No. 834,607. PATENTED OCT. 30, 1906.

W. F. DRAPER.

AUTOMATICALLY THREADING SHUTTLE.

APPLICATION FILED JUNE 8, 1905.

2 SHEETS—SHEET 1.

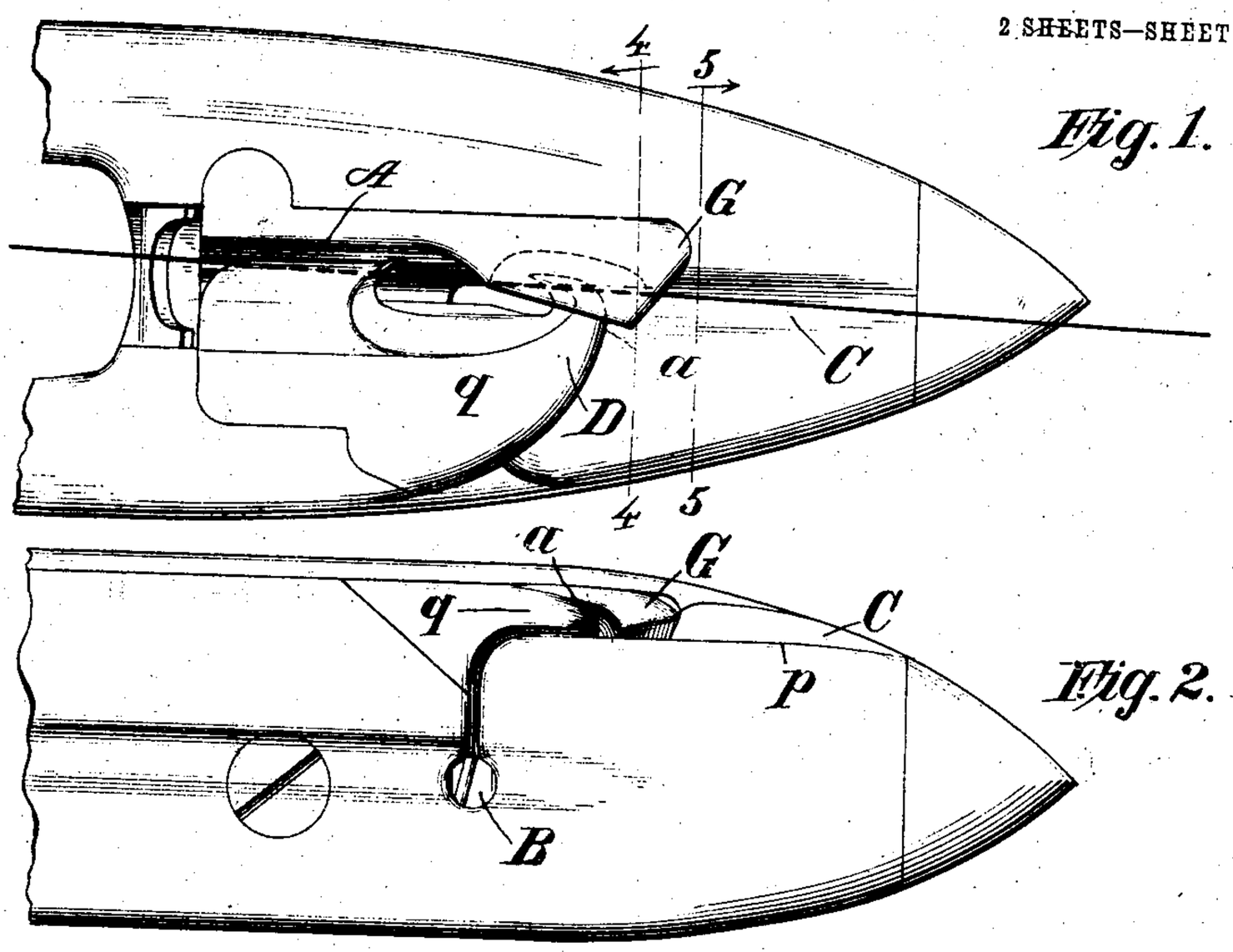


Fig. 1.

Fig. 2.

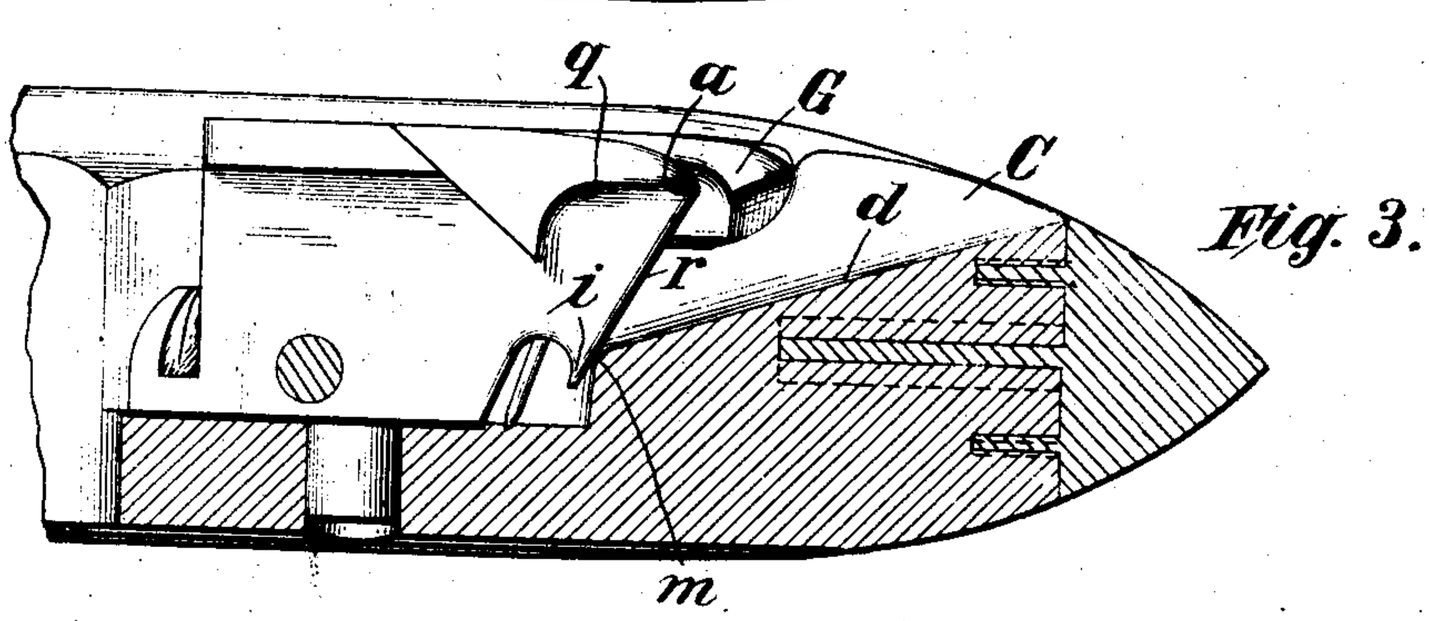


Fig. 3.

Fig. 4.

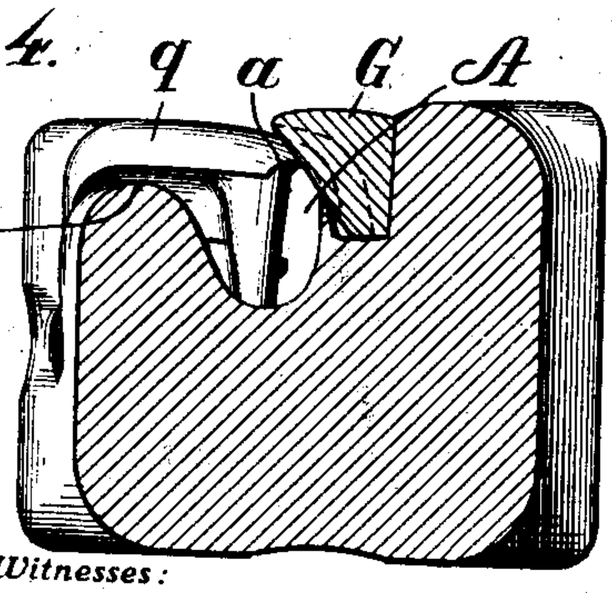
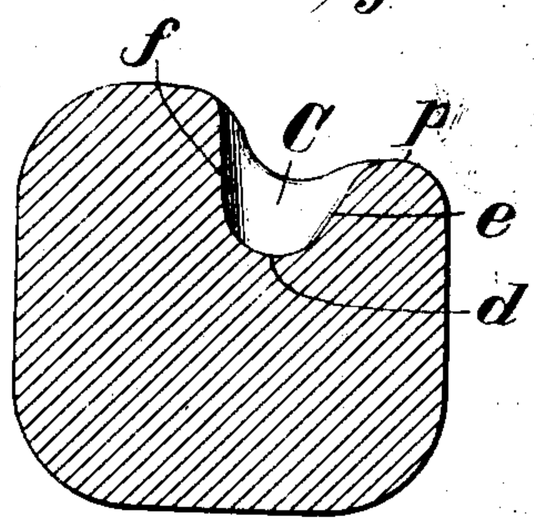


Fig. 5.



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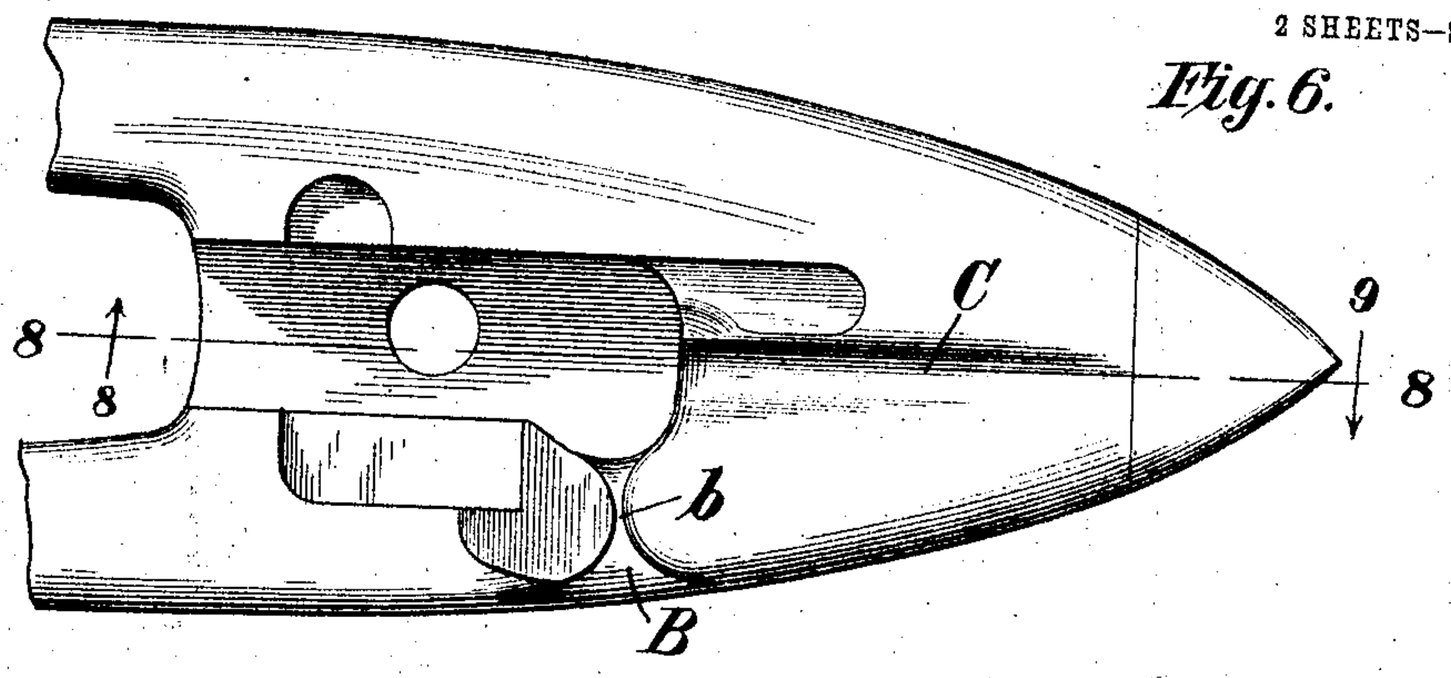
2 SHEETS—SHEET 2.

Fig. 6.



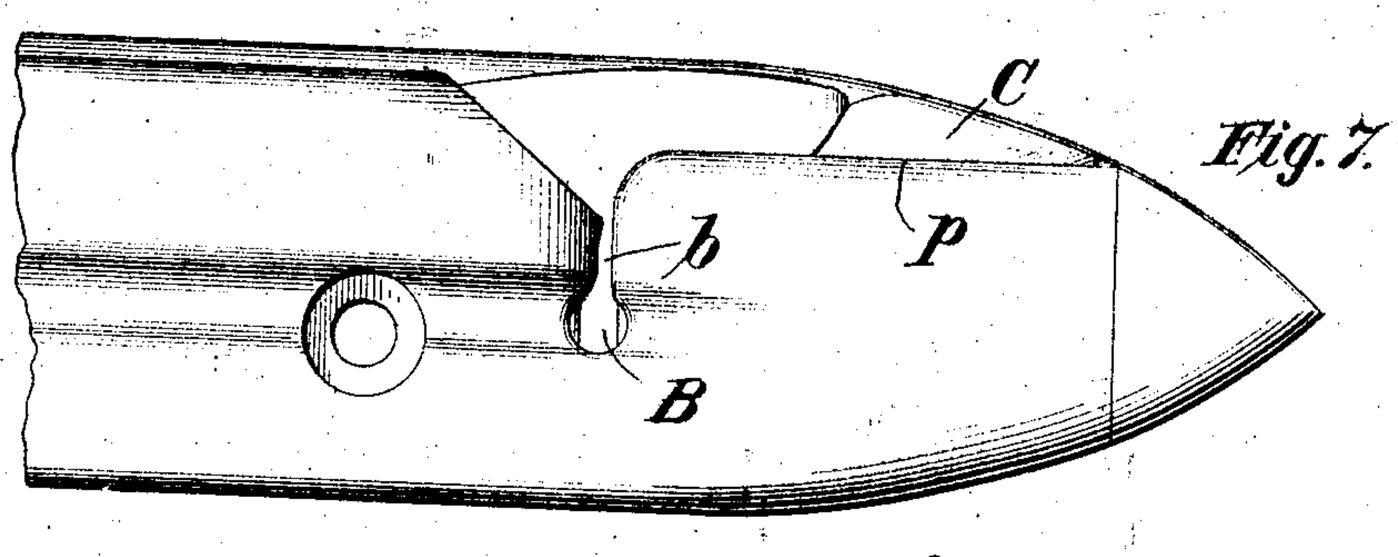


Fig. 7.

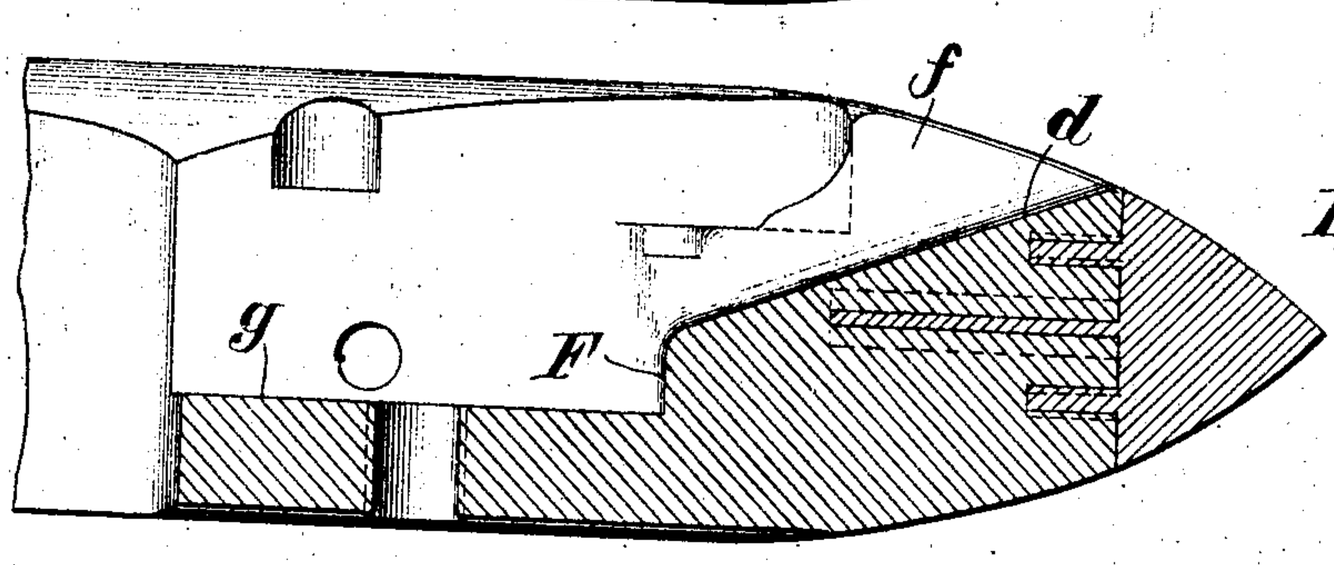


Fig. 8.

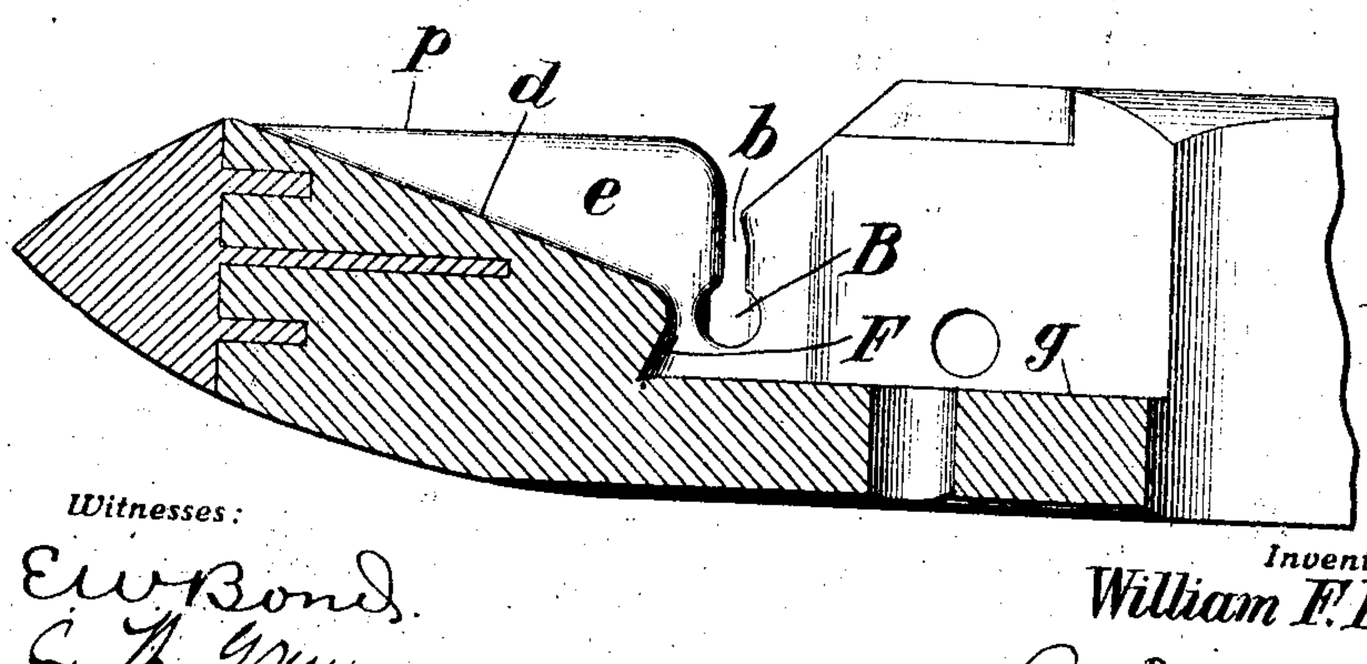


Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM F. DRAPER, OF HOPEDALE, MASSACHUSETTS.

AUTOMATICALLY-THREADING SHUTTLE.

No. 834,607. Specification of Letters Patent. Patented Oct. 30, 1906.

Application filed June 8, 1905. Serial No. 264,231.

To all whom it may concern:

Be it known that I, WILLIAM F. DRAPER, of Hopedale, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Automatically-Threading Shuttles, of which the following is a specification.

Automatic weft-replenishing looms in which weft or filling carriers are automatically transferred to a shuttle while in position on the lay require that the shuttles should be capable of being automatically threaded. The automatically-threading shuttle which is usually employed has a slotted or open thread-eye into which the thread is automatically conducted by the traverse of the shuttle back and forth across the lay after a fresh filling-carrier has been inserted in the shuttle, the free end of the thread being held by a suitable weft-end holder. It is therefore of vital importance that the shuttle should be so constructed as to reliably receive the thread into the shuttle-eye. Heretofore difficulty has been experienced through the occasional failure of the shuttle to become threaded, this involving a breakage of the thread and the transfer of another weft-carrier to the shuttle immediately following the transfer of the weft-carrier whose thread failed to become threaded. Also in such shuttles having open eyes the further difficulty has been experienced that occasionally the thread would jump out of the eye, this involving frequently the breakage of the thread followed by an unnecessary transfer of a fresh weft-carrier. Whenever there thus occurs an unnecessary breakage of thread, it follows that weft-carriers, still with large amounts of weft on them, are ejected from the shuttle and fresh weft-carriers are substituted therefor. This involves an unnecessarily early depletion of the spare weft-carriers in the hopper or magazine, thus involving increased attention to the loom, and hence diminishing the number of looms to which a single weaver can attend. It is also important to avoid transfers in immediate succession, since this may cause a defect in the cloth. Many attempts have been made to so construct the shuttles as to avoid these defects; but, while progress has been made in this direction, nevertheless with the best forms of shuttles heretofore existing there has been an amount of misthreading and breakage of threads which interferes with the theoretical capacity of weft-replenishing looms as labor-saving devices.

The purpose of the present invention is to reduce to a minimum misthreading, unthreading, and the breakage of thread due thereto, and the present improved automatically-threading shuttle successfully attains this object.

The invention consists in the improved construction whereby the threading is rendered certain and accidental unthreading is avoided.

One embodiment of the present improvements is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the eye end of a shuttle containing the present improvements. Fig. 2 is a side view thereof. Fig. 3 is a longitudinal vertical section. Fig. 4 is a cross-section in the plane indicated by the line 4 4 in Fig. 1 and looking in the direction of the arrow 4. Fig. 5 is a cross-section taken in the plane indicated by the line 5 5 in Fig. 1 and looking in the direction of the arrow 5. Fig. 6 is a plan view similar to Fig. 1, with the metallic block containing the threading-passages and the horn removed. Fig. 7 is a side view with the said block removed. Fig. 8 is a longitudinal section in the plane indicated by the line 8 8 in Fig. 6 and looking in the direction of the arrow 8. Fig. 9 is a section similar to Fig. 8 and taken in the same plane, but looking in the direction of the arrow 9. Fig. 9 also shows a modification involving an additional improvement.

The shuttle has a longitudinal threading-passage A, a slotted or open eye B, a delivery-passage C, and a horn D, which in their general coöperative relations are or may be substantially the same as in prior types of automatically-threading shuttles. The threading-passage and the horn are formed in a metal block which is inserted into a cavity at the front end of the shuttle, and they may be constructed as heretofore. By preference there is employed the form of inserted block with threading-passage and horn such as are set forth in the United States patent of Northrop, No. 769,914, dated September 13, 1904, and such is indicated in the present drawings. When a weft-carrier is inserted in the shuttle, the end of its thread is secured to a suitable holder, and the shuttle then travels

away from the holder, the end of the shuttle having the thread-eye being toward the weft-end holder. Hence it may appropriately be said that during the first flight of the shuttle across the lay with the fresh weft-carrier the shuttle travels backward. This lays the thread lengthwise of the shuttle and carries the thread down into the threading-passage below the forward point *a* of the horn and extends it longitudinally of the delivery-passage C. At the completion of the backward flight of the shuttle the thread should occupy the position indicated in Fig. 1. The delivery-passage C is forward of the horn and communicates with the open thread-eye B through the slot *b* in the upper part of the thread-eye, which slot may be regarded as a continuation of the delivery-passage. When the shuttle makes its next or second flight through the shed, it travels with its eye end forward, and during this forward travel of the shuttle the thread is led backwardly through the delivery-passage against the front edge or wall of the horn D, which conducts the thread through the thread-slot *b* into the thread-eye B. This general operation is that which has heretofore been carried out by automatically-threading shuttles in automatic weft-replenishing looms.

In order that the threading may be successfully accomplished, it is necessary that the thread should be laid beneath the point of the horn and that it should not escape therefrom during the second or forward flight of the shuttle. The problem to be solved is complicated, first, by the fact that the shuttle does not travel back and forth in a straight line, because in addition to its own proper movement it partakes of the swing of the lay, and, second, because during the time that the shuttle is traveling from the shuttle-box (during its second or forward flight) until after its eye has well passed the selvage-threads the thread is slackened and is liable to become detached from the horn. Accordingly it is important that the delivery-passage, while so constructed that the thread may lie well below the point of the horn, should at the same time be of appropriate size and shape to prevent the thread escaping while it is slack. On the other hand, while the delivery-passage should be of such a character as to facilitate the threading it should not go to the other extreme and render unthreading easy. Now in accordance with the present invention the delivery-passage is so constructed and related to the eye and horn that not only is the completion of the threading properly performed, but also the accidental unthreading is avoided.

The delivery-passage C of the present invention has a bottom *d*, a directing-wall *e*, and a guard-wall *f*, the "directing-wall" being so called because it is the one adjacent the eye B and directs the thread thereto. The top of the delivery-passage is open. The bottom *d* inclines downwardly and rearwardly from the tip end of the shuttle toward the horn D, as best shown in Fig. 3. Its lower end terminates in a plane at or below the level of the top of the eye B. The lower rear end of the inclined bottom *d* terminates at a wall F, which constitutes the end wall of the cavity in which the block carrying the threading-passage A and the horn D is located. This wall F is shown as substantially vertical in Figs. 3 and 7 and as overhanging in Fig. 9. It is desirable that it should be substantially vertical; but it is preferably overhanging, as shown in Fig. 9, so as to insure that it shall not guide an engaging thread to the delivery-passage. This wall extends downwardly from the lowest point of the delivery-passage to a plane at or below the bottom of the thread-eye. The bottom *g* of this cavity is below the bottom of the thread-eye B, as clearly shown in Fig. 9. The lower edge of the inclined bottom *d* is just above the lower heel *i* of the horn D. Consequently a thread which should lie along the bottom *d* would be way beneath the point of the horn and would be in the close neighborhood of the thread-eye and the heel *i* of the horn, where the thread is in contact with the lower edge of the bottom *d* of the delivery-passage. At the same time the lowermost point of the bottom *d* is very close to the nearest point of the horn D, leaving only a narrow throat *m* for the passage of the thread. The importance of this small throat will hereinafter appear in connection with the construction which prevents unthreading. The highest point of the bottom *d* of the delivery-passage where it merges into the top surface of the shuttle near the front tip of the shuttle is below the point *a* of the horn, so that when the thread is strained and bears against the front edge of the delivery-passage it is drawn below the plane of the point of the horn.

The guard-wall *f* of the delivery-passage curves downwardly from the top of the shuttle to the bottom *d*, affording a guiding-surface to guide the thread downwardly and beneath the point *a* of the horn. The upper edge of the guard-wall is substantially in line with the rear portion of the threading-passage A, (see Fig. 1,) and the initial downward abruptness of the guard-wall *f* affords free and unobstructed downward passage of the thread to a point well below the point of the horn. The top edge of the guard-wall *f* is not along the longitudinal middle line of the shuttle, but is back of said line—that is to say, the said middle line of the shuttle is between the plane of the top edge of the guard-wall and the shuttle eye.

The directing-wall *e* of the delivery-passage has its upper edge *h* in a plane below the

top of the shuttle, so that at its rear upper corner, where it merges into the forward wall of the slot *b*, it is below the top plate *q* of the horn D, thereby leaving room for the passage of the thread into the open top of the slot *b*. This edge *p* extends substantially longitudinally, and no part of it is above the under face of the point of the horn, (see Fig. 4,) so that as the thread is drawn over it during the forward flight of the shuttle there is nothing to make the thread rise above the point of the horn. This edge *p* constitutes the "forward" edge of the delivery-passage, because as the shuttle beats backward and forward with the lay it is at the forward wall of the shuttle. The directing-wall *e* of the delivery-passage slopes downwardly and inwardly toward the bottom *d*, affording an ample and free space between it and the side face of the horn, which fronts the thread-eye B. The shape given to the delivery-passage as the result of this construction of the bottom and the two walls is such that at the tip end of the shuttle the delivery-passage terminates, and from this point it spreads laterally or diverges and deepens toward the point of the horn, its directing-wall *e* terminating in the slot *b* of the thread-eye, its guard-wall being back of and free from the horn, while its bottom at its lowest point reaches nearly to the heel *i* of the horn at a plane at or below the top of the thread-eye. As the result of this construction the delivery-passage presents ample room forward of and on both sides of the horn to receive the thread irrespective of the swing of the lay and the kinking of the thread, and at the same time the delivery-passage is so deep that the thread once in it will not escape during the slackening of the thread when the shuttle makes its forward or second flight after receiving a fresh weft-carrier. As the result the shuttle is threaded with certainty. It will be observed that the highest point of the bottom *d* of the delivery-passage C near the point of the shuttle is not at the longitudinal middle of the shuttle, but is toward the eye side of the shuttle. This is indicated by the section-line 8 8 in Fig. 6, which intersects this highest point of the bottom *d*. As the result the thread is directed toward the eye side of the shuttle by the guard-wall *f*, and thereby its passage beneath the overhanging beak G is facilitated.

The leading edge *r* of the horn inclines from its point to its heel downwardly and rearwardly, as best shown in Fig. 3, so that the upper point of the horn overhangs the bottom *d* of the delivery-passage, this being rendered possible because the depth of the delivery-passage enables its bottom to be extended downwardly and rearwardly beneath the point of the horn. This is an important factor in insuring the correct threading of the shuttle, because some portion of the thread will lie underneath the point *a* of the horn when the thread is left slack during the beginning of the second or forward flight of the shuttle. This inclined edge *r* of the horn constitutes a rear wall for the delivery-passage, and it will be noted that the edge and the bottom *d* converge toward the throat *m*. The delivery-passage as a whole thus diverges rearwardly and laterally, so as to be widest at the point of the horn, and it converges downwardly, being narrowest at its lowest part, where it terminates in the restricted throat at or below the top of the thread-eye. The delivery-passage thus affords a wide mouth to receive the thread and downwardly-conveying wall to direct the thread to the thread-eye.

It is not only important that the shuttle should thread properly, but also that it should not become accidentally unthreaded. As in the case of the United States Patent of Northrop, No. 718,575, dated January 13, 1903, the horn D back of its heel *i* is upwardly arched in substantial conformity with the curvature of the eye B, this arch constituting an upper wall for the eye. Now it is evident from an inspection of Fig. 3 that the thread once in the eye can escape only by the upward passage of the thread through the narrow throat *m*, and not only must the thread so escape through this narrow throat, but it must in addition then move forwardly toward the tip end of the shuttle a sufficient distance to clear the upper point *a* of the horn. This is practically impossible and is rendered so, first, by the circumstance that the bottom *b* of the delivery-passage extends so close to the horn; second, because the wall F of the cavity in the shuttle below the point *i* is substantially vertical and preferably overhanging, and hence has no tendency to guide the thread into the narrow throat *m*, and, thirdly, because the point *a* of the horn overhangs the throat. Consequently the unthreading of the shuttle is reduced to a minimum. The throat *m* is rendered so narrow by the close approach of the bottom *d* to the edge of the horn as to leave a minimum space for the passage of the thread. There is just room for the thread to freely pass, and hence the danger of accidental unthreading is substantially overcome.

It will be noted that a salient characteristic of the improved construction is that the bottom of the delivery-passage extends downwardly back of the point of the horn and into close proximity with its heel and near the plane of the top of the shuttle-eye.

Shuttles provided with the present improvements substantially eliminate as a disturbing factor the misthreading, unthreading, and the resulting breakage, thus enabling automatic weft-replenishing looms to be run to their maximum capacity

I claim as my invention—

1. An automatically-threading shuttle having a threading-passage; an open thread-eye; a horn, the leading edge of which extends backwardly from its point to its heel, its heel being below the plane of the top of the thread-eye; and a delivery-passage forward of the horn, said delivery-passage diverging laterally and inclining downwardly and rearwardly from the tip end of the shuttle, its directing-wall terminating at the slot of the open thread-eye and inclining downwardly and inwardly, its guard-wall inclining downwardly and outwardly, its bottom inclining downwardly and terminating beneath the point of the horn and in close proximity to the heel of the horn and in a plane substantially at or near the plane of the top of the thread-eye, and its forward edge being below the point of the horn, and the upper edge of the directing-wall being at least as low as the under side of the point of the horn.

2. An automatically-threading shuttle having a threading-passage, a thread-eye, a horn having a point at its top and a heel at its bottom, and a delivery-passage forward of the horn, said delivery-passage diverging laterally and inclining downwardly and rearwardly from the tip end of the shuttle, its directing-wall inclining downwardly and inwardly, its guard-wall inclining downwardly and outwardly, and its bottom inclining downwardly and terminating beneath the point of the horn and in close proximity to the heel of the horn, thereby leaving a narrow throat of minimum width for the free passage of the thread.

3. An automatically-threading shuttle having a threading-passage, a thread-eye, a horn, and a delivery-passage forward of the horn, said delivery-passage diverging laterally and inclining downwardly from the tip end of the shuttle toward the horn, and the entire forward edge of the delivery-passage being below the under side of the point of the horn.

4. An automatically-threading shuttle having a threading-passage, a thread-eye, a horn, the leading edge of which extends backwardly from its point to its heel, its heel being below the plane of the top of the thread-eye, and a delivery-passage extending beneath the point of the horn, the bottom of which extends into close proximity with the heel of the horn, and to a plane substantially at or near the plane of the top of the thread-eye.

5. An automatically-threading shuttle having a threading-passage; a thread-eye; a horn, the leading edge of which extends backwardly from its point to its heel, its heel being below the plane of the top of the thread-eye; and a delivery-passage extending beneath the point of the horn, the bottom of which extends into close proximity with the heel of the horn, thereby leaving a narrow throat of minimum width for the free passage of the thread.

6. An automatically-threading shuttle having a threading-passage, an open thread-eye, a horn having a point at its top and a heel at its bottom, and a delivery-passage forward of the horn and communicating with the open eye, said delivery-passage having a bottom inclining downwardly from the tip end of the shuttle beneath the upper point of the horn and close to the heel of the horn, and terminating at its lowest position at least as low as the plane of the upper part of the thread-eye.

7. An automatically-threading shuttle having a threading-passage, an open thread-eye, a horn, and a delivery-passage forward of the horn and communicating with the open eye, said delivery-passage having a bottom inclining downwardly from the tip end of the shuttle beneath the point of the horn and close to the heel of the horn, thereby leaving a narrow throat of minimum width for the free passage of the thread.

8. An automatically-threading shuttle having a threading-passage, a thread-eye, a horn, and a delivery-passage forward of the horn, the bottom of which inclines downwardly from the tip end of the shuttle and terminates at its lowest point where it is nearest the horn in a plane at least as low as the plane of the upper part of the thread-eye.

9. An automatically-threading shuttle having a threading-passage, an open thread-eye, a horn, and a delivery-passage forward of the horn and communicating with the open eye, said delivery-passage having a bottom extending beneath the point of the horn and close to the heel of the horn, thereby leaving a narrow throat of minimum width for the free passage of the thread.

10. An automatically-threading shuttle having a threading-passage, a thread-eye, a horn, and a delivery-passage forward of the horn and communicating with the eye, said delivery-passage extending beneath the point of the horn, and converging downwardly at both sides, rear and bottom to a narrow throat just permitting the free passage of the thread, and diverging at its top from front to rear.

11. An automatically-threading shuttle having a threading-passage, a thread-eye, a horn, and a delivery-passage forward of the horn and extending beneath the point of the horn, and an overhanging wall extending downwardly from the lowest part of the delivery-passage.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM F. DRAPER.

Witnesses:

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GEORGE OTIS DRAPER.