No. 872,254. PATENTED NOV. 26, 1907.

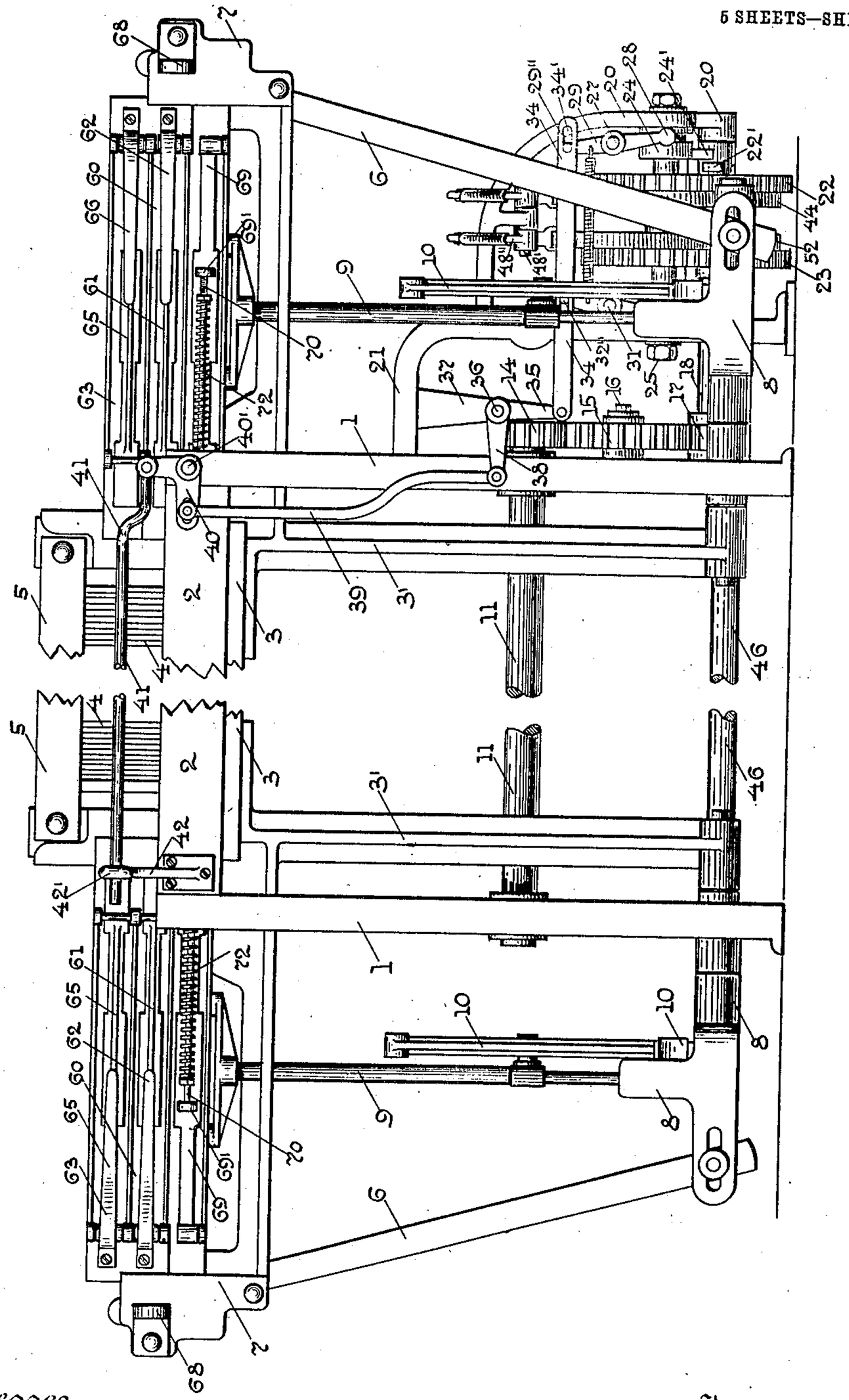
E. H. RYON.

SHUTTLE CHANGING MECHANISM FOR LOOMS.

APPLICATION FILED APR. 9, 1906.

5 SHEETS—SHEET 1.

Fig. 1.



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5 SHEETS—SHEET 2.

Fig. 2.

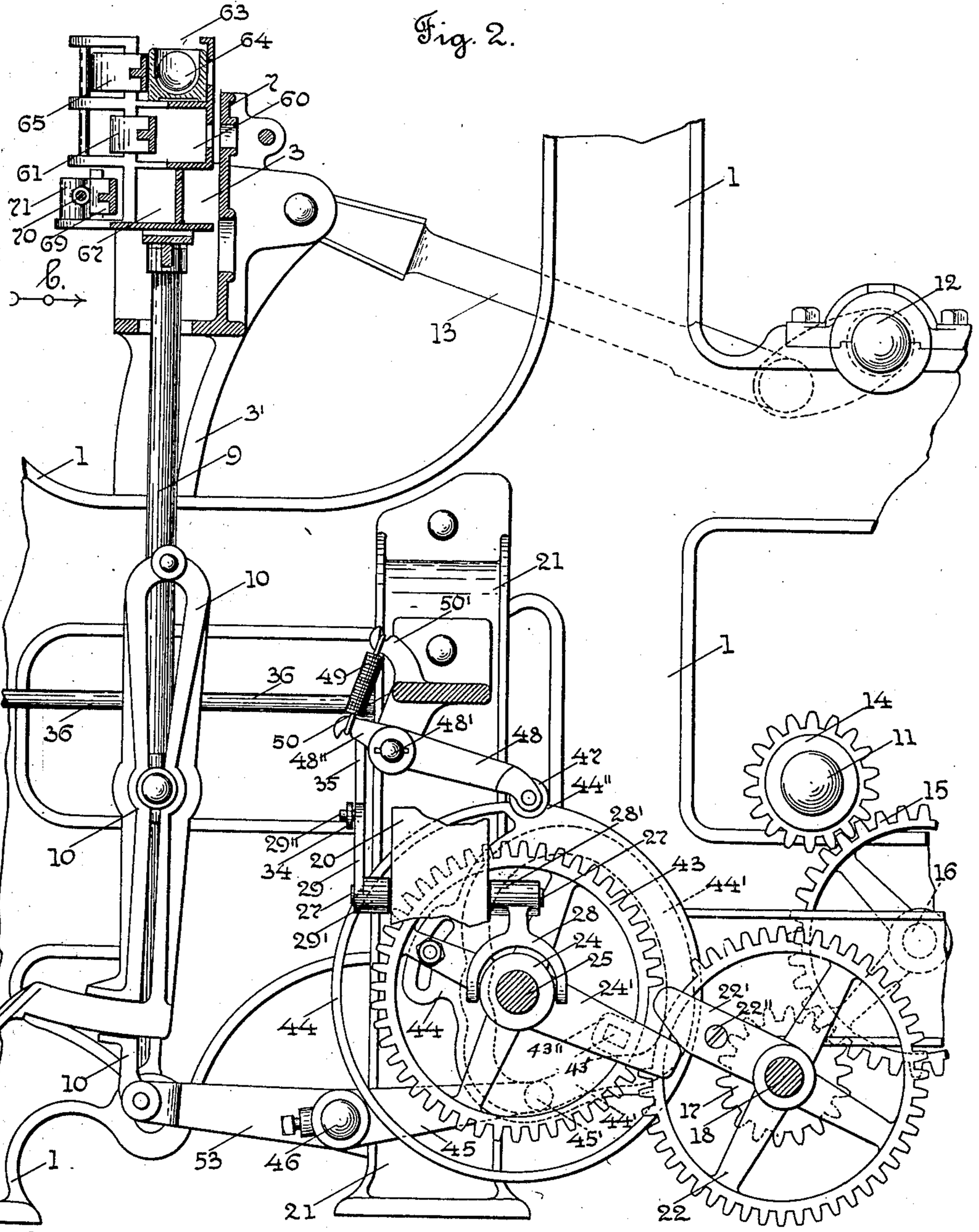

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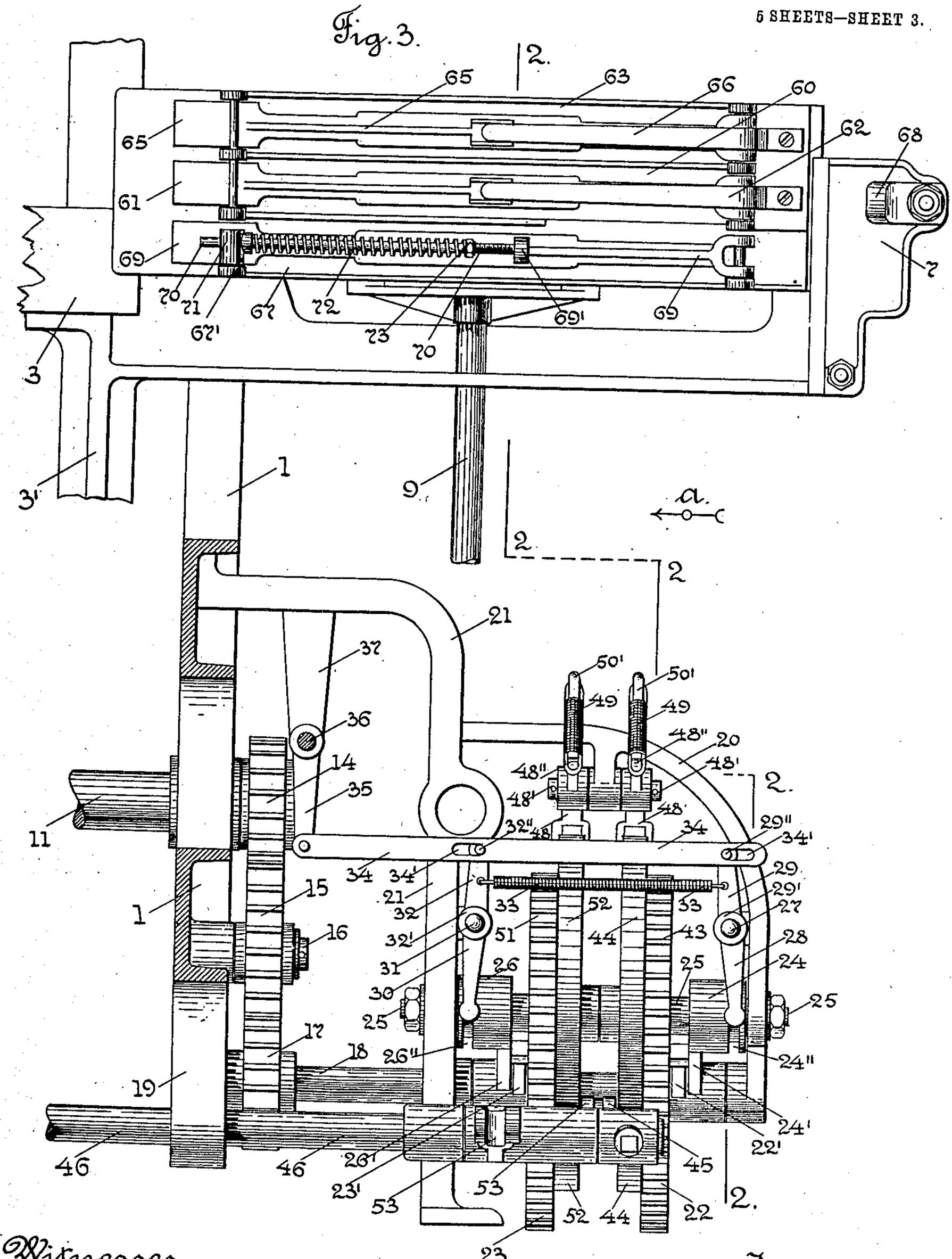
Fig. 3.



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5 SHEETS—SHEET 4.

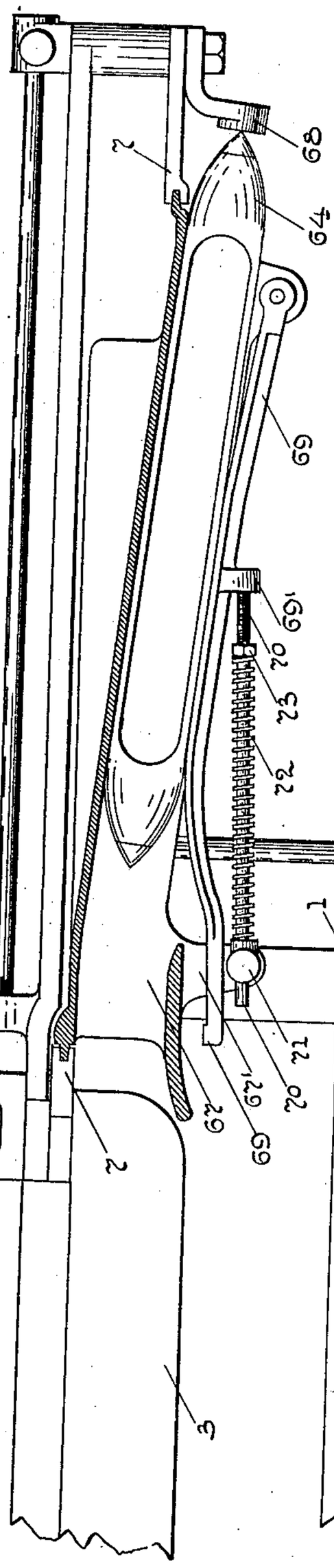

Fig. 5.

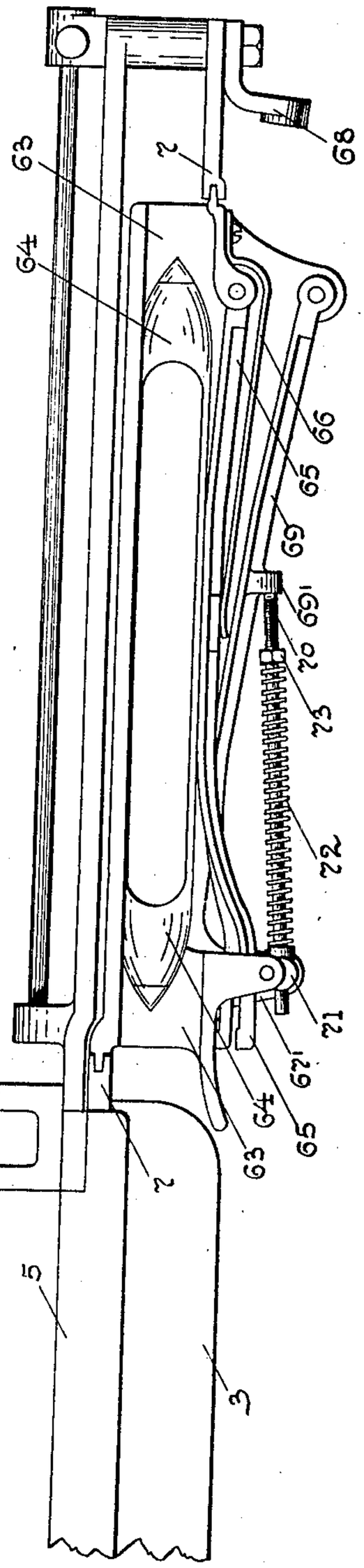

Fig. 4.

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5 SHEETS—SHEET 5.

Fig. 6.

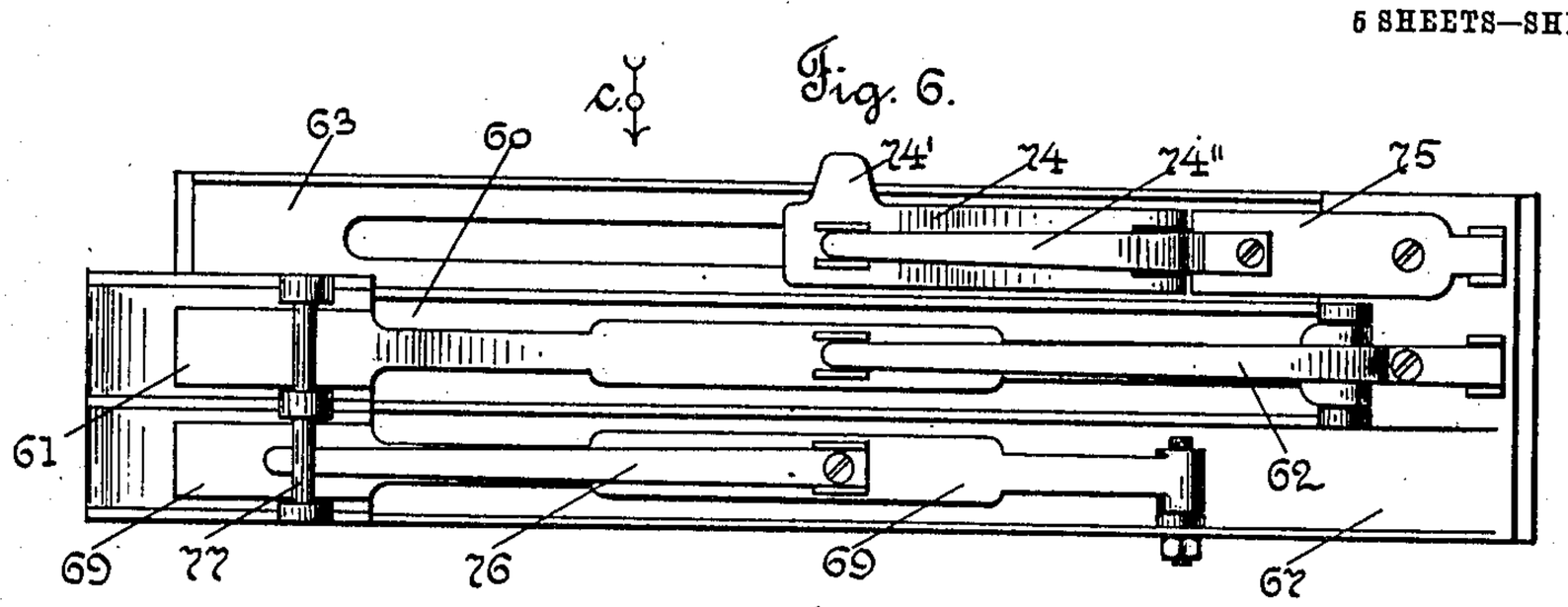


Fig. 7.

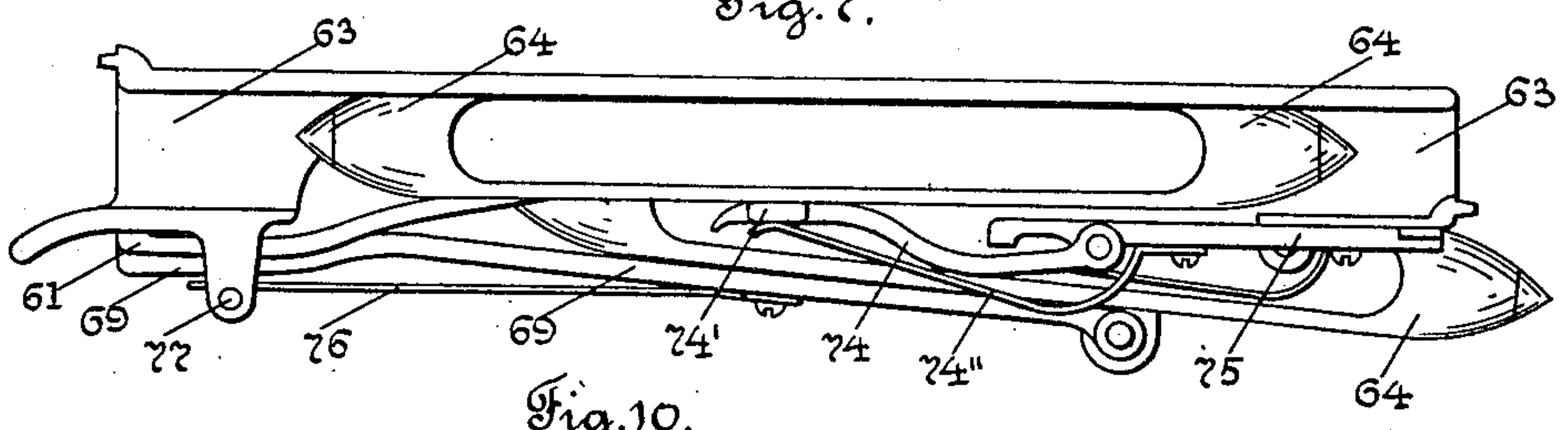


Fig. 10.

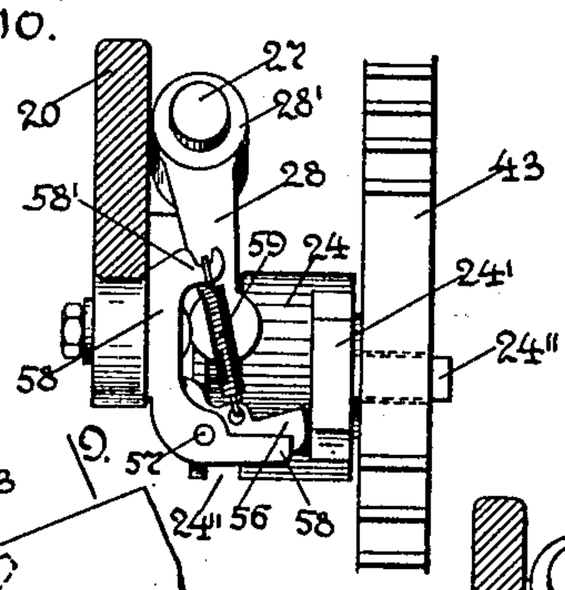


Fig. 8.

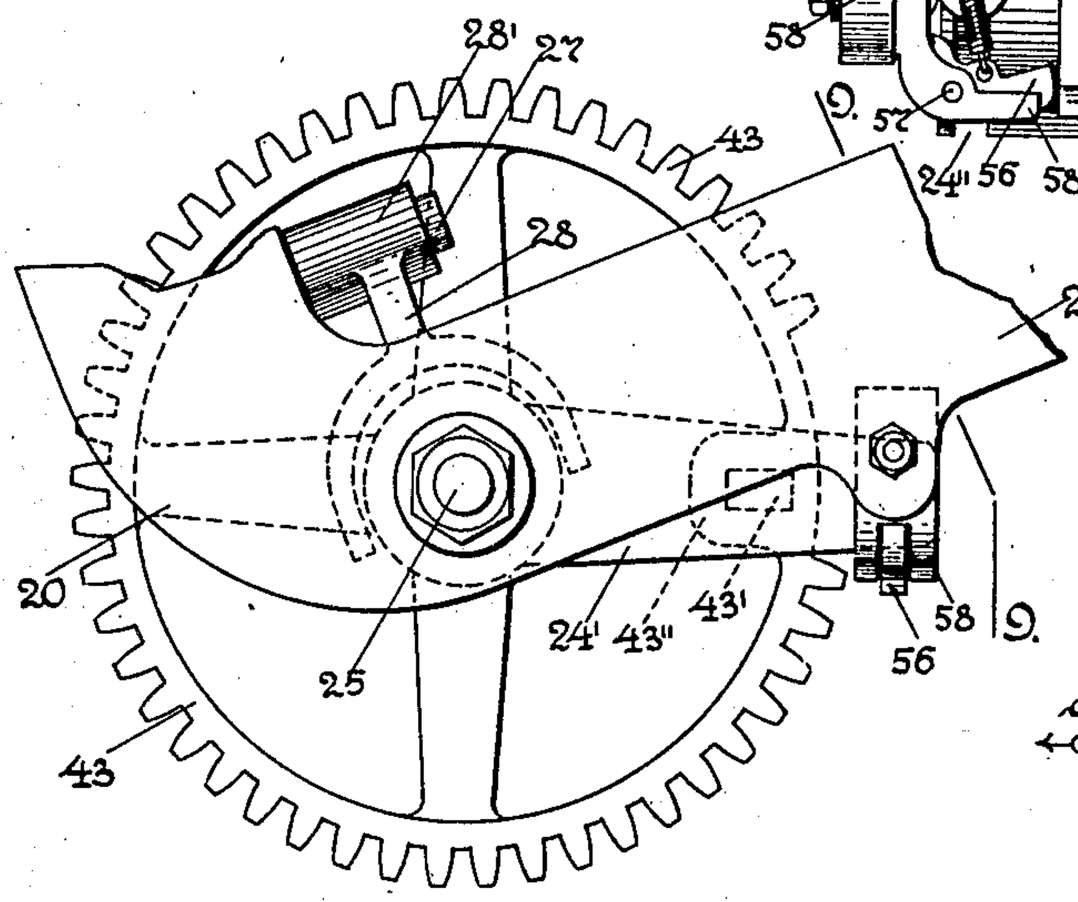
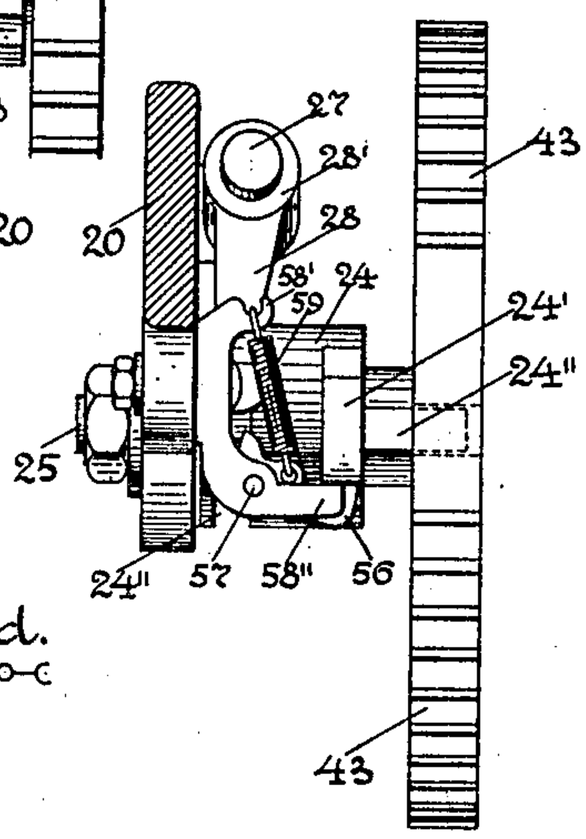


Fig. 9.



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UNITED STATES PATENT OFFICE.

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SHUTTLE-CHANGING MECHANISM FOR LOOMS.

No. 872,254. Specification of Letters Patent. Patented Nov. 26, 1907.

Application filed April 9, 1906. Serial No. 310,665.

To all whom it may concern:

Be it known that I, EPPA H. RYON, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Shuttle-Changing Mechanism for Looms, of which the following is a specification.

My invention relates to looms, and particularly to shuttle changing mechanism for looms using only one color or character of filling.

The object of my invention is to provide a shuttle changing mechanism adapted to be applied to and combined with looms, and particularly the class of looms referred to, for changing a shuttle, preferably at either end of the loom, when the filling thereon has become practically exhausted, or when a change of shuttle is desirable, without stopping the loom; the change of the shuttle being accomplished through mechanism put into operation by the weaver.

In my improvements I may provide mechanism for changing the shuttle at either end of the loom, or mechanism for changing the shuttle at only one end of the loom. In case of changing the shuttle at both ends of the loom, the mechanism is substantially a duplicate of the mechanism for changing the shuttle at one end of the loom.

In my improvements, I provide on the end of the loom on which the shuttle is to be changed, a shuttle box with three separate cells, in line with each other in a vertical plane. The top cell is for the spare or extra shuttle, which is inserted therein by the weaver through the upper open end of the cell; the middle cell is for the active shuttle, which is continuously thrown across the lay in the normal operation of the loom, and the lowest cell receives the shuttle which is to be changed and removed from the loom by the weaver.

I have only shown in the drawings detached parts of a loom with my improvements combined therewith sufficient to enable those skilled in the art to understand the construction and operation thereof.

Referring to the drawings:—Figure 1 is a front view of portions of a loom, broken out through the center, and having my improvements combined therewith, for changing a shuttle at both ends of the loom. Fig. 2 is, on an enlarged scale, a section on line 2, 2, Fig. 3, looking in the direction of arrow *a*, same figure; this figure shows some parts which are not shown in Fig. 3. Fig. 3 is a front view of the parts shown in Fig. 2, looking in the direction of arrow *b*, same figure; this figure shows the shuttle box frame and shuttle cells in full, the lower part of the vertically moving shuttle box rod, the give-way mechanism, and some other parts are not shown. Fig. 4 is, on an enlarged scale, a plan view of one end of the lay, and of the shuttle cells, detached, shown in Fig. 3. Fig. 5 corresponds to Fig. 4, but shows a sectional plan view of the lowest shuttle cell. Fig. 6 shows on an enlarged scale, a modified construction of the shuttle cells shown in Fig. 3. Fig. 7 is a plan view of the shuttle cells shown in Fig. 6, looking in the direction of arrow *c*, same figure. Fig. 8 shows, on an enlarged scale, one of the gears with its starting tooth shown in Fig. 2, detached, and also shows a locking device. Fig. 9 is a section, on line 9, 9, Fig. 8, looking in the direction of arrow *d*, same figure. Fig. 10 corresponds to Fig. 9, but shows some of the parts in a different position.

In the drawings, I have shown three shuttle cells embodying my improvements at each end of the loom, and mechanism for operating said cells. As the cells at each end of the loom are of the same construction, and the mechanisms for operating each set of cells are of the same construction and operation, a description of one will answer for both, and the same figures of reference will be used for similar parts.

In the accompanying drawings, 1 are the loom sides or end frames, 2 the breast beam, 3 the lay, 3′ the lay swords, 4 the reed, 5 the hand rail, 6 the picker sticks, 7 the shuttle box guide frames on each end of the lay, and movable therewith, 8 the rocker irons with which the picker sticks 6 and the lower ends of the vertically moving shuttle box rods 9 are connected in the usual way, 10 the give-way mechanisms connected with the shuttle box rods 9, and also connected at their lower ends with the levers which communicate vertical movement to the shuttle box rods.

11 is the bottom or cam shaft, driven in the usual way by gears, not shown, and connected with the crank shaft 12 by gears, not shown.

13 is the crank connector to the lay 3.

All of the above parts may be of the usual and well known construction.

I will now describe my improvements.

On the bottom or cam shaft 11 is fast a pinion 14 which meshes with and drives in this instance an intermediate gear 15 on a stud 16. The gear 15 meshes with and drives a pinion 17 fast on a shaft 18 mounted in a suitable bearing 19 on the loom frame 1, see Fig. 3, and on a stand 20, forming a part of, and secured to a stand 21, secured to the loom frame 1. On the shaft 18 is fast a mutilated gear 22, see Fig. 2, for operating the shuttle cells at the left hand end of the loom shown in Fig. 1. The mutilated gear 22 has in this instance an engaging tooth or projection 22′ secured thereon by a screw 22″, see Fig. 2. The engaging tooth 22′ projects beyond the mutilated part of the gear 22. On the shaft 18 is in this instance a second mutilated gear 23 for operating the shuttle cells at the right hand end of the loom, Fig. 1. The mutilated gear 23 has an engaging tooth or projection 23′ thereon, corresponding to the engaging tooth 22′. The tooth or projection 22′ on the mutilated gear 22 is adapted to engage a projection 24′ extending out from a hub 24, and forming a clutch member, see Fig. 2, and loosely mounted on a stationary shaft 25, to move longitudinally thereon. The shaft 25 is secured to the stands 20 and 21.

The projection 23′ on the mutilated gear 23 is adapted to engage a projection 26′ extending out from a hub 26, see Fig. 3, and forming a clutch member, and loosely mounted on the shaft 25 to move longitudinally thereon.

A rock shaft 27 is mounted in suitable bearings on the stand 20, see Fig. 2, and has fast on its inner end, the hub 28′ of a fork or clutch lever 28 having pins thereon adapted to enter the annular groove 24″ in the hub 24, and acts to move said hub longitudinally on the shaft 25. The outer end of the rock shaft 27 has fast thereon the hub 29′ of an arm 29, see Fig. 2. A corresponding fork or clutch lever 30, fast on a rock shaft 31, see Fig. 3, has pins thereon to enter the annular groove 26″ in the hub 26, and acts to move said hub longitudinally on the shaft 25. The outer end of the rock shaft 31 has fast thereon the hub 32′ of an arm 32, see Fig. 3.

A helical tension spring 33, attached at each end to the lever or arms 29 and 32, acts to move the upper ends of said arms towards each other to rock the shafts 27 and 31 and move the clutch levers 28 and 30 away from each other, and consequently to move the hubs 24 and 26, or clutch members, away from each other, to move the projections 24′ and 26′ thereon out of the path of the engaging arms 22′, and 23′, on the mutilated gears 22 and 23, and hold the clutch levers 28 and 30 in their normal inoperative position.

A link or bar 34 is connected with both of the levers 29 and 32, in this instance by pins 29″ and 32″ on said levers extending into two elongated slots 34′ in said bar or link 34. The bar or link 34 is also pivotally connected in this instance at its inner end with an arm 35 fast on a rock shaft 36 mounted at its rear end in a stand 37, secured to the frame 21. The front end of the rock shaft 36 has an arm 38 fast thereon, see Fig. 1, which is pivotally connected through a connector 39 with one arm of an angle or bell crank lever 40, in this instance pivotally mounted on a stud 40′, secured to the front side of the loom frame; the other arm of the angle or bell crank lever 40 has secured thereto one end of a rod 41, which is supported and moves longitudinally in guide eyes 42′ on stands 42, secured in this instance to the front of the breast beam, see Fig. 1.

I will now describe the mechanism put into operation by the movement of a clutch levers 28, or 30, into its operative position.

Loose on the shaft 25 is a mutilated gear 43, which has adjustably secured thereto, through a slot and bolt connection, see Fig. 2, a cam 44. The gear 43 has an opening 43′ in an ear 43″ thereon, see Fig. 8, which receives a side extension or lug 24″ on the projection 24′ on the hub 24, see Fig. 9. The lug 24″ extending into the opening 43′ on the gear 43, attaches said gear to the hub 24, and causes it to revolve with said hub, when said hub is revolved by the mutilated gear 22. The cam 44 has a cam groove 44′, shown by broken lines in Fig. 2, into which extends a pin or roll 45′ on a lever 45, fast on a rock shaft 46, which is mounted in suitable bearings and extends transversely through the loom. Said rock shaft 46 is connected at its other end through the give-way mechanism 10, with the shuttle box rod 9 of the shuttle box having three cells, shown at the left in Fig. 1. The cam 44 has in this instance a recess 44″ in its periphery, to receive a roll 47 on an arm 48, pivoted on a stud 48′, and actuated by a helical tension spring 49, attached at one end to a projection 48″ on said arm 48, and at its other end to a projection 50′ on a stand 50, see Fig. 2. The roll 47 acts as a yielding lock for the cam 44 and gear 43, to hold them in position after each complete revolution thereof. A second mutilated gear 51, see Fig. 3, corresponding to the gear 43 is loose on the shaft 25, and has secured thereto, by a bolt and slot connection, not shown, a cam 52 corresponding to the cam 44. The mutilated gear 51 is connected with the hub or clutch 26, in the same manner as described above in connection with the mutilated gear 43 and the hub or clutch 24. The cam 52 has a cam groove

therein to receive a pin or roll on the inner end of the box lever 53, which has a hub loosely mounted on the shaft 46, and the outer end of the box lever 53 is connected with the lower end of the give-way mechanism 10, attached to the vertically moving shuttle box rod 9, see Fig. 2.

A locking mechanism for the cam 52, and gear 51, similar to the locking mechanism above described for the gear 43 and cam 44, is provided, said locking mechanism being shown in Fig. 3, and having the same figures of reference as the other locking mechanism.

In Figs. 8, 9, and 10 is shown a locking mechanism, which is preferably used to hold each sliding clutch member 24 and 26 in lock with the engaging arm on a mutilated gear, when said clutch member is moved into position to be engaged by said engaging arm. This mechanism in this instance consists of a latch 56, pivotally mounted on a pin 57 on a stand 58 bolted to the frame 20. A spring 59 attached at one end to the latch 56, and at its other end to a stationary projection 58′ on the stand 58, acts to raise the outer end of said latch.

When the clutch member 24 is out of clutch with the engaging arm 22′ on the mutilated gear 22, as shown in Fig. 9, the projection 24′ on the clutch 24 will engage with and move down the latch 56, and also engage the projecting end 58″ of the stand 58, to prevent any further rotation of the clutch.

When the clutch member 24 is moved on the shaft 25, to bring the projection 24′ in the path of the engaging arm 22′ on the gear 22, as shown in Fig. 10, the projection 24′ on the clutch member 24 will be moved out of the path of the latch 56, and allow the spring 59 to act to move up said latch 56, and cause the end thereof to extend back of the projection 24′ on the clutch member 24, as shown in Fig. 10, to hold said clutch member 24 in its operative position, until the movement of the mutilated gear 22 rotates the clutch member 24, and moves it out of engagement with the latch 56.

I will now describe the shuttle box, in this instance at each end of the loom in Fig. 1, and having three cells.

The middle, or intermediate cell 60 is preferably of the ordinary construction of a shuttle box cell in shifting shuttle boxes, and has a shuttle binder 61, and a binder spring 62, in the usual way. The top cell 63 is open on top, as shown in Fig. 4, to allow of the ready insertion of a shuttle therein by the weaver, which shuttle is the extra or spare shuttle 64, to be substituted for the shuttle which is to be exchanged on account of practical exhaustion of filling, or for any other reason. The top cell 63 has a binder 65 and binder spring 66, preferably of usual construction. The bottom cell 67, which receives the shuttle having the filling practically exhausted, or the shuttle which is to be exchanged, is preferably made as shown in Fig. 5, with its inner end in line with the race-way of the lay, and outwardly inclined from its inner end, to cause the shuttle therein to extend beyond and out of line with the other cells.

A stationary stop 68 is secured on the shuttle guide frame 7, see Fig. 5, in line with the race-way of the lay, against which the shuttle entering the bottom cell 67, when it is in line with the race-way, strikes. The bottom cell 67 is provided with a binder 69, which preferably is moved inwardly, to bear against the shuttle 64, see Fig. 5, by a spring actuated rod 70, secured at its outer end in an ear 69′, and extending at its inner end loosely through an opening in a boss 71 on a projection 67′ on the front side of the inner end of the bottom cell 67, see Fig. 5.

A helical expansion spring 72 encircles the rod 70, and bears at one end against the boss 71, and at its other end against a nut 73, adjustable on the threaded outer end of the rod 70.

In Figs. 6 and 7 are shown a modified construction of the shuttle cells above described. In said Figs. 6 and 7, the upper shuttle cell, for the extra shuttle is open in front as well as on the top, and has a short binder 74, which in this instance is pivotally attached at its outer end to a plate 75, secured to the outer front side of the cell, and its inner end, which extends to about the middle point of the cell, is provided with an upwardly extending projection 74′, which is adapted to be engaged by the weaver, to move out the binder and insert a shuttle. A short binder spring 74″ is used in connection with the binder 74.

The bottom shuttle cell of the shuttle cells shown in Figs. 6 and 7, is of substantially the same construction as the bottom cell 67, shown in Fig. 5, except that the binder 69 is actuated by a flat leaf spring 76, secured at one end to the binder 69, and extending at its other end under the binder retaining rod 77.

From the above description in connection with the drawings, the operation of my improvements will be readily understood by those skilled in the art.

A normal position of the shuttle cells at each end of the loom, is with the middle cell in line with the race-way of the lay, and a spare or extra shuttle will always be in the top shuttle cell. When, in the normal operation of the loom, with the several parts in the position shown in Figs. 1, 2, and 3, the weaver notices that the filling in the running shuttle is practically exhausted, or for any other reason it is desired to change the running shuttle and substitute another shuttle, the weaver moves the rod 41 to the right or to the left, in case there are two sets of shuttle cells, one at each end of the loom, ac-

cording to whether the change is to be made on the right hand end, or the left hand end of the loom. In case the change is to be made on the left hand end of the loom, Fig. 1, the weaver moves the rod 41 to the left, and, through the bell crank lever 40, connector 39, arm 38, rock shaft 36, arm 35, bar 34, arm 29, and rock shaft 27, the lever 29 is moved against the action of the spring 33, to move the clutch 24, loose on the stationary shaft 25, into the path of the projection 22′ on the mutilated gear 22. The revolution of the mutilated gear 22, through the system of gears to the pinion 14 on the bottom shaft 11, will cause the rotation of the hub or clutch 24, and through the engagement of said clutch with the gear 43, will cause the rotation of said gear 43, and the cam 44 attached thereto, and through the cam lever 45 and give-way mechanism 10, the box rod 9 and the shuttle cells supported thereon, will be moved up to bring the lowest cell 67 on a line with the race-way of the lay, to receive the shuttle to be exchanged; the continued rotation of the cam 44 will, through cam lever 45, lower the cells to bring the top cell 63 in line with the race-way of the lay, so that the spare shuttle therein may be picked across the loom into a shuttle cell on the other end of the loom, to take the place of the one exchanged. After the shuttle has been picked, the continued revolution of the cam 44, to make one complete revolution thereof, will, through cam lever 45, move up the shuttle cells to bring the middle cell 60 of the three shuttle cells in line with the race-way, to receive the new shuttle from the other end of the loom, and the loom will continue to operate with the middle shuttle cells on a line with the race-way. The cam 44 having made one complete revolution, the roll 47 will enter the recess 44″ in the periphery of the cam 44, to yieldingly hold the cam. On the movement of the hub or clutch 24 into the path of the projection 22′ on the mutilated gear 22, the latch 56 drops in back of the engaging arm 24′ on the hub 24, to hold it in the path of the projection 22′ on the gear 22 as above described. As soon as the operation of changing the shuttle and substituting a new shuttle has been completed, the spring 33 acts, through connections to the clutch 24, to move it on the shaft 25 into its inoperative position, with its engaging arm 24′ out of the path of the projection 22′ on the mutilated gear 22. The arm 24′ on the clutch 24, engaging with the stop 58″ on the stand 58, see Fig. 9, stops the rotation of the clutch, and also of the gear 43, and cam 44.

In case a change of shuttle is to be made on the right hand end of the loom shown in Fig. 1, the weaver moves the rod 41 to the right, and through the intermediate connections to the clutch 26, said clutch is moved into the path of the projection or engaging arm 23′ on the mutilated revolving gear 23, and the revolution of said gear 23 revolves the hub or clutch 26, and the mutilated gear 51 with which it is connected, and also the cam 52 connected with said gear 51, and through the cam lever 53 and give-way mechanism 10, and the shuttle box rod 9, the shuttle cells on the right hand end of the loom, shown in Fig. 1, are operated in the same manner as above described in connection with the shuttle cells on the left hand end of the loom.

It will be understood, that as soon as the cells have been returned to their normal position, the weaver will remove the shuttle from the bottom cell, and will insert a new shuttle in the top cell, for the extra or spare shuttle. With my improvements I obtain a continuous running loom with a shuttle changing mechanism which may be put into operation at either end of the loom, and allow the weaver to change the shuttle at either end of the loom and substitute a new shuttle, without stopping the loom.

It will be understood that the details of construction of my improvements may be varied if desired. The shuttle changing cells may be on only one end of the loom, in which case the opposite end of the loom will preferably have a single shuttle box or cell, and one-half of the mechanism for operating the shuttle cells shown in the drawings will be dispensed with, to wit,—the mutilated gear 23 having a projection 23′ thereon, the clutch 24, the mutilated gear 43, the cam 44, mechanism for locking said cam, and mechanism for locking the clutch 24, and mechanism for moving the clutch 24.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with a lay, a shuttle box having a cell to receive the spare shuttle, to be inserted by the weaver, a second cell to receive the shuttle to be removed, and a third cell for the shuttle in the normal operation of the loom, of manually controlled means to bring each of the three cells into line with the race-way.

2. The combination with a lay, a shuttle box having a cell to receive the spare shuttle, to be inserted by the weaver, a second cell to receive the shuttle to be removed, and a third cell for the shuttle in the normal operation of the loom, of manually controlled means to bring each of the three cells into line with the race-way, said means consisting of a cam, connections to the shuttle box, and mechanism to operate said cam.

3. In a loom of the class described, a shuttle box having a working cell, a cell to receive the spare shuttle, a cell to receive the shuttle to be removed, a driving gear, a driven gear, connections from said driven gear to said shuttle box, and manually oper-

ated means for effecting operative connection between said gears.

4. In a loom of the class described, a shuttle box having a spare shuttle cell, a cell for the shuttle to be removed, and a normally operative cell, a driving gear, a driven gear normally at rest, manually operative means for effecting operative connection between said gears, and connections from said driven gear to the shuttle box to operate the same.

5. In a loom of the class described, a shuttle box, having a spare shuttle cell, a cell for the shuttle to be removed, and a normally operative cell, a driving gear connected with a moving part of the loom, and a second gear adapted to be driven by said driving gear, and having a movable manually controlled member adapted to be engaged by a corresponding member of said driving gear, and connections from said driven gear to the shuttle box to operate the same.

6. In a loom of the class described, a shuttle box having a spare shuttle cell to receive a shuttle to be inserted by the hand of the weaver, a cell for the shuttle to be removed, and a normally operative cell, and connections between said shuttle box and a rotatable cam, a dwell gear to operate said cam, and manually controlled means to start and stop said gear.

7. In a loom of the class described, a shuttle box having a spare shuttle cell, a cell for the shuttle to be removed, a normally operative cell, and the normally operative shuttle, a driving gear connected with a moving part of the loom, and a second gear adapted to be driven by said driving gear, and having a movable manually controlled member adapted to be engaged by a corresponding member of said driving gear, and locking mechanism for said manually controlled member, and connections from said driven gear to the shuttle box, to operate the same.

8. In a loom of the class described, a shuttle box having a spare shuttle cell, a cell for the shuttle to be removed, a normally operative cell, and the normally operative shuttle, a driving gear connected with a moving part of the loom, and a second gear adapted to be driven by said driving gear, and having a movable manually controlled member adapted to be engaged by a corresponding member of said driving gear, and locking and stopping mechanism for said manually controlled member, and connections from said driven gear to the shuttle box to operate the same.

9. The combination with a lay, a shuttle box at each end of the lay, each box having a cell to receive the spare shuttle, to be inserted by the weaver, a second cell to receive the shuttle to be removed, and a third cell for the shuttle in the normal operation of the loom, of manually controlled means to bring either of the three cells of either box into line with the race-way.

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