(No Model.)

4 Sheets—Sheet 1.

H. WYMAN.

SWIVEL LOOM.

No. 449,790. Patented Apr. 7, 1891.

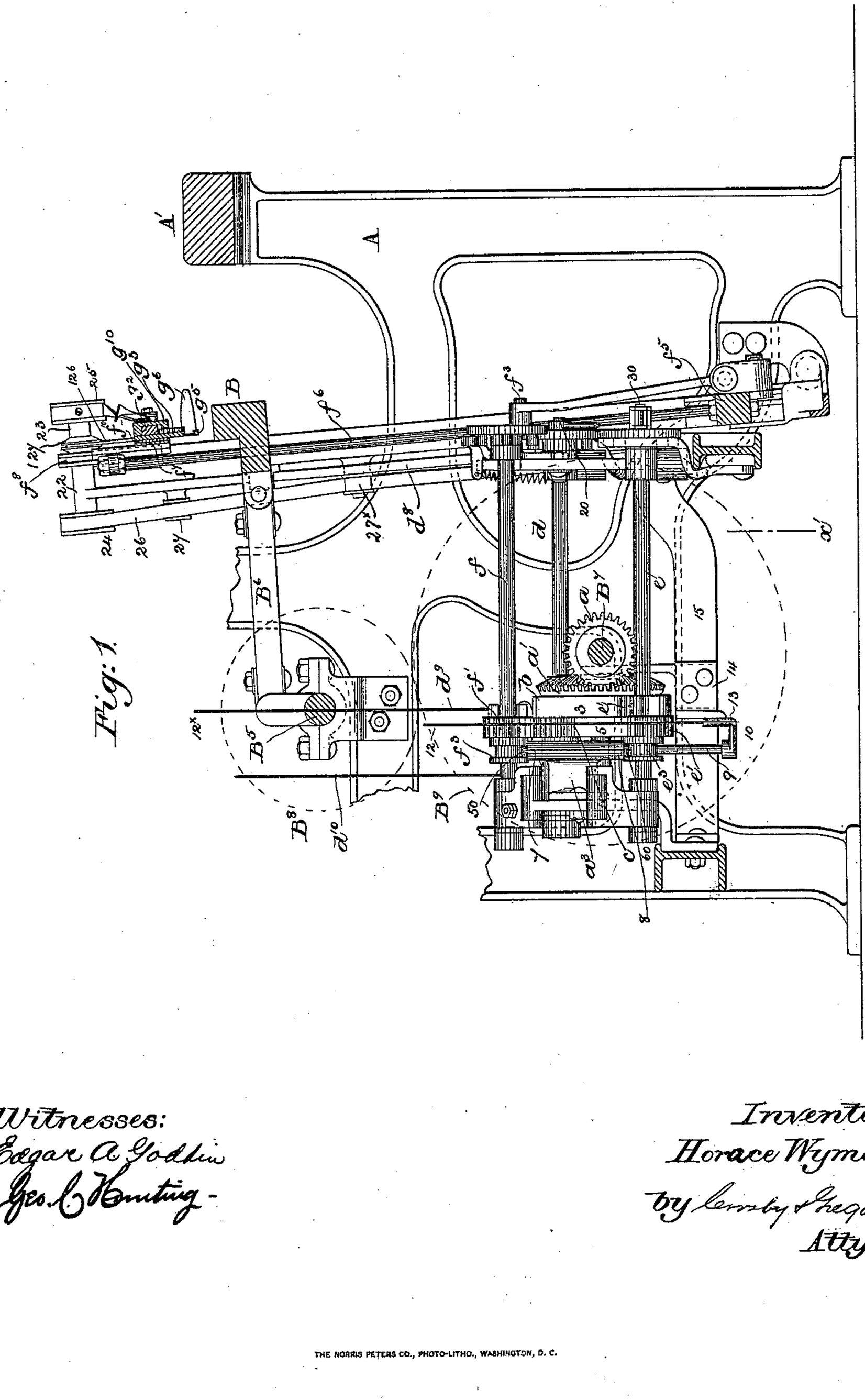


Fig: 1.

Witnesses:
Edgar A. Goddin
Geo. C. Hunting -

Inventor:
Horace Wyman
by Lemby & Gregory
Attys.

(No Model.)

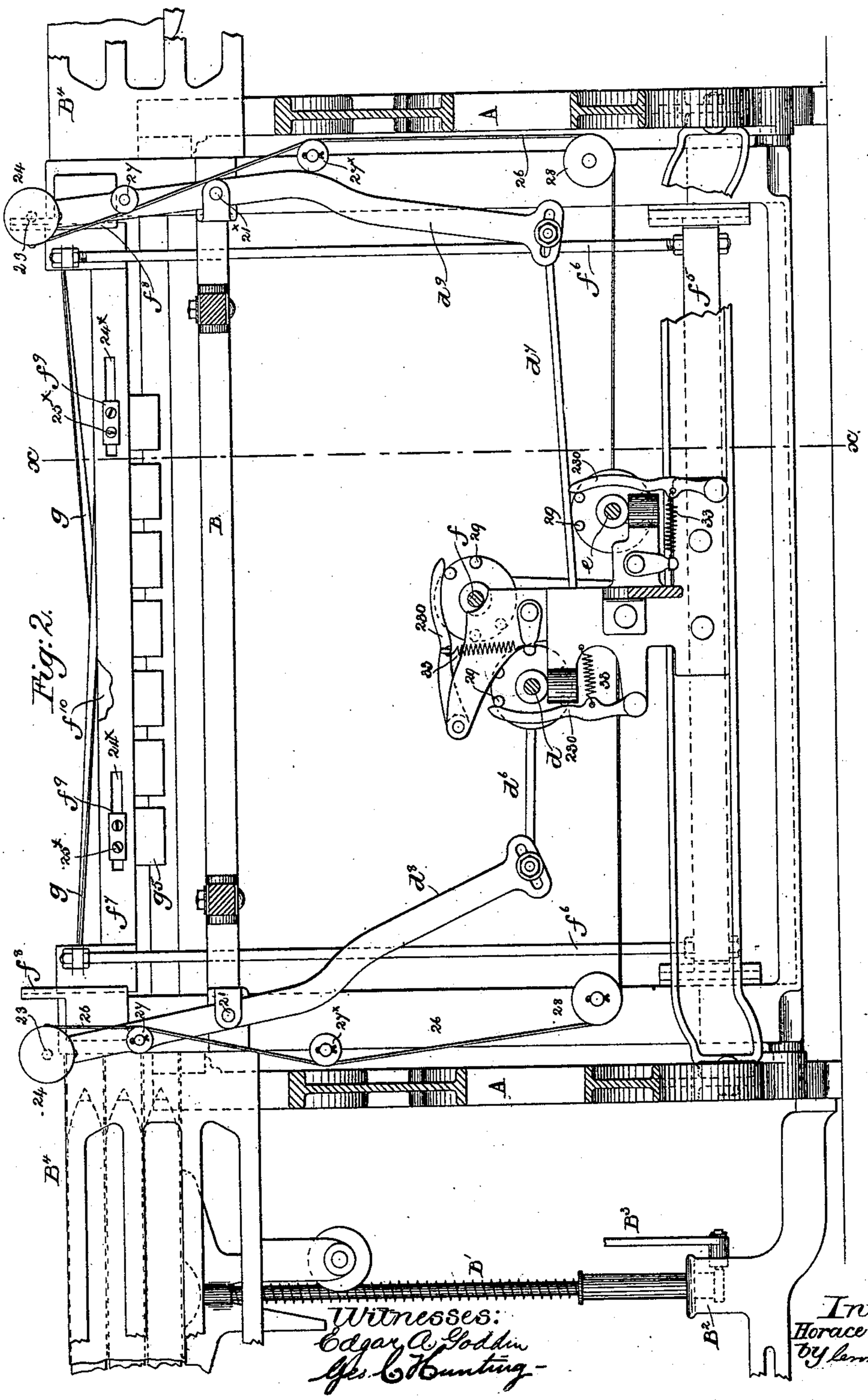
4 Sheets—Sheet 2.

H. WYMAN.

SWIVEL LOOM.

No. 449,790. Patented Apr. 7, 1891.

Fig: 2.



Witnesses:
Edgar A. Goddin
Geo. C. Hunting.

Inventor:
Horace Wyman
by Lemby Gregory
Attys.

(No Model.) 4 Sheets—Sheet 3.

H. WYMAN.

SWIVEL LOOM.

No. 449,790. Patented Apr. 7, 1891.

Fig: 9.

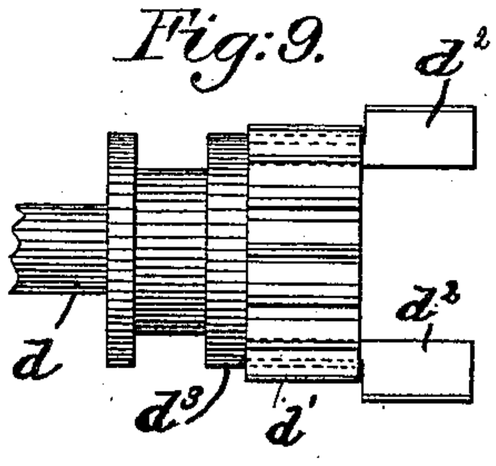
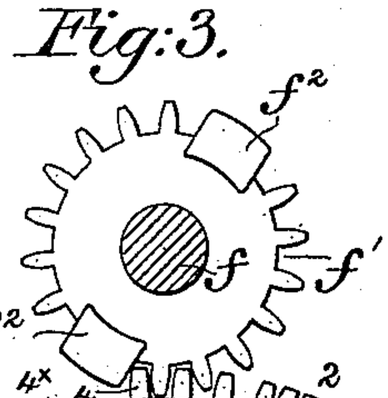


Fig: 3.



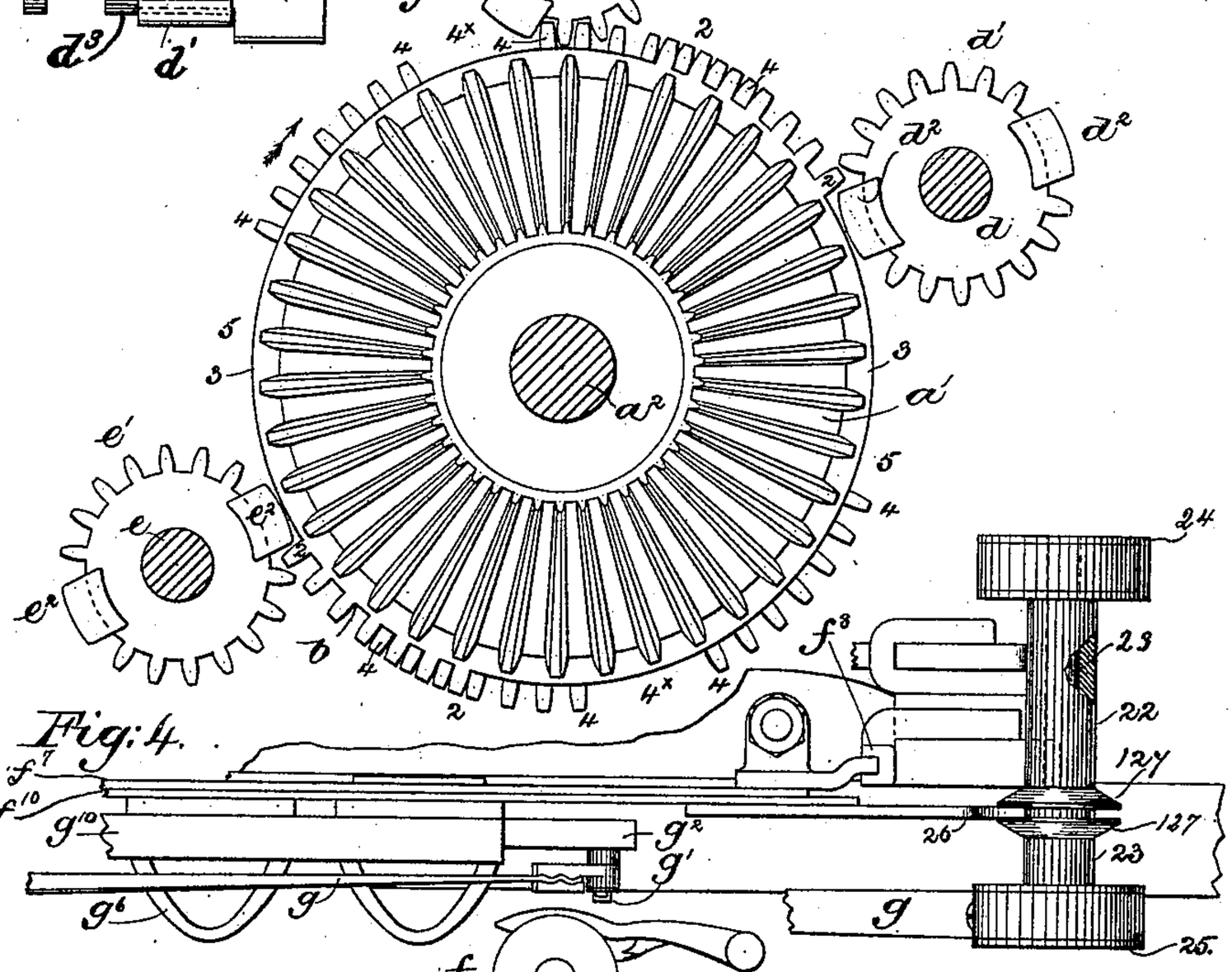


Fig: 4.

Fig: 6.

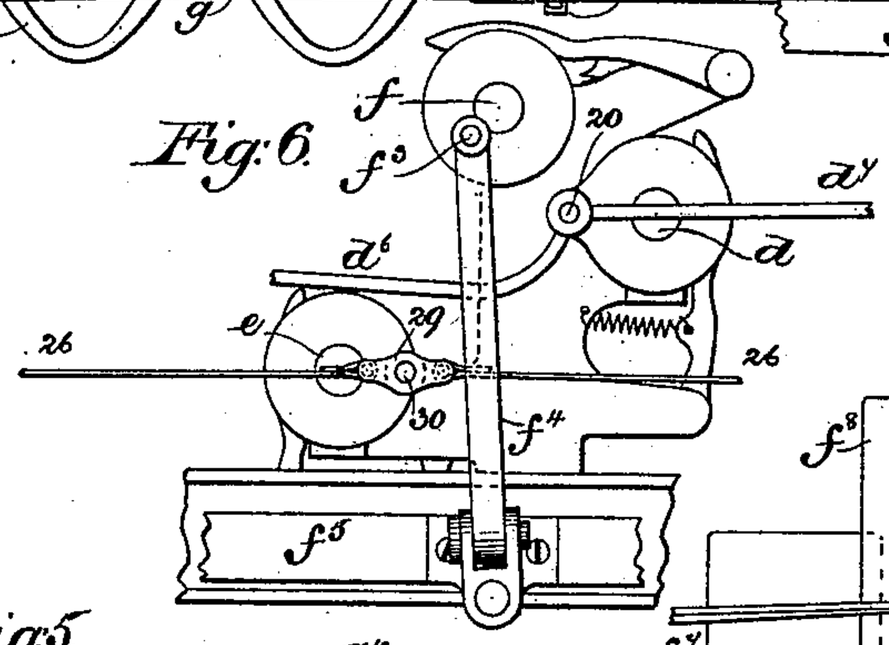
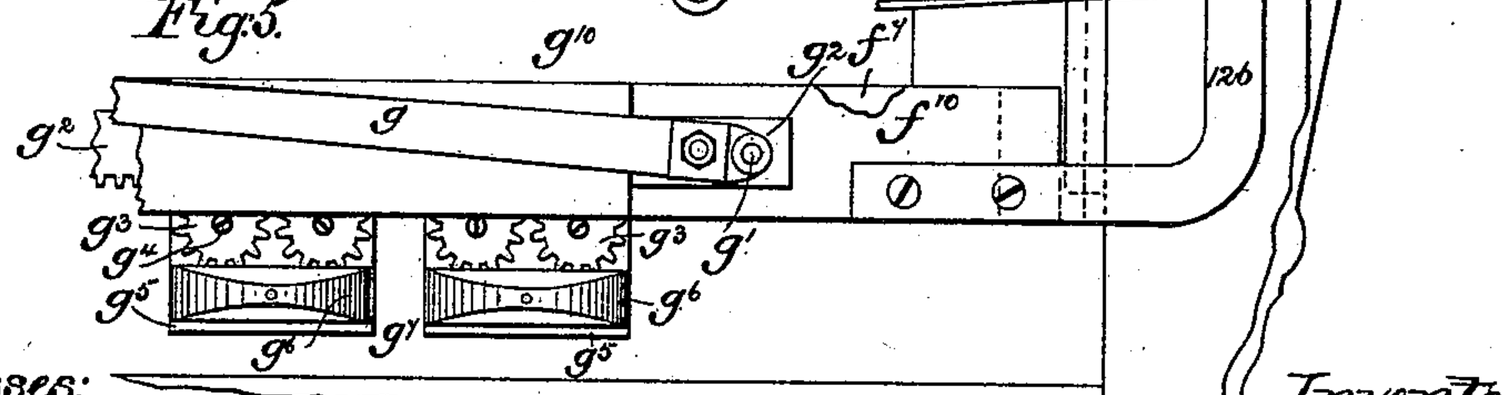


Fig: 5.



Witnesses:
Edgar A. Goddin
Geo. C. Hunting

Inventor:
Horace Wyman
by Crosby & Gregory
Attys.

(No Model.)

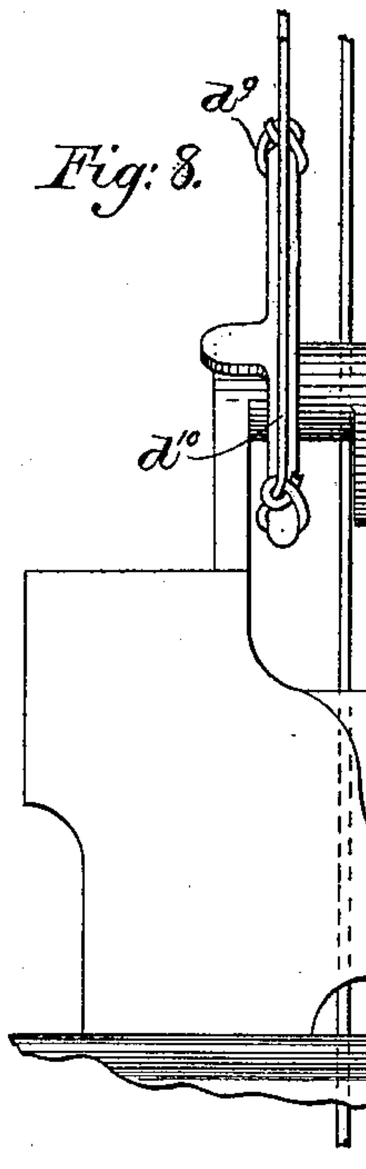
4 Sheets—Sheet 4.

H. WYMAN.

SWIVEL LOOM.

No. 449,790. Patented Apr. 7, 1891.

Fig: 8.



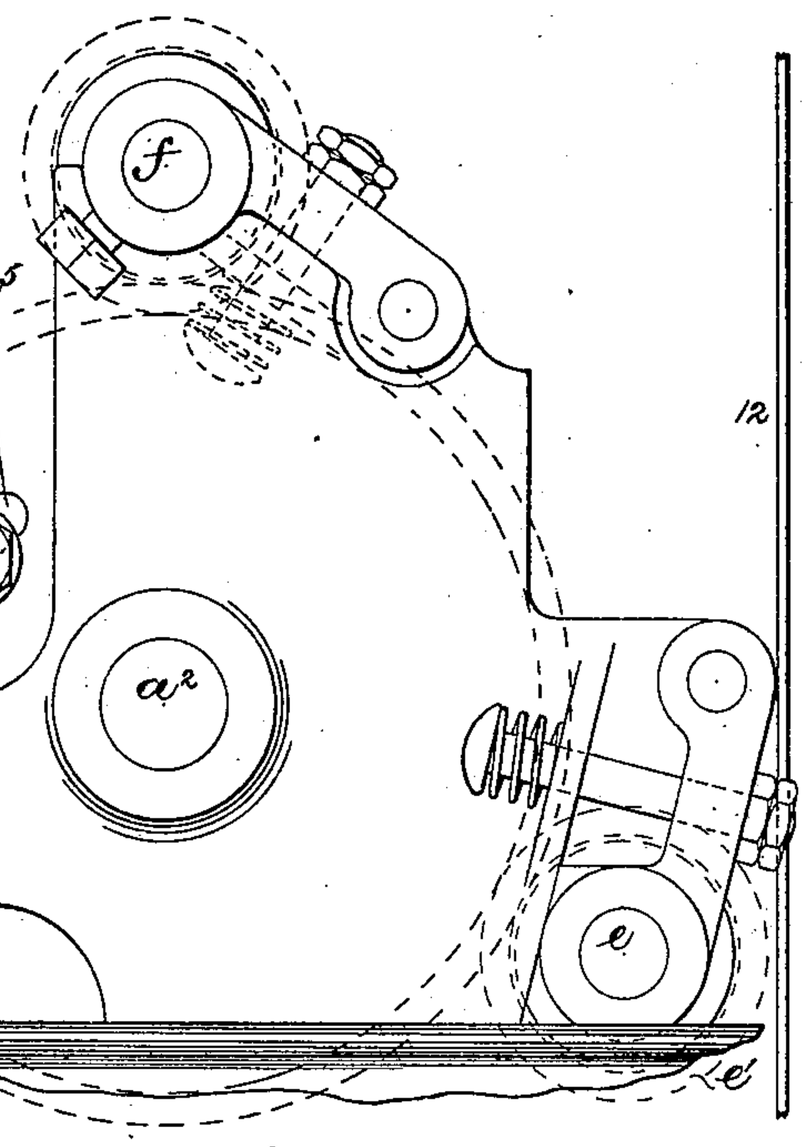


Fig: 7.

Witnesses:
Edgar A. Goddin
Geo. C. Hunting.

Inventor:
Horace Wyman
by Lemby & Gregory
Attys.

UNITED STATES PATENT OFFICE.

HORACE WYMAN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE CROMPTON LOOM WORKS, OF SAME PLACE.

SWIVEL-LOOM.

SPECIFICATION forming part of Letters Patent No. 449,790, dated April 7, 1891.

Application filed June 27, 1890. Serial No. 356,944. (No model.)

To all whom it may concern:

Be it known that I, HORACE WYMAN, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Swivel-Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve and simplify that class of looms wherein a regularly-woven fabric is provided at intervals with spots or figures formed by threads carried by what are called "swivel-shuttles," the latter at the proper times, according to the figure to be woven, being automatically placed in position to enable the threads carried by them to be interwoven with some of the warp-threads for one or more picks while the figure or spot is being woven, the regular shuttle of the loom at such time remaining in its box while the swivel-shuttle acts. The swivel-shuttle race has combined with it mechanism whereby it may be raised and lowered in the proper time in order, and also to be shogged laterally to alternate the location of the figures to be produced by the swivel-shuttles, according to the location of the figures or spots on the fabric. The shogging-frame carrying the race for the swivel-shuttles derives its vertical movement from a crank-pin; but it may be an eccentric attached to an intermittingly-rotating shaft and intermediate connections, the said crank-shaft deriving its movement, as herein shown, from a pinion having one or more sliding or clutch-like teeth and a partially-toothed gear. The rack which imparts movement to the gear to actuate the swivel-shuttles, as herein shown, is also moved by or through an intermittingly-rotating crank-pin on a shaft which derives its motion in substantially the same manner as the shaft which raises the frame carrying the swivel-shuttle race, the said intermittingly-rotating shafts being moved in such time and order with relation each to the other as to enable the swivel-shuttle race to remain down in position while the swivel-shuttles are passed through the shed, both intermittingly-rotating shafts remaining at rest and the swivel-shuttle race elevated while the regular shuttle employed to lay the weft for the body of the fabric is operated. The shogging motion given to the swivel-shuttle race is also derived in like manner from a crank-pin actuated by an intermittingly-rotating shaft, and for greater compactness of parts the said intermittingly-rotating shafts are arranged parallel to each other and about the partial gears for actuating them. The time and order of the engagement and disengagement of the clutch-pinions and partially-toothed gears are determined by or through usual pattern mechanism, which in practice controls the formation of the sheds.

By the term "crank" as herein used it is intended to include its equivalent, an eccentric.

Figure 1 is a partial longitudinal section of a swivel-shuttle loom embodying my invention, the section being taken on the line x, Fig. 2, the shuttle-boxes being omitted. Fig. 2 is a partial cross-section of a loom containing my invention, the said section being to the right of the line x', Fig. 1, and the view being from the left in Fig. 1, the shuttle-boxes and their actuating mechanism being partially broken off to save space upon the drawings. Fig. 3 is an enlarged sectional detail, looking toward the left from the dotted line x', Fig. 1. Fig. 4 is a partial plan view of the lathe and the frame for carrying the swivel-shuttles, and means for actuating them. Fig. 5 is an enlarged detail showing a partial front elevation of the upper part of the lathe and the swivel-shuttle raceway. Fig. 6 is a detail, to be described, taken from the front of the loom, the said figure showing the cranks, which are attached to the intermittingly-rotating shafts employed to raise and lower the frame which carries the raceway for the swivel-shuttles, for reciprocating the swivel-shuttles, and for shogging the said raceway. Fig. 7 is an enlarged plan view taken from the rear of the machine, chiefly to show the partial tooth-gears and the clutch-gears engaged thereby, and the means employed for making the said clutch-gears effective, or for making them inoperative with relation to the partial gears. Fig. 8 is a detail

looking at Fig. 7 in the direction of the arrow thereon; and Fig. 9 shows one of the clutch-gears by itself, its movable teeth being pushed out of line with relation to its stationary teeth.

The frame-work A, having a breast-beam A′, the lay B, having at each end suitable guides for the reception of shifting shuttle-boxes, each set of shuttle-boxes having in practice an attached rod B′, extended through a suitable guide B^2, and having connected to it a link B^3, joined in usual manner to a shuttle-box lever—such, for instance, as shown in United States Patent No. 402,122; and the crank-shaft B^5, the connecting-rods B^6 between it and the lathe, the main or picking shaft B^7, and the gears B^8 and B^9, (shown by dotted lines only in Fig. 1,) to connect the said shafts so that one may be rotated from the other, are and may be all as common in said patent.

In the loom herein to be described it will be understood that the shifting shuttle-boxes B^4 will be actuated in the proper time and order according to the pattern to be woven, all as provided for in the said patent; but it is obvious that the invention would be the same should the shuttle-box levers at opposite ends of the lathe be actuated by any other usual mechanism employed for such purpose and under the control of a pattern-surface.

It will be understood that the warp in the loom to be herein described will be shed by any usual mechanism, either the mechanisms common to fancy looms or to Jacquard looms.

The picker-shaft B^7 referred to will in practice carry picker-arms or bowls, with which may be combined any usual mechanism which is adapted to cause the said arms or bowls to be temporarily thrown out of operative position when it is desired to leave at rest the usual picker-stick, (not shown,) but which in practice will be such as employed in the loom described in the patent referred to, so that the said picker-sticks may remain inoperative during such times as it is desired that the main shuttle or shuttles (shown by dotted lines at the left in Fig. 2 and employed to carry the weft for the foundation of the fabric being woven) shall remain in their shuttle-boxes while the swivel-shuttles, to be described, are actuated to put their threads into the sheds.

I have considered it unnecessary to represent the picking mechanism, because it may be of any suitable or usual construction—as, for instance, as in United States Patent No. 169,248.

The lower shaft B^7, in accordance with this invention, is provided with a beveled pinion a, which engages a beveled gear a', mounted upon a stud a^2, held in a bearing in a suitable stand a^3. The beveled gear a' has connected to it at its rear side two partial gears b c, the partial gear c being preferably adjustably connected to the gear b by a suitable bolt or bolts a^4 in slots a^5 of the gear c, as shown in Fig. 8. The partially-toothed gear b, as represented, has at substantially diametrically-opposite points series of teeth 2, (herein shown as seven in number each,) there being long blank spaces 3 between the said series of teeth. The partially-toothed gear c, as herein represented, has four series of teeth 4, each series containing seven teeth, there being untoothed spaces $4^\times$ and 5 on the said gear c between its series of teeth 4, the spaces 5 being longer than the spaces $4^\times$. Clustered around the partial gears referred to are the crank-shafts d e f. The crank-shafts d e derive their intermitting motion (herein supposed to be a half-rotation) through the teeth 2 of the partially-toothed gear b, which engage the clutch-pinions d' e', each fixed to its own proper shaft. The shaft f derives its intermitting rotation from the teeth 4 of the partial gear c.

The pinions d' e' f' are grooved at diametrically-opposite points to receive sliding clutch-teeth d^2 e^2 f^2 in pairs, each set of clutch-teeth extending from parallel arms of sliding collars d^3, e^3, or f^3, loose on one of the shafts d, e, or f. When the clutch-teeth on these arms are in line with the teeth of the pinion in which the arms slide, then each such pinion will be rotated by the teeth of the gear b or c, but when a said sliding collar is moved to slide the arms and remove the clutch-teeth from position in line with the teeth of the said pinion, then the said pinion will be out of mesh with the teeth of the gear which otherwise actuate it. In Fig. 7 the clutch-teeth d^2 of the pinion d' are out of line with the teeth of the said pinion, and the clutch-teeth f^2 e^2 of the pinions f' e' are in line with the teeth of the said pinions, the pinion d' being supposed to be at rest. Each collar d^3 e^3 f^3 has an annular groove which is entered by a suitable roller or other stud by which to slide the said collar on the shaft on which it is mounted. The roller-stud d^5 (shown best in Figs. 7 and 8 as entering the groove of collar d^3) is mounted upon a rocking arm d^6, supported by a stud d^7 of a stand d^8, the said rocking arm having connected to its opposite ends suitable wires, as d^9 d^{10}, which in practice may be carried up to and connect with usual fingers extended over a pattern-chain, such as represented in United States Patent No. 227,667, so that in the rotation of the said pattern-chain certain rollers or projections thereon will cause the said arm d^6 to be rocked in one or the other direction to place the clutch-teeth d^2 in line with the teeth of the pinion d' to be engaged by the teeth 2 of the gear b, or to move the said clutch-teeth out of line with said teeth, as represented by the full lines, Fig. 7, the clutch-teeth d^2, when shifted out from the line of movement of the teeth of the pinion b, causing the pinion d' to remain at rest after the teeth of the partial gear b shall have run out of mesh therewith, the said pinion remaining at rest until the said clutch-

teeth, by or through the action of the pattern mechanism moved in unison with the usual shed-forming mechanism, places the said clutch-teeth d^2 back into line with the teeth of the pinion d'. The collars f^3 e^3 have respectively clutch-teeth f^2 e^2, which reciprocate with the gears f' e'; but the acting portions of the clutch-teeth f^2 are at the inner ends of the arms carrying them, rather than at the outer ends of the arms, as is the case with the teeth e^2 d^2. The grooves in the collars f^3 e^3 are entered, respectively, by roller-studs 50 60, (see Fig. 1,) carried by arms 7 8 on a vertically-placed rock-shaft 9, having on its lower end (see Fig. 1) an arm 10, with which are connected two like cords 12 $12^\times$, (both shown in Fig. 7,) extended over suitable sheaves, as 13, mounted upon a bracket 14, attached to a suitable girt 15 of the loom-frame, the said cords being in practice extended up to and connected with fingers resting upon a pattern-chain, as before referred to, so that when the said cords are moved the said clutch-teeth, co-operating with the gears e and f, will be simultaneously moved into or out of line with the teeth of their respective pinions. If desired, the cords referred to, as well as the wires d^9 and d^{10}, may be joined directly to any usual hook or connection of a jacquard, so as to be lifted and lowered at the proper time. Two of the series of teeth 4 of the partially-toothed gear c are arranged quite close together, as represented at the upper and lower sides of the said gear in Fig. 3, the spaces $4^\times$ at the upper and lower sides of the said gear, as shown in the said figure, being shorter than the spaces 5, for in practice, as herein provided for, it is intended that the shaft f, having the pinion f', be left at rest just long enough after it has been given a half-rotation to depress the swivel-shuttle frame to permit the shaft e' to actuate the swivel-shuttles, and then the shaft f' is again started quickly to elevate the swivel-shuttle frame, to be described, it again remaining at rest while the clutch-teeth are opposite the long spaces 5, at which time the regular shuttle will be thrown across through the shed from one to the other shuttle-box.

In practice it will be understood that should the gear c be made small enough it need have but two series of teeth and one space $4^\times$ and one space 5, the gear f' being properly proportioned, or, in other words, this invention is not limited to the number of series of teeth upon any one gear. Shaft d has at its front end a crank-pin 20, to which is connected links d^6 d^7, in turn jointed to the lower ends of the shogging-levers d^8 d^9, having their fulcra at 21 $21^\times$ in suitable ears attached to the rear side of the lay. (See Fig. 2.) These shogging-levers have at their upper ends suitable bearings 22 for the reception of like shafts 23, provided at their rear ends with pulleys 24 and at their front ends with pulleys 25, the pulleys 24 having connected to them one end of a strap 26, which, after being passed over and under sheaves 27 $27^\times$ and 28, are connected to a block 29, mounted loosely upon a crank-pin 30 at the front end of the shaft e, the said shaft in its intermitting rotation oscillating the shafts 23 through the straps 26 referred to. The pulley 25 is represented as made integral with the shaft 23, the latter being reduced in diameter a short distance from the pulley 25, so as to leave a shoulder on the shaft 23 to abut against the guide 127, fast to the end of the bearing 22. Fig. 4 shows the bearing somewhat broken out, the reduced part of the shaft being indicated by dotted lines. The front end of the shaft f has a suitable crank-pin f^3, which receives upon it a link f^4, jointed to a cross-beam f^5, to the opposite ends of which are secured two like rods f^6, which at their upper end support a cross-bar f^7, the ends of the said cross-bar being fitted into and so as to slide in ways f^8, secured to upper ends of the swords of the lay. The cross-bar f^7 is slotted, as at $24^\times$, to receive and act as a guide for blocks f^9, attached by screws $25^\times$ to the shogging-bar f^{10}, portions of the said blocks fitting the said slots, the blocks being shorter than the slots, so that they may travel therein when the shogging-bar is moved longitudinally. The shogging-bar, supported by the cross-bar f^7 through the medium of the said blocks, has at each end an upright 126, which enters an annular groove in the collar 127, secured on the front end of the bearing 22, the said collar acting as a guide for the ends of the shogging-bar in its vertical movement, it being understood that when the crank-shaft d is rotated half-way around that it turns the shogging-levers upon their fulcra and causes the shogging-bar to be carried to the right or to the left, so as to bring the figuring-shuttles g^6 into working position in the warps at the points where the spot or figure is to be worked into the foundation fabric. The pulleys 25, connected to the ends of the rock-shafts 23 nearest the breast-beam, have connected to them straps g, which are attached to pins g' at the opposite ends of the rack-bar g^2, toothed at its under side and adapted to engage and rotate the pinions g^3, pivoted at g^4 upon suitable plates g^5 of such shape in cross-section (see Fig. 1) that a series of such plates constitutes the raceway for the swivel-shuttles g^6, or, in other words, the raceway in which the swivel-shuttles slide is broken up into sections, so as to leave spaces, as g^7, into which may be lifted the warps which are to be raised when the swivel-shuttles are to operate to lay their threads into the fabric to form a spot or figure, as commonly practiced in narrow ware looms. The plates constituting the shuttle-race for the swivel-shuttles are connected directly to the shogging-bar f^{10}, and the rack-bar is kept in place by a cap-bar g^{10}. Each of the shafts d, e, and f referred to have near their front ends suitable locking-pins or projections, as 29, with which co-operate suitable like lock-

ing devices 230, (shown as levers,) pivoted at one end upon a suitable stand, and as acted upon near one end by a suitable spring 33, the spring normally serving to keep the locking-levers against the said pins to hold the shafts in any position in which they may be left by the gears *b* and *c*. Assuming that the crank-pins 20 and 30 and f^3 of the shafts *d*, *e*, and *f* are in the position shown in Fig. 6, and that the cross-bar f^5 has been put into substantially its lowest position, thus carrying the swivel-shuttle race down toward the usual raceway of the lay, placing the swivel-shuttles in position to be actuated and carried through the shed in which they are to work. In this position it will be understood that the clutch-teeth of the pinion *d* stand in the full-line position, Fig. 7, out of line with the teeth of the pinion, and that the clutch-teeth of both the gears *e' f'* are in line with the series of teeth of the said gears, and that one of the series of teeth of the pinion *f'* is just running out of mesh with one of the series of teeth of the gear *c*, and that the leading tooth of one of the series of teeth 2 is just coming into position to engage and rotate the gear *e'* and the shaft *e*, now in the further movement of the loom, and while the tooth f^2 travels in the space $4^{\times}$ the shaft *f* will remain at rest, leaving the swivel-shuttle race down, so that as the leading tooth 2 of gear *b* strikes the clutch-tooth e^2 it will rotate the shaft *e* and cause it, through the straps referred to and rock-shafts 23, straps *g*, and rack-bar g^2, to move the swivel-shuttles across the spaces in the swivel-shuttle race, and through the sheds for the swivel-shuttles, and as soon as the shuttles are so moved, or while they are moving, the clutch-tooth f^2 is again engaged by the advancing series of teeth on the gear *c*, which quickly rotates the pinion *f'*, shaft *f*, and crank-pin f^3 to raise the swivel-shuttle race, and this done, the series of teeth run out of mesh with the pinion *f'*, and the series of teeth 2 also run out of mesh with the gear *e'* on the picking-shaft *e*, causing both the shafts *e* and *f* to be stopped temporarily, while the usual picking mechanism acts to cause one of the regular shuttles of the loom to be shot across from one to the other shuttle-box. This operation is continued, the swivel-shuttle race being lowered and left down long enough to enable the swivel-shuttles to be moved, and then the said shuttle-race is lifted and kept up long enough to permit the regular shuttles of the loom to be put through the shed. When, however, it is desired to start the swivel-shuttle race so as to weave the ornamental figure or spot in another part of the warp or at one side of the line in which the figure has just been made, then the clutch-teeth d^2 of the pinion *d'* are moved in from their full-line position, Fig. 7, so as to be in the line with the series of teeth of the pinion *d'*, so that the teeth of the partial gear *b'* may engage and rotate the said pinion for half a rotation, the clutch-teeth being then again thrown out of position, so as to leave the shaft *d* at rest until the new figure or spot has been woven.

Prior to my invention I am not aware that the swivel-shuttle race, or that the shogging-bar, or that the rack-bar for moving swivel-shuttles have ever derived their movement from an intermittingly-rotating crank-pin, so this invention is not limited to the exact form of partial or mutilated gear shown or to the exact form of means or devices by which to impart to the crank-pins f^3, 20, and 30 an intermitting rotation, and instead of the devices shown for such purpose I may employ any other known mechanism by which to impart intermitting movement, as described, at the proper time to the crank-pins 20 or 30 or f^3, and instead of the particular form of gear herein shown I may employ any other well-known partial or mutilated or clutch gears, many forms of which are at present employed in connection with shifting shuttle-box mechanisms and harness mechanisms of looms, and instead of arranging in a circle, as on gears *b c*, the series of teeth which actuate the pinions on the shafts *d*, *e*, and *f*, I may place the said series of teeth upon sliding racks, substantially as in United States Patent No. 264,594.

It is obvious that by the use of shifting shuttle-boxes one cell of the shuttle-boxes without a shuttle may be placed in line with the race of the lay whenever it is desired to let the swivel-shuttles work, and at such time should the picker-sticks be actuated no harm could be done, for the cell in operative position is without a shuttle. Thus it will be seen that the shifting bowls referred to and picker-suspending mechanism may be omitted. In this latter plan the blank cell of the shifting shuttle will have a binder so shaped or positioned as to remain out as though a shuttle was in that cell.

It will be understood in the case of the pinion *f'*, while the acting parts of the teeth are next the annular grooved hub or collar, that if the said teeth were not provided with arms or projections to remain in engagement with the grooves in the pinion *f* when the teeth are drawn back away from the position shown in Fig. 7, that the connection between the teeth and the gear would be broken and might be difficult to make again when the teeth f^2 were to be put in line.

I claim—

1. A loom containing the following instrumentalities, viz: a lay, a swivel-shuttle race, an intermittingly-rotating crank-pin, and intermediate connections to raise and lower the said swivel-shuttle race, whereby the swivel-shuttles may be placed in position at the proper time with relation to the warp to enable ornamental figures or spots to be woven into the body of the fabric, substantially as described.

2. A loom containing the following instru-

mentalities, viz: a swivel-shuttle race adapted to receive a series of swivel-shuttles, a crank-pin, means to rotate the same intermittingly, and intermediate connections between the said crank-pin and the said swivel-shuttle race to raise and lower the latter, substantially as described.

3. A loom containing the following instrumentalities, viz: a swivel-shuttle race adapted to receive a series of swivel-shuttles, a crank-pin, means to operate the same intermittingly, intermediate connections between the said crank-pin and the said swivel-shuttle race to raise and lower the latter, and means, substantially as described, to actuate the said swivel-shuttles.

4. In a loom, the following instrumentalities, viz: a lay, a swivel-shuttle race, a shogging-bar to which it is attached, a cross-bar to support the said shogging-bar, a crank-pin, means to actuate it intermittingly, and intermediate connections between the said crank-pin and cross-bar to raise and lower the said cross-bar, substantially as described.

5. The following instrumentalities, viz: a lay, a swivel-shuttle race, a shogging-bar, pinions and rack to actuate the swivel-shuttles, two rock-shafts having pulleys and connections between them and the said rack-bar, means to support the said rock-shafts and the crank-pin, and means to actuate it intermittingly, combined with strapping connecting the said crank-pin with the said rock-shafts, to operate substantially as described.

6. The lay, a swivel-shuttle race, a shogging-bar, guides 127 for the ends of the said bar, a cross-bar to support the shogging-bar and the shogging-levers, combined with a crank-pin, means to actuate it intermittently, and devices intermediate the crank-pin and the shogging-levers to operate them, substantially as described.

7. The intermittingly-actuated crank-shaft *d*, the shogging-levers, connections between the said crank-shaft and shogging-levers, the rock-shafts mounted in the upper ends of the said shogging-levers and provided with pulleys at their opposite ends, a crank-shaft *e*, and means to actuate the said crank-shafts intermittingly, combined with a rack-bar, gears to engage and move the swivel-shuttles, strapping to connect the shaft *e* with a pulley on each rock-shaft at the upper ends of the shogging-levers, and strapping to connect the pulleys at the other ends of the said rock-shafts with the said rack-bar, to operate substantially as described.

8. A loom containing the following instrumentalities, viz: a lay, a swivel-shuttle race, a supporting cross-bar, gears to engage the swivel-shuttles, the rack-bar to actuate the said gears, rock-shafts, strapping to connect them with the rack-bar, an intermittingly-rotating crank-shaft, strapping to connect it with the said rock-shafts, an intermittingly-rotating shaft *f*, intermediate connecting devices to raise and lower the cross-bar, pinions having clutch-teeth and carried by the said intermittingly-rotating shafts, and a series of movable teeth to intermittingly engage and rotate the said pinions and crank-shafts upon which they are mounted, whereby the said crank-shafts are operated at the desired times and are left at rest at other times, as and for the purpose set forth.

9. A loom containing the following instrumentalities, viz: a lay, a swivel-shuttle race, a supporting cross-bar, gears to engage the swivel-shuttles, the rack-bar to actuate the said gears, rock-shafts, strapping to connect them with the rack-bar, an intermittingly-rotating crank-shaft, strapping to connect it with the said rock-shafts, an intermittingly-rotating shaft *f*, intermediate connecting devices to raise and lower the cross-bar, pinions having clutch-teeth and carried by the said intermittingly-rotating shafts, and a series of movable teeth to intermittingly engage and rotate the said pinions and crank-shafts upon which they are mounted, a shogging-bar, shogging levers, an intermittingly-operating crank, means for intermittingly rotating it, and devices to connect it with the shogging-levers, to operate substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HORACE WYMAN.

Witnesses:
JUSTIN A. WARE,
JOHN B. SYME.