C. LEA.

REED FOR SPACING WARP THREADS.

APPLICATION FILED SEPT. 17, 1915. RENEWED JAN. 19, 1921.

1,394,431. Patented Oct. 18, 1921.

3 SHEETS—SHEET 1.

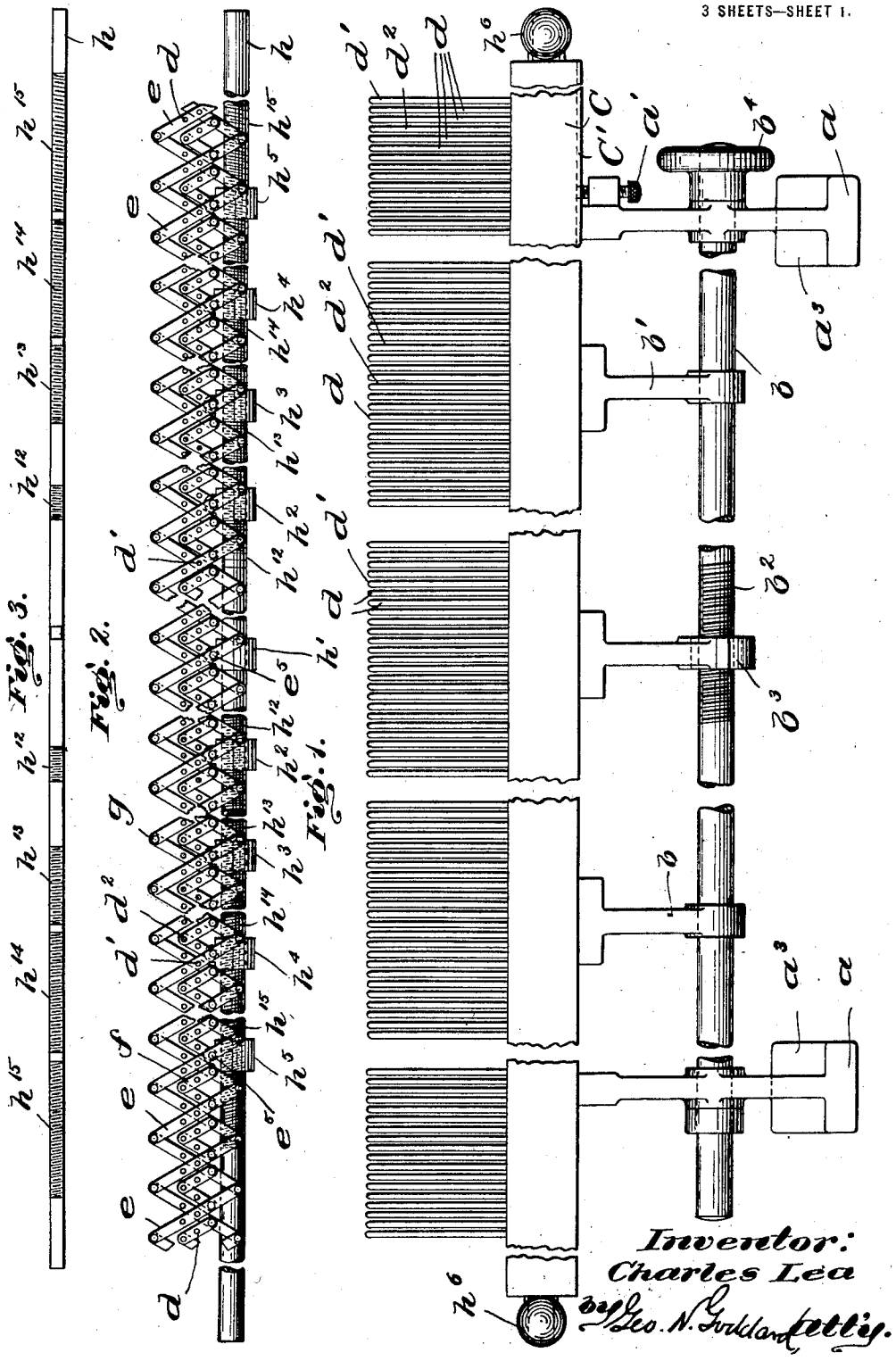


Fig. 3.

Fig. 2.

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 4.

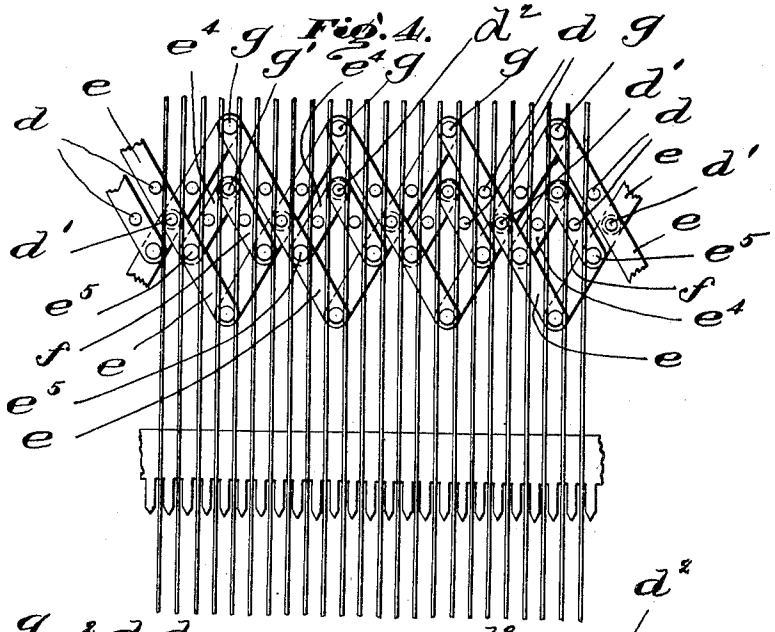


Fig. 5.

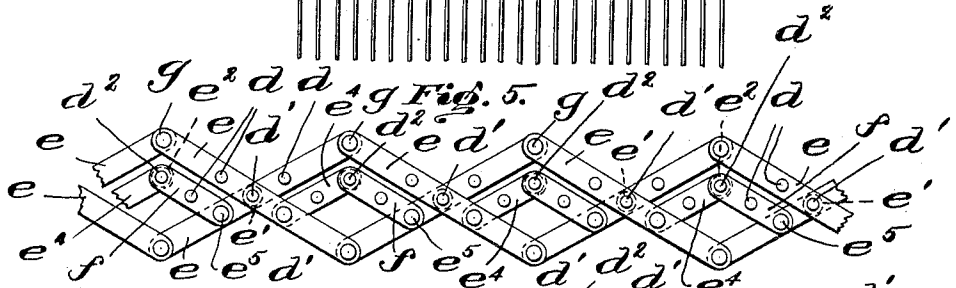
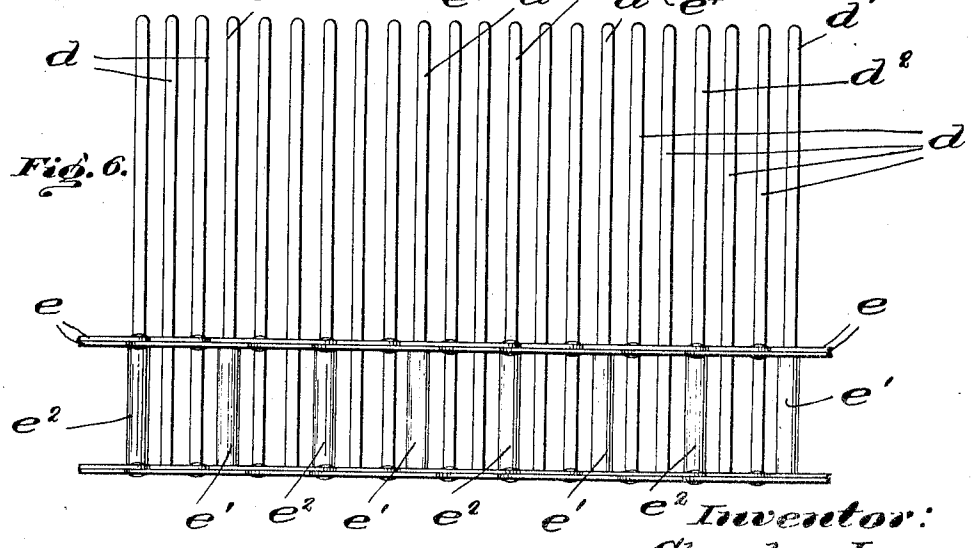


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

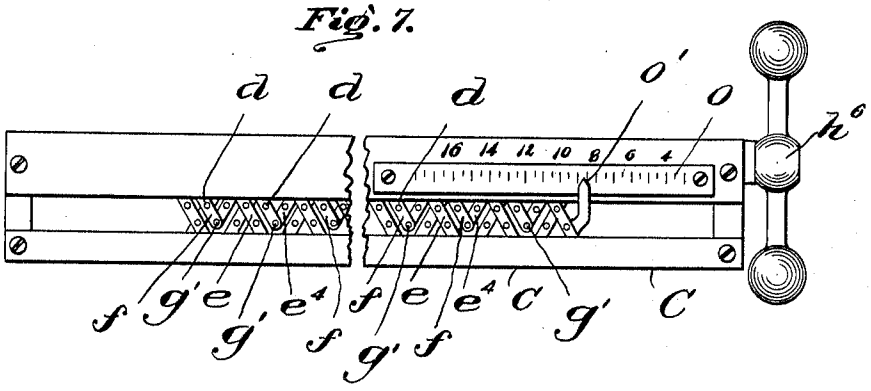


Fig. 9.

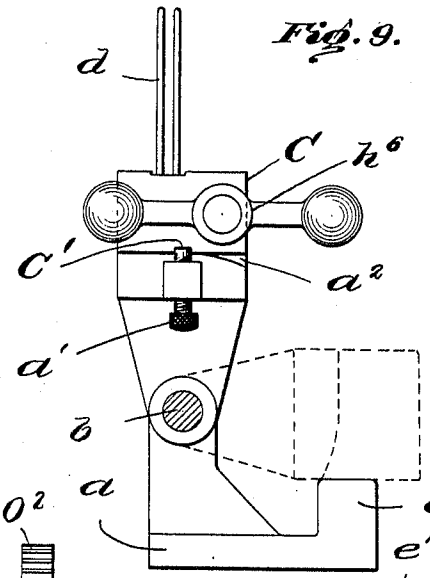
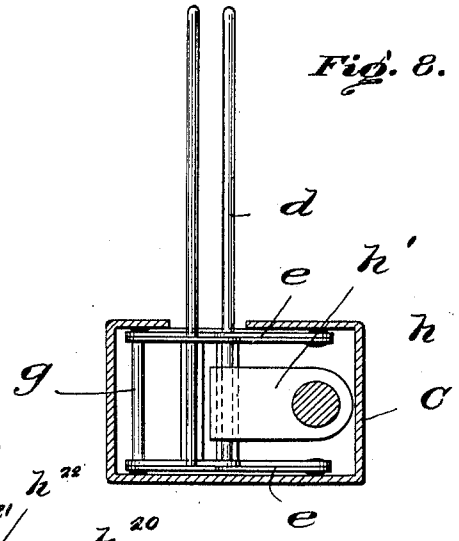


Fig. 8.



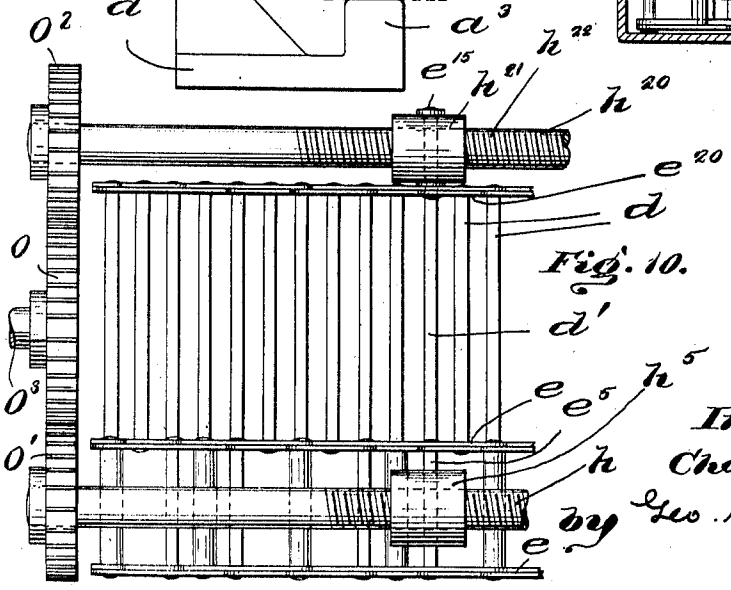


Fig. 10.

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UNITED STATES PATENT OFFICE.

CHARLES LEA, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO AMERICAN WARP DRAWING MACHINE COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

REED FOR SPACING WARP-THREADS.

1,394,431. Specification of Letters Patent. Patented Oct. 18, 1921.

Application filed September 17, 1915, Serial No. 51,164. Renewed January 19, 1921. Serial No. 438,525.

To all whom it may concern:

Be it known that I, CHARLES LEA, citizen of the United States, and resident of Boston, Massachusetts, have invented certain new and useful Improvements in Reeds for Spacing Warp-Threads, of which the following is a specification.

This invention relates to reeds or combs for holding or guiding warp threads, and is intended for use in beaming machines or other apparatus in which it is desired to hold a series of parallel threads separated or spaced from one another.

The chief object of the invention is to provide a simple and reliable reed or thread-spacing device which shall be adjustable so as to vary the number of dents per unit space, while at the same time maintaining an accurate and uniform spacing of the dents or teeth throughout the whole length of the reed. Provision is also made for easily disengaging or engaging the teeth simultaneously with the parallel threads. By combining with the reed a properly related scale or indicator, the setting of the reed to any desired pitch to accommodate differently spaced threads is easily and accurately effected.

These and other features of the invention will be hereinafter explained in detail and will be defined in the claims annexed to this specification.

In the drawings I have shown the preferred form and arrangement embodying the underlying principles of this invention, in which—

Figure 1 is a side elevation of the complete reed with intermediate parts broken out to permit illustration on a larger scale.

Fig. 2 is a plan view of the collapsible and expansible mechanism supporting the dents of the reed.

Fig. 3 is a detail view showing the longitudinal adjusting rod for setting the reed to any desired pitch.

Fig. 4 is a detail view showing on an enlarged scale a portion of the reed in contracted position in order to cause the dents to register with the dents of a holding clamp.

Fig. 5 is a plan view of a portion of the reed in expanded position.

Fig. 6 is a side elevation thereof.

Fig. 7 is a plan view showing the expansible reed operatively mounted in its casing in connection with the indicator or scale.

Fig. 8 is a cross sectional view through the reed-containing casing.

Fig. 9 is a side elevation of the complete structure.

Fig. 10 shows a modified construction for a closed reed adapted for use in looms.

Heretofore it has been proposed to make an expansible or contractible reed having its dents or teeth mounted on the levers of a lazy-tongs structure, the teeth being brought nearer together or separated more widely by the movement in or out of one end of the lazy-tongs. Owing to the considerable length of a reed and the consequent use of numerous joints in the lazy-tongs structure, each of which necessarily involves a slight lost motion or play, the actual movement imparted to the free end of the lazy-tongs is gradually reduced as it is transmitted from joint to joint so that the actual movement of the dents at the middle and at the respective ends of the reed is not at all uniform. The consequence of this different amount of contraction or expansion in different parts of the reed is that the dents or teeth throughout the whole reed do not register with the dents or teeth in the particular holding clamp which is to be fastened on the warp, and this involves the insertion of a greater or less number of the warp threads individually into the holding clamp by manual operation. Moreover, any tendency to contract one part of the reed more than another is likely to lead to the overlapping of adjacent warp threads on the beam.

By connecting the end members and the intermediate members or levers of the lazy-tongs with properly controlled actuating or controlling members, I make it possible to secure an accurate and uniform spacing of the dents throughout the whole length of the reed, no matter to what extent it be contracted or expanded. By the use of intermediate dent-supporting members carried by the lazy-tongs arms or levers, I make it possible to confine the width of the reed to narrow limits embracing only two rows of dents or teeth in staggered relationship.

By pivotally mounting the reed carrier

or casing on its base or support, I afford means for quickly and simultaneously engaging or disengaging the reed with its series of warp threads.

Coming now to a detail description of the form of the invention illustrated in the drawings, I provide a base or support, in this case consisting of the two brackets or standards a having bearings for the support of a longitudinal rod or shaft b, which forms a support upon which are pivotally mounted the supporting levers or arms b' secured to the bottom of the trough-like casing or frame c which carries the reed proper. At one end, the bottom of said casing is provided with a groove or slot c' to receive the upper end of the lock screw a' mounted in the standard a in such relationship that when the screw is fed upward to project into said slot c', it locks the reed frame c against swinging movement. On one side, the top of the standard a is cut away, as shown at a^2, to allow the frame or casing c to swing downward out of operative position, so as to rest upon a projecting member or stop a^3 of the base.

The reed-supporting frame comprising the casing c and its pivotal supporting arms b' may be longitudinally adjusted by providing the rod or shaft b with a screw-thread b^2 engaging an internal screw-threaded arm b^3 secured to the casing or trough c so that as the shaft b is turned by the hand wheel b^4 in its fixed bearings, such screw-threaded engagement with the arm b^3 serves to shift the reed-supporting frame longitudinally of the shaft. The purpose of this adjustment is to secure proper positioning of the reed as a whole with relation to the warp threads.

The contractible and expansible reed itself comprises in this case two rows of pins or teeth d and the lazy-tongs arms or levers e which form movable supports for some of said pins, the remainder of said pins being supported in supplemental or intermediate pivotal arms f. As shown in Fig. 6, the lazy-tongs structure is made double, that is it embraces upper and lower pivoted levers e registering with each other and connected by common or identical pins d' whose upward extensions form teeth or dents in the reed and whose lower ends are surrounded by loose sleeves or bushings e' which serve to space the upper series of levers from the lower series of levers. The extreme ends of the lazy-tongs levers e along one side are jointed together by vertical pivot pins g, common to both the upper and the lower series of levers.

Within the sides of each parallelogram formed by the adjacent or connected ends of four adjacent levers of the lazy-tongs, are disposed a pair of shorter intermediate levers f whose extreme ends are pivotally connected by pivot pins e^5 to corresponding points intermediate of the middle and the end pivots of the upper and lower series of lazy-tongs e and whose adjacent ends are pivotally connected by means of vertical pins d^2. These intermediate or short arms are parallel to the adjacent arms or levers of the lazy-tongs so that the extending or contracting of the lazy-tongs operates to extend or contract these intermediate arms in parallelism therewith. The inter-connecting pivot pins d^2 extend upward to form dents or teeth of the reed. Loose sleeves or bushings e^2, similar to the bushings e' are used as vertical spacing means to separate the upper and lower pairs of intermediate arms or levers f.

Both the longer levers e and the shorter intermediate arms f carry pins or teeth d suitably disposed between their pivoted joints to form in connection with the pins d', d^2, two longitudinal parallel rows of teeth arranged in staggered arrangement and separated from each other by uniform distances so that as the levers are extended or drawn together respectively the various teeth on the parallel arms are equally extended or drawn nearer together. By this arrangement a very close spacing of the dents in a longitudinal direction is obtained while confining the whole series within narrow limits transversely. Moreover, since the drawing together or contracting of the lazy-tongs brings the shorter and longer parallel arms closer together, the inside arms f act as a stop to prevent the complete closing of the lazy-tongs, thus avoiding bringing the staggered pins of the two rows directly opposite each other.

To avoid increasing the lost motion as movement is transmitted from joint to joint through the length of the lazy-tongs, I provide an actuating means therefor constructed and arranged to have proper actuating connection with numerous points of the lazy-tongs intermediate of its ends. The device shown for this purpose comprises the actuating rod h supported in stationary thrust bearings at the opposite ends of the reed frame or casing c. Midway of its length, this rod is provided with a connecting block or member h' projecting laterally therefrom and having a vertical bore to receive the middle one of the series of pins e^5 which form a pivotal or joint connection between the ends of the levers e along the rear side thereof. It will be understood that this middle block h', like the shaft or rod h has no longitudinal movement and serves as an anchoring member to hold the middle parallelogram or set of levers against longitudinal movement.

At suitable intervals along the adjusting

rod h, I provide additional connection blocks h^2, h^3, h^4, h^5, etc., to any desired number. These additional connecting blocks as shown have vertical bores to receive the corresponding pivot pins e^5 of every alternate parallelogram or section of levers and have at their rear ends screw-threaded engagement with the corresponding portions of the screw-threaded actuating rod h in order to shift longitudinally the pin which connects it to its corresponding parallelogram of levers. It will be observed that the screw-thread at h^{12} corresponding to the first shifting block h^2, that is, the one nearest the center, has a certain definite pitch, that the screw-thread at h^{13} corresponding to the next shifting block or member h^3 has a screw-thread of twice the pitch of screw-thread h^{12}, that screw-thread h^{14} corresponding to shifting block or member h^4 has a pitch three times the pitch of screw-thread h^{12}, and that screw-thread h^{15} has a pitch equal to four times the pitch of screw-thread h^{12}, so that each successive shifting block or member transmits not only the actual traverse imparted to it through the intermediate arms leading from the next preceding shifting block, but adds to that traverse an increment of movement equal to the movement of the first shifting member nearest to the central stationary block h'. With this arrangement, therefore, each section of lazy-tongs included between two adjacent actuating blocks is stretched or contracted to the same extent as every other section, thus giving a uniform and regular expansion or contraction to each and every section or parallelogram of the lazy-tongs throughout its whole length. In other words, individual sections from the middle toward the ends are given an expanding or contracting movement directly from its own actuating member instead of receiving this movement transmitted through the numerous joints interposed between itself and the end of the lazy-tongs, and this movement in each case is proportioned to the position of the individual section in the whole series so as to give an equal and uniform expansion between the dents or teeth throughout the entire length of the reed, a result which is very necessary in order to secure proper alinement or registration between the dents of the reed and the warp clamps that are to be applied to the warp threads carried by the reed.

It is obvious, therefore, that if it is desired to space the warp threads so as to have different numbers of threads occupying the width of the warp beam, the reed can readily be set to the desired pitch or spacing without causing any crowding together or over-lapping of any adjacent warp threads, while at the same time, owing to the equal and uniform spacing of the dents, whether the reed be collapsed or expanded, it is possible to insert the particular holding clamp appropriate to that pitch or spacing of the warp threads, since the dents or teeth of such clamp will accurately register throughout with the dents or teeth of the reed.

The adjusting or setting rod h is provided at one end with a hand lever h^6 to facilitate its rotation in either direction. It is also to be observed that the pitch of the corresponding threads on opposite sides of the middle of this rod are reversed to each other, that is, all adjusting threads on one side of the middle will be cut in a right-hand direction, and all the threads on the other side, in a left-hand direction, so that the sections constituting the two halves of the reed are either moved away from or drawn toward the middle with corresponding rates of movement.

It will be noticed, also, that the frame c which supports the reed proper is closed on all sides except for the longitudinal slot in the top through which the dents project, thereby excluding as much as possible the entrance of lint or foreign matter. It will also be observed in studying the plan views shown in Figs. 4 and 5 that the entire system of dents or teeth is constituted of a series of triangular groups with the apex or pivotal dent or pin of one triangular group arranged on the opposite side or row to the apex or pivotal dent or pin of the next triangular group. It will be observed that one triangular group comprises the pivotal pin d' connecting the middle points of two intersecting levers e of the lazy-tongs, and the two adjacent pins d mounted in the intermediate portions of the levers e, while the next triangular group of teeth includes the pivot pin d^2 forming the joint for the adjacent ends of the levers e^4 and the two pins d mounted on the intermediate portion of these levers. In order to secure the arrangement of dents in two parallel rows, the pivot or middle pin of each triangular group is arranged alternately in the two rows.

It will be observed that Fig. 7 has shown a graduated scale o secured to the top of the frame or casing c and that I have secured a pointer o' to the end of the lazy-tongs structure arranged to travel along said scale. Any appropriate system of marking may be used. In this case I have shown the scale marked from 4 to 16 to indicate the number of spaces to the inch in the various positions of adjustment of the reed. When the reed embracing the lazy-tongs structures is contracted to its shortest length with the teeth as close together as possible, the pointer will be opposite the 16 mark indicating 16 threads to the inch. When the reed is extended to its outermost position, the pointer o' registers with the 4 mark of

the scale, indicating 4 dents or threads to the inch. By simply turning the adjusting rod h, the operative may quickly and accurately set the reed to the pitch desired for any particular series of threads.

The form illustrated in Figs. 1 to 9 shows a comb open at the top to allow the threads to be dropped in or removed from the tops of the dents or pins. In Fig. 10 I have shown how the same principle may be applied to a closed reed such as is used in looms.

In the form shown in this figure, the upper ends of the dents or teeth d, d' are inserted in a series of lazy-tongs levers e^{20} corresponding exactly in size and arrangement to the lower sets of lazy-tongs levers e. The additional shifting rod h^{20}, corresponding to the rod h, is mounted above the collapsible reed in position to operatively engage the screw-threaded connecting blocks h^{21}, which operatively connect the topmost lazy-tongs structure e^{20} with the adjusting rod h^{20}. The upwardly extending pin e^{15}, corresponding in location and function to the pin e^5, passes through the shifting block h^{21} in order to operatively connect it with the levers e^{20} of the topmost lazy-tongs structure.

To synchronize the movement of the upper and lower lazy-tongs structures, I connect the ends of the shafts h, h^{20} by a suitable synchronizing means consisting in this case of the spur gears o', o^2 secured to the respective shafts and intermeshing with the intermediate gear o which is provided with an actuating shaft o^3 so that the rotation of the two shafts in the same direction and to the same extent is simultaneously effected.

It will be observed that by the use of the intermediate arms e^4 which are pivotally connected with one set of the main or longer arms of the lazy-tongs that lie parallel with the other set, it is possible to insert a larger number of dents between the pivotal points connecting the intersecting pairs of levers while still using only two rows of dents than would be possible if all the dents were mounted on the two intersecting long arms of the lazy-tongs structure, thereby giving a very close compact structure for the reed and keeping the width of the reed transversely within narrow and convenient limits. If the short intermediate arms were omitted, in order to get the same number of dents between two intersecting pivotal points of the long arms it would be necessary to use at least four rows of dents, thereby doubling the width of the reed and increasing the liability of error in laying the warp threads between successive dents.

A further advantage of the present structure is that by mounting the individual dents in both the upper and lower sets of arms forming part of the lazy-tongs structure the dents are held in correct vertical position parallel with one another instead of being allowed to lean more or less toward or away from each other as might otherwise happen, and this double support for the individual dents is, from a practical point of view, important.

It will also be observed that the whole lazy-tongs structure forming the collapsible and expansible support for the reed dents are inclosed in the hollow trough with only the wires or dents projecting through the upper end, thereby lessening the tendency to catch yarn or lint between the levers. The adjusting rod is also inclosed within said trough or casing having its connection with the lazy-tongs structure between the upper and lower members thereof.

What I claim is:

1. A variable-pitch reed embracing in combination a series of equally spaced parallel dents, duplicate sets of inter-connected lazy-tongs levers arranged in parallel planes and forming simultaneously adjustable supports engaging each of said dents at two different points and acting to maintain said dents in parallelism in their different positions of adjustament, substantially as described.

2. An extensible and contractible reed for retaining a series of parallel threads embracing a series of equally spaced teeth or dents, upper and lower series of supporting levers therefor pivotally connected together, one superimposed above the other with their pivotal joints in axial alinement and expanding and contracting mechanism having direct connection at frequent intervals with different levers of the series in order to impart expanding or contracting movement thereto, the movement of the respective connecting members being controlled to secure uniform expansion or contraction of the reed throughout its entire length, substantially as described.

3. An expansible and contractible reed for warp yarns or the like embracing two parallel sets of lazy-tongs levers, one superimposed above the other, with their respective intersecting joints co-axially connected together, a series of uniformly spaced dents mounted for support in both the corresponding upper and lower arms of said lazy-tongs levers, and means for expanding and contracting the reed by simultaneously drawing out or collapsing said lazy-tongs levers, substantially as described.

4. An expansible and contractible reed for warp yarns and the like embracing upper and lower lazy-tongs levers interconnected at their corresponding joints by common pivotal connecting means, a series of spaced dents mounted for support in both upper and lower sets of levers in order to preserve their parallelism, an adjusting screw arranged along one side of said dents intermediate of

the planes of the upper and lower levers and connecting members projecting from said screw laterally between the upper and lower levers and having operative connection with said levers for simultaneously expanding and contracting the upper and lower sets of levers, substantially as described.

5. An adjustable reed embracing in combination a lazy-tongs structure, a series of intermediate parallel levers pivotally mounted inside of each paralleogram formed by the intersecting levers of the lazy-tongs, a series of spacing teeth mounted at equal distances apart upon the lazy-tongs levers and the intermediate levers, a longitudinal adjusting rod, a series of connecting members engaging respectively said rod and the lazy-tongs structure for imparting longitudinal movement directly to different portions of the lazy-tongs structure, substantially as described.

6. A reed of variable pitch embracing duplicate sets of lazy-tongs levers mounted in parallel planes one above the other and directy connected together at their pivotal joints to maintain corresponding pivotal joints in alinement, a series of dents each of which is mounted in corresponding levers of both sets of lazy-tongs to afford a double support therefor whereby the dents are supported and maintained in parallelism, and means for equally expanding and contracting both sets of levers in unison, substantially as described.

7. A reed of variable pitch embracing in its construction duplicate sets of lazy-tongs levers arranged in juxta-position in parallel planes, connecting means for directly connecting each pair of levers with the corresponding levers of the other set to maintain their pivotal axes in constant alinement with each other, a series of equally spaced dents operatively supported in parallelism with one another by engagement with the corresponding levers of both sets of levers, substantially as described.

8. A variable reed embracing in its construction an expansible and contractible supporting structure comprising pivoted levers arranged to form a series of connected parallelograms, a double row of pins or teeth carried by said pivoted levers, said pins being arranged in triangular groups, the middle or pivotal pin of each successive triangular group being arranged alternately in each of the parallel rows, and means for collapsing and expanding the pin-supporting structure so as to equally draw together or push apart the whole series of pins, substantially as described.

9. A reed of variable pitch embracing in combination with a frame or casing, a collapsible and expansible dent-supporting structure supported thereby and comprising upper and lower series of lazy-tongs levers, one superimposed over the other with their intersecting pivotal points registering with each other, a series of suitably spaced dents or teeth carried by said collapsible and expansible structure and passing through the levers of both sets, and equalizing adjusting means having operative connections with said collapsible and expansible structure to cause the equal and unifrom contraction and expansion of the reed throughout its length, substantially as described.

10. An adjustable reed embracing in its construction a longitudinal bar or casing, a collapsible and expansible supporting structure mounted therein, a series of uniformly spaced reeds mounted on said supporting structure, brackets for operatively supporting said bar or casing, said brackets having their upper ends formed to engage the bottom of said supporting bar or casing, said ends being formed to allow said casing to swing downwardly and means for normally interlocking said casing with said brackets to hold it in normal operative position, substantially as described.

11. The combination with a longitudinal supporting bar, a collapsible and expansible reed structure mounted thereon having dents normally spaced apart, supporting brackets for said bar, a longitudinal shaft parallel with said bar, a series of arms pivotally connecting said bar with said shaft, the upper ends of said brackets being formed and proportioned to supportingly engage the under side of said bar when the reed is in operative position while allowing said bar to swing downwardly therefrom, substantially as described.

12. The combination of reed supporting brackets, a longitudinal supporting bar normally resting on the top of said brackets, a longitudinal shaft supported in said brackets below said bar, a series of supporting arms pivotally connecting said bar with said shaft, a locking device adjustable into position to lock said bar firmly on top of said brackets, and means for shifting said bar longitudinally on said brackets, substantially as described.

13. A collapsible and expansible reed for spacing warp threads or the like embracing in its construction two sets of levers of equal length arranged to intersect at their middle points and pivotally connected together at said intersecting points, a set of shorter levers whose adjacent ends are pivotally connected to each other and whose outer ends are pivotally connected with one set of said intersecting levers so as to cause said shorter levers to lie parallel with the levers of the other set, and a series of dents uniformly spaced apart and arranged partly on the shorter arms and partly on the set of longer arms that lie parallel with said shorter arms, substantially as described.

14. In a collapsible and expansible reed for warp threads or the like, the combination of two sets of intersecting levers of equal length pivotally connected together at their middle points, a series of uniformly spaced dents mounted thereon in two parallel rows laterally opposite in relation to each other, a portion of said dents being mounted at the intersecting points of said levers and at intermediate points of said levers adjacent to said intersecting points, and supplemental means between two adjacent pivotal points of said levers for supporting additional dents intermediate thereof, substantially as described.

15. The combination of a reed-carrying frame or casing, a collapsible and expansible reed mounted thereon, adjusting means mounted in said frame and having operative connection with the collapsible and expansible reed, and a graduated scale or indicator arranged longitudinally on said frame in juxta-position to said reed to indicate the pitch thereof in its various positions of adjustment, substantially as described.

16. A reed-supporting frame, a contractible and expansible reed mounted therein, adjusting means for expanding and contracting said reed, a pointer connected to said reed, and a coöperating graduated scale mounted longitudinally of said frames in juxta-position to the end of said reed, substantially as described.

In witness whereof, I have subscribed the above specification.

CHARLES LEA.