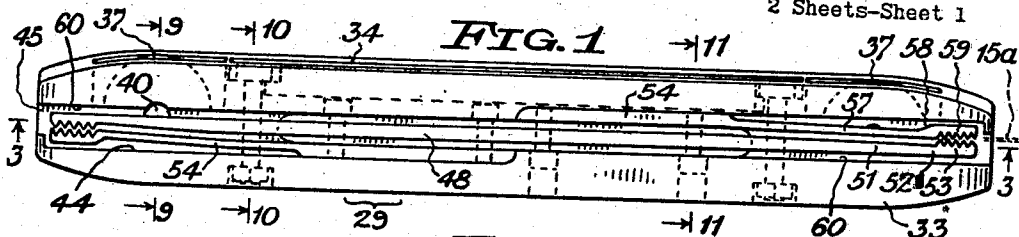


H. C. FRENTZEL
LOOM SHUTTLES

Original Filed Dec. 6, 1950

2 Sheets-Sheet 1



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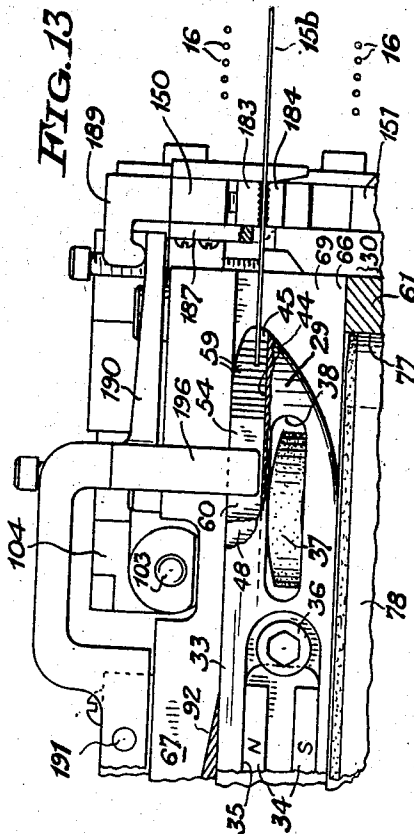
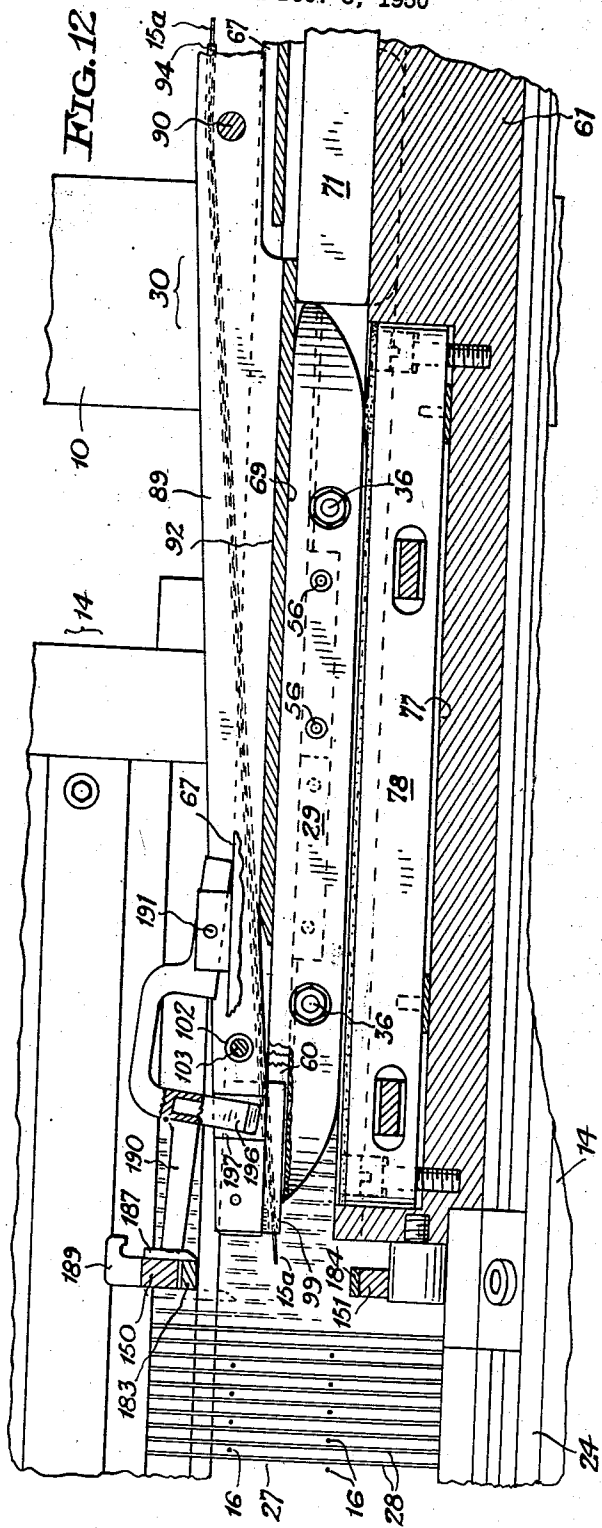
March 10, 1959

H. C. FRENTZEL
LOOM SHUTTLES

2,876,802

Original Filed Dec. 6, 1950

2 Sheets-Sheet 2



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2,876,802

LOOM SHUTTLES

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Original application December 6, 1950, Serial No. 199,482, now Patent No. 2,731,986, dated January 24, 1956. Divided and this application June 6, 1955, Serial No. 513,181

5 Claims. (Cl. 139—125)

The present invention relates to loom shuttles and more particularly to those of the pirnless or gripper type.

An object of the invention is to provide an improved gripper shuttle adapted to be reciprocated through a warp shed to lay weft therein from weft supply means at opposite sides of the loom, and which is so arranged as to conserve weft material.

Another object is to provide a gripper shuttle which will facilitate the engagement and release of weft ends with respect thereto.

Still another object is to provide a gripper shuttle including improved weft-gripping parts which are capable of easy assembly and replacement.

A further object is to provide a gripper shuttle which is particularly suitable for use on wire weaving looms.

A still further object is to provide a gripper shuttle which is of simple, durable and inexpensive construction, and which is reliable in operation.

The invention further consists in the several features hereinafter described and claimed.

This application constitutes a division of my copending application for Wire Weaving Looms, Serial No. 199,482, filed December 6, 1950, now Patent No. 2,731,986, issued January 24, 1956.

In the accompanying drawings,

Fig. 1 is a top view of a two-way gripper shuttle constructed in accordance with the invention and adapted for use on a wire weaving loom;

Fig. 2 is a top view of the shuttle with weft-gripping members thereof removed, parts being broken away and parts being shown in section;

Fig. 3 is a longitudinal elevational section of the shuttle, taken generally on the line 3—3 of Fig. 1;

Fig. 4 is a side elevation of the shuttle, showing the reed side thereof;

Fig. 5 is an exploded view of the weft-gripping members;

Fig. 6 is a side elevation of the central weft-gripping member;

Fig. 7 is a side elevation of one of the outer weft-gripping members;

Fig. 8 is an end view of the shuttle as it appears upon arrival in the right-hand shuttle box;

Fig. 9 is a transverse sectional elevation of the shuttle taken generally on the line 9—9 of Fig. 1;

Fig. 10 is a transverse elevational section, taken generally on the line 10—10 of Fig. 1;

Fig. 11 is a transverse elevational section, taken generally on the line 11—11 of Fig. 1;

Fig. 12 is a longitudinal fragmentary elevational section of the right-hand shuttle box unit, taken generally on the line 12—12 of Fig. 8, the shuttle being boxed and ready to leave the shuttle box, and

Fig. 13 is a longitudinal fragmentary elevational section taken generally on the line 13—13 of Fig. 8, the shuttle being boxed and the weft being released from the shuttle, ready for the fall of the lay.

In the drawings, the loom shuttle of the invention is

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designated generally by the numeral 29 and is adapted for use in a wire weaving loom such as that described in my above copending application Serial No. 199,482, now Patent No. 2,731,986.

The loom includes a frame 10 on which is swingably mounted a lay 14 having a lay beam 24 with the usual reed 27. The lay is suitably actuated to beat up weft wires 15a and 15b laid in the warp shed formed between warp wires 16, the warp wires being actuated to shed-forming position by the usual heddle mechanism, not shown. The reed comprises parallel steel strips or dents 28 forming between them narrow spaces receiving there-through the warp wires, the forward edges of the strips being disposed in a plane to form the face of the reed for guiding the shuttle in its flight and for beating up the weft wires.

The fly shuttle 29 is of the pirnless or gripper type and is thrown through the shed between shuttle boxes 30 (the right-hand shuttle box being shown) adjustably mounted on opposite end portions of the lay beam. The shuttle carries the weft wire through the shed in each direction from weft-supplying units, not shown, located at each side of the loom. The weft wires 15a and 15b are preferably identical, although not necessarily so.

The shuttle boxes 30 are each longitudinally adjustable along the lay beam to suit the width of the fabric being woven, the inner end of each shuttle box being spaced a short distance from the side edge of the warp bank. Each shuttle box is provided with suitable picking or shuttle-throwing mechanism including a reciprocatory picker block or ram 71 slidably guided in the shuttle box and engageable with the end of the shuttle.

The gripper shuttle 29 comprises an elongated boat-shaped body 33 of non-magnetic material, preferably metal, such as aluminum or stainless steel, the shuttle body being flat-bottomed and adapted to slide over the warp wires forming the bottom of the shed. The bottom warp wires of the shed will adequately support the shuttle without the use of the conventional shuttle board or race member. The shuttle is suitably guided in a smooth true course along the reed, as by means of a channel-shaped permanent magnet 34 which is secured in the reed side of the shuttle body and exerts an attractive force on the magnetizable reed, there being a small air gap between the reed and the magnet. The permanent magnet is disposed in a longitudinal groove 35 formed in the shuttle body and has its ends clamped by cross bolts 36. The shuttle body is also provided near its opposite ends with reed rollers 37 which are housed in wells 38 formed in the shuttle body and project slightly from the reed side of the shuttle body to ride on the reed face and determine the small air gap between the polar portions of the magnet and the edges of the magnetizable reed dents. Each reed roller has a ball-bearing 39 carried on a headed pin 40 and has a resilient annular tread member 41, such as of rubber, which is attached to the outer race of the bearing by opposed shouldered clamping rings 42 riveted together. A spacing washer 43 is interposed between the inner bearing race and the lower wall of the roller well.

The top wall of the shuttle body has formed therein a longitudinally extending recess or cavity 44 which terminates in notches 45 in the opposite ends of the shuttle body, the recess having a widened and deepened intermediate portion 46 and having aligned central end grooves 47. An elongated gripping bar 48 extends centrally in the recess 44 and has a thickened intermediate portion 49 which is clamped to the bottom of the intermediate portion 46 of the recess by screws 50. The opposite end portions 51 of the bar extend in the grooves 47 and are provided with terminal jaws 52 having lateral weft-gripping serrations or teeth 53, the teeth being formed on

one side of one of the terminal jaws and on the other side of the other terminal jaw. Gripping bars 54 are disposed along opposite sides of the central gripping bar 48 at the opposite end portions of the latter bar and have widened inner end portions 55 which are clamped to the sides of the central bar by screws 56, the shuttle body being apertured to accommodate these screws. The reduced outwardly projecting end portions 57 of the two side bars 54 are laterally resilient and have terminal jaws 58 provided with serrations 59 cooperating with the respective serrations 53 at the opposite ends of the central bar to grip the end of a weft wire at either end of the shuttle. The gripping planes of the opposite serrated end portions of the central gripping bar are not aligned, but are laterally offset a small distance, for example, in the order of $\frac{1}{8}$ ", to facilitate feeding and release of the weft wires 15a and 15b, as hereinafter described. A pair of narrow channels 60 extend longitudinally in the top face of the shuttle along the opposite sides of the central gripping bar 48 to admit shiftable feeding and releasing parts, hereinafter described, for the respective weft wires 15a and 15b. Each channel 60 has an open leading end at an end notch 45 of the shuttle body, and has a trailing portion which is formed between the central gripping bar and an adjacent side bar 54 and extends to the relatively separable serrated end jaws 52 and 58 of these bars.

Each longitudinally adjustable shuttle box comprises an elongated base or body 61 of light-weight cast metal, such as aluminum alloy. At its upper rear portion the shuttle box base has a longitudinal rabbet 66 the upper side of which is closed by an elongated metal plate 67 screwed to the base, thus forming a channel 69 all or a part of which is closed along the rear by the face of the reed, the channel being open at the inner end of the base. The inner end portion of the channel is adapted to receive and guide the shuttle, as seen in Figs. 8, 12 and 13, the channel being slightly higher and wider than the shuttle. When the shuttle is housed in the shuttle box the rear side of the shuttle is confined by the face of the reed, and in some cases by a magnetizable plate, not shown, forming a coplanar extension of the reed face. The picker block or ram 71 is longitudinally slidable in the shuttle box channel 69 to throw the shuttle through the shed. When the picker block is fully retracted, the distance between the forward end of the block and the inner or open end of the shuttle box channel 89 is slightly longer than the shuttle, as seen in Fig. 12.

When the shuttle enters the shuttle box after a flight through the shed it is brought to a stop by suitable braking mechanism including a vertically shiftable brake member 78 housed in an elongated cavity 77 formed in the shuttle box body. The brake member is engageable with the bottom face of the shuttle to stop the shuttle and is releasable to permit a homing travel of the shuttle against the picker block and to avoid resistance to shuttle travel during the exit of the shuttle from the shuttle box.

Disposed longitudinally above the top plate 67 of the shuttle box is a generally horizontal elongated weft-feeding lever or feeder arm 89 pivoted at 90 to the shuttle box, the arm being rockable in a vertical plane through a small angle, and being movable in a longitudinal guide slot 92 formed in the top plate. The feeder arm has a longitudinally extending guide passage or tube 94 through which the weft wire slidably passes while subjected to a slight friction. The forward or inner end portion of the feeder arm extends approximately to the inner end of the shuttle box and is vertically slotted for attachment therein of a thin feeding vane or feather 99 which projects longitudinally below the feeder arm in a vertical plane, the weft-guiding passage extending downwardly and forwardly through the vane. The end of the weft wire projects from the guide passage, as seen in Fig. 12, which shows the vane in its depressed position in the

shuttle at the moment the shuttle is about to be thrown from the shuttle box. The feeder vane of the right-hand feeder arm is insertible into that one of the two shuttle channels 60 which is nearer the reed face, while the vane of the left-hand feeder arm is insertible into the other shuttle channel. During the initial part of the shuttle flight in either direction, the vane 99 opens the serrated jaws 52, 58, at the trailing end of the corresponding shuttle channel 60, and the end of the weft wire protruding from the vane is caught or pinched in these jaws as they leave the vane, carrying the weft wire through the shed to the opposite shuttle box. The feeder arm vane at the receiving shuttle box is raised above the shuttle path so as to avoid interference with the entry of the shuttle.

Each rockable feeder arm is suitably actuated during the loom cycle, as by means including an actuating lever 104 with a terminal pin 103 loosely engaging in a transverse bushing 102 secured in the feeder arm near the feeder vane.

As in the above application Serial No. 199,482, means are provided to clamp the laid weft wire, to sever the laid weft wire at the discharging shuttle box, and to release the laid weft wire from the shuttle after it arrives at the receiving shuttle box. Upper and lower weft clamping levers 150 and 151 are disposed in the space between the inner end of each shuttle box and the adjacent side edge of the warp bank and have their free end portions above and below the path of the weft wires, the levers being swingable apart in a vertical plane to permit passage of the shuttle. The upper lever 150 has a resiliently mounted weft-clamping jaw 183 and the lower lever 151 has a cooperating weft-clamping jaw 184. The upper lever also carries a knife 187 adapted to cooperate with the lower jaw 184 and so positioned as to sever the outgoing weft wire after the weft is laid in the shed but not to sever the end portion of the weft wire which is gripped by the newly arrived shuttle.

An arched weft-releasing lever 190 extends along a side of the feeding end portion of the feeder arm 89 and is rockably mounted on a pin 191 secured to a bracket 192 on the shuttle box cover plate 67 to swing in a vertical plane. The weft-releasing lever, which is normally spring-urged upwardly, carries a downwardly projecting cam blade 196 which is movable in a side notch 197 formed in the feeder arm and is adapted to enter the shuttle box channel 60 at a point between the fixed gripper bar 48 and the resilient gripper bar 54 so as to spread the gripper jaws 52 and 58 and thus release the gripped end of the weft wire from these jaws after the shuttle is boxed. The free end of the weft-releasing lever 190 extends under a hook member 189 attached to the weft-clamping lever 150 so that when the latter lever is depressed to weft-clamping position the weft-releasing lever will be moved downwardly by the hook member, as seen in Fig. 13, to spread the weft-gripping jaws of the shuttle. After the shuttle is thus released from the weft end, the shuttle is free to move farther into the shuttle box to abut against the picker block 71, this homing travel of the shuttle being effected by suitable mechanism such as that shown in the above application Serial No. 199,482, now Patent No. 2,731,986.

During the operation of the loom, the shuttle 29 is thrown back and forth between the shuttle boxes 30 by the picker blocks 71, the throw of the shuttle occurring when the lay approaches its back position, and both sets of weft-clamping levers being then open. Immediately before each shuttle throw the feeding end of the feeder arm 89 is depressed to insert the feeding vane or feather 99 thereof into the end portion of the corresponding shuttle channel or passageway 60. In Fig. 12, the shuttle is shown ready to leave the right-hand shuttle box, the feeding vane being entered into the rear shuttle channel. As the shuttle is thrown from the shuttle box, the feeding vane 99 spreads the weft-gripping jaws at the trailing end

of the shuttle, and as the rapidly moving shuttle leaves the feeding vane, these jaws close on and grip the end of the weft wire 15a protruding from the vane and carry this weft wire through the shed to the left-hand shuttle box where the shuttle is braked to a stop. Both sets of the weft-clamping levers 150 and 151 are then swung to closed position to grip the laid weft which is cut off at the right-hand shuttle box by the knife 187, and the weft-gripping jaws in the shuttle are released from the weft wire end by the cam blade 196 of the left-hand shuttle box. The shuttle is then homed into abutment with the retracted picker block 71 of the left-hand shuttle box. The clamped section of weft wire laid in the warp shed is then beaten into the cloth by the forward swing of the lay, the shed closing at or near the time of beat. The cycle is then repeated, the shuttle being thrown from the left-hand shuttle box where the feeding vane for the weft wire 15b enters the front channel 60 of the shuttle so as to effect gripping of the end of this weft wire in the associated gripping jaws 52, 58, at the left-hand end of the shuttle.

The weft-gripping jaws of the shuttle are disposed close to the opposite ends of the shuttle, and as each pair of active jaws is at the trailing end of the shuttle, there is very little waste of weft material, particularly since the shuttle boxes can be brought reasonably close to the opposite sides of the warp bank. The laterally offset relation of the two sets of weft-gripping jaws in the shuttle facilitates the engagement and release of the weft ends with respect to the jaws, and the disposition of the weft-gripping jaws permits the use of relatively simple picking or throwing members engageable with the opposite ends of the shuttle body. The weft-gripping parts are readily and firmly secured in place in the shuttle body and can easily be replaced when necessary.

I claim:

1. In a loom, weft-inserting means comprising a reciprocable shuttle having a pair of generally parallel channel passages therein, gripping bars extending longitudinally in said shuttle in secured relation thereto and including a pair of weft-gripping jaws at an end portion of one passage and a pair of weft-gripping jaws at the opposite end portion of the other passage, said bars including an intermediate bar the opposite sides of which form one of the side walls of each pair of passages, each pair of jaws being relatively yieldable in a transverse direction with respect to said shuttle and adapted to be spread by a weft-feeding member to admit a weft member between them, the end portion of each channel passage remote from the weft-gripping jaws at the other end portion of said passage adapted to receive the weft-feeding member for opening said jaws during the initial part of the shuttle flight.

2. In a loom, weft-inserting means comprising a shuttle having a longitudinally extending recess therein opening at opposite ends of the shuttle and having a deepened intermediate portion, and laterally adjacent gripping bars extending longitudinally in said recess and having widened portions rigidly secured in said deepened intermediate portion of said recess, said bars having end portions of reduced width with cooperating weft-gripping jaws thereon disposed in the opposite end portions of said shuttle recess, said jaws being relatively yieldable in a transverse direction with respect to said shuttle and adapted to be spread by a weft-feeding member to admit a weft member between them.

3. In a loom shuttle, a shuttle body, and weft-gripping means carried by said shuttle body and comprising selectively active pairs of weft-gripping jaws at opposite end portions of the shuttle body, each pair of said jaws being relatively yieldable in a transverse direction with respect to said body and adapted to be spread by a weft-feeding

member to admit a weft member between them, the active pair of said weft-gripping jaws being disposed at the trailing end portion of said shuttle body, the gripping region of one pair of said jaws being laterally offset with respect to the gripping region of the other pair of said jaws, and there being an unobstructed space extending longitudinally of said shuttle body from each pair of said jaws to the opposite end of said shuttle body to provide operating clearance for the weft-feeding member during the flight of the shuttle.

4. In a loom, weft inserting means comprising an elongated shuttle body member adapted to be reciprocated through a warp shed and having a recess extending longitudinally therein and opening at the opposite ends of said body member, the intermediate portion of said recess being deeper than the end portions of said recess, a first gripping bar extending longitudinally in said recess and having a thickened intermediate portion disposed in said deepened portion of the recess, said thickened portion having parallel side walls, the end portions of said bar having weft-gripping jaws, means for securing the thickened portion of said first gripping bar to the bottom wall of the deepened portion of said recess, a pair of resilient gripping bars disposed in the opposite end portions of said recess at opposite sides of said first gripping bar, said resilient gripping bars each having a widened intermediate portion extending in said deepened portion of the recess and laterally secured to the thickened portion of said first gripping bar, there being a channel passage between the outer longitudinal edge portion of said first gripping bar and each resilient gripping bar, the free end portion of each resilient gripping bar having a weft-gripping jaw cooperating with a laterally adjacent jaw of the first gripping bar, each channel passage adapted to admit a weft-feeding member for spreading said jaws during the initial part of the shuttle flight.

5. In a loom, weft-inserting means comprising an elongated shuttle body member adapted to be reciprocated through a warp shed and having a recess extending longitudinally therein and opening at the opposite ends of said body member, the intermediate portion of said recess being deeper than the end portions of said recess, a first gripping bar extending longitudinally in said recess and having a widened intermediate portion disposed in said recess, the opposite end portions of said bar having weft-gripping jaws disposed in the opposite end portions of said recess, a pair of resilient gripping bars disposed longitudinally in said recess at opposite sides of said first gripping bar, said resilient gripping bars each having a widened portion extending in the deepened portion of said recess, means for securing the widened portions of said first bar and resilient bars in the deepened portion of said recess, there being a pair of generally parallel channels formed between the opposite sides of the outer longitudinal edge portion of said first bar and the respective resilient bars, each resilient bar having a free end portion with a weft-gripping jaw disposed in an end portion of said recess and cooperating with the laterally adjacent jaw of said first bar, each channel passage adapted to admit a weft-feeding member for spreading the jaws at the trailing end of the shuttle body during the initial part of the shuttle flight.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,876,802

March 10, 1959

Herman C. Frentzel

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 3, for "assignor to Appleton Wire Works Inc., of New York, N. Y., a corporation of New York," read -- assignor to Appleton Wire Works Inc., of Appleton, Wisconsin, a corporation of Wisconsin, --; in the heading to the printed specification, lines 3, 4 and 5, for "assignor to Appleton Wire Works Inc., New York, N. Y., a corporation of New York" read -- assignor to Appleton Wire Works Inc., Appleton, Wis., a corporation of Wisconsin --.

Signed and sealed this 30th day of June 1959.

(SEAL)

Attest:

KARL H. AXLINE

Attesting Officer

ROBERT C. WATSON
Commissioner of Patents