

TEXTILE
MACHINERY
Relating to
WEAVING
by
E.A. POSSELT

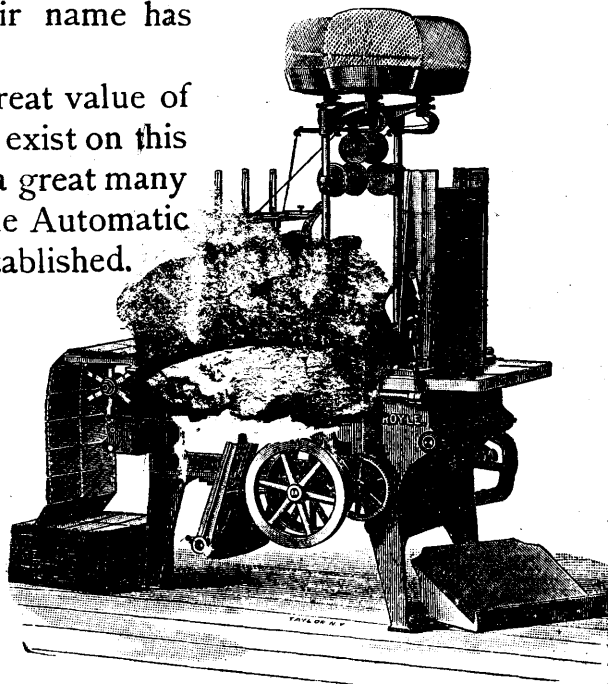
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of recent additions to the machinery used for cutting Jacquard Cards, is the Automatic Lacer built by John Royle & Sons, of Paterson, N. J., U. S. A. The distinctive feature of this machine is that it unites the two operations of punching and lacing cards, operations heretofore separate and distinct, and requiring separate care and attention.

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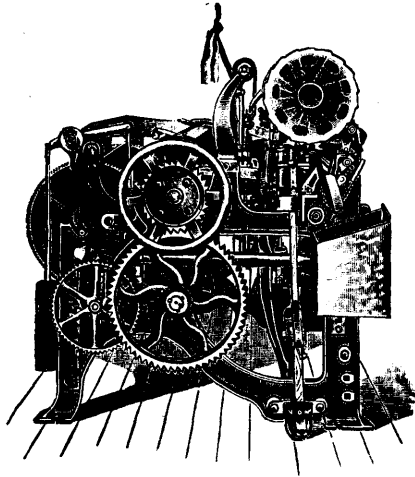
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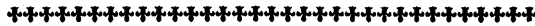
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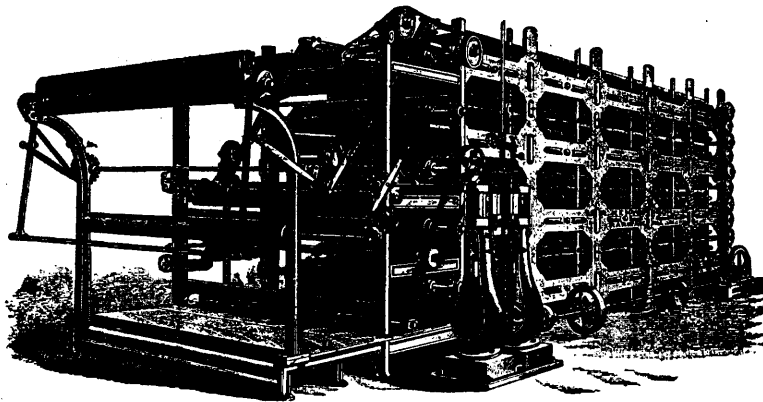
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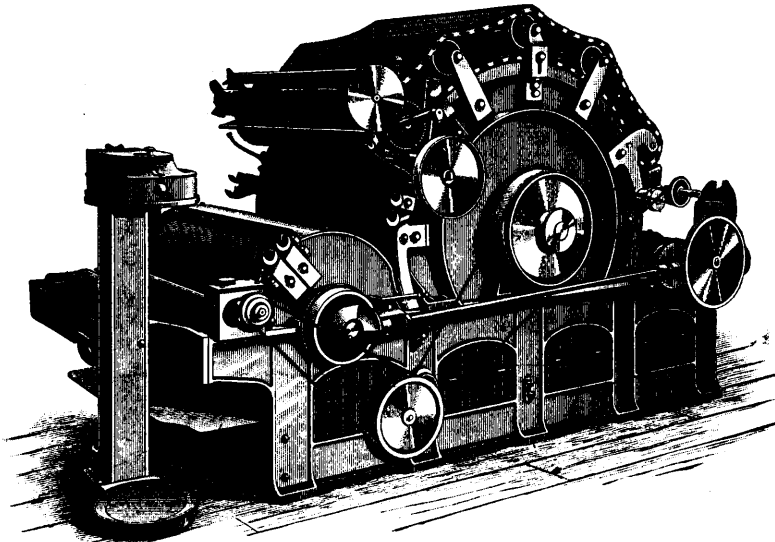
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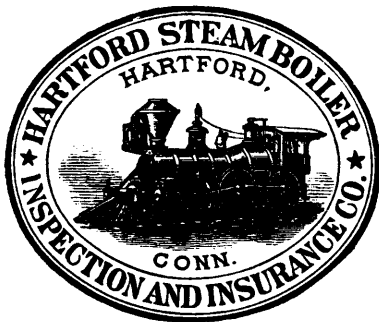
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PREFACE.

THE importance for every Textile Manufacturer, Superintendent, Designer, Overseer and Student to be familiar with the latest and most improved Machinery, Devices and Supplies as needed in the weaving department of an up-to-date mill, is the cause of bringing this book before the public.

Illustrations and reading matter have been most carefully edited so as to bring the various subjects as plain as possible before the reader.

It would have been impossible to furnish a work dealing with each and every make of machinery or devices at present in use; however, a successful attempt has been made to illustrate the latest and those of the most importance, and it is my intention to publish a second volume, to be issued three years hence, giving a description of such machinery or devices as either escaped notice or were impossible to be obtained for this book, or such as will be invented and put to practical test previously to publishing said volume. The present book will also form a most valuable manual of reference to inventors, it being the most complete work on textile machinery relating to weaving heretofore published.

I have the pleasure in acknowledging my indebtedness to Mr. Geo. W. Kritler, Master Weaver, Philadelphia, for his kindness in examining proofs.

E. A. POSSELT.

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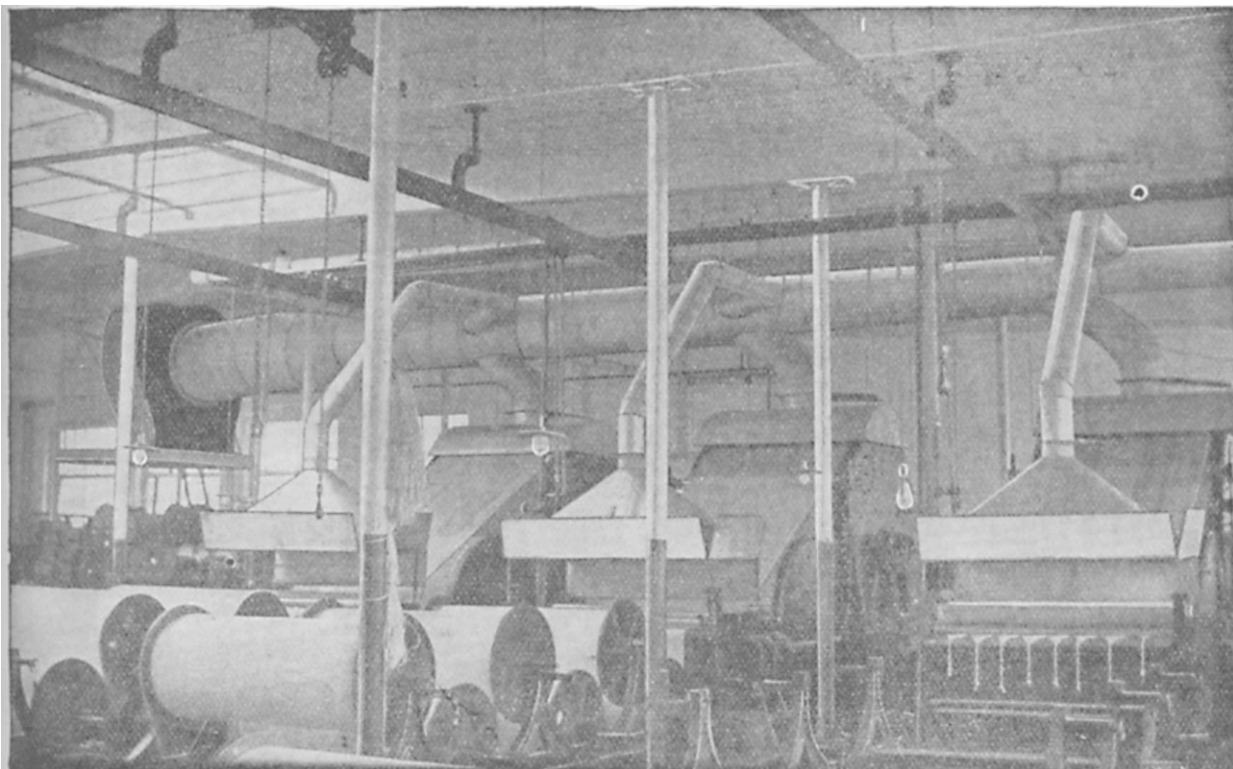
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SHEDDING MECHANISMS.

THE KNOWLES SHEDDING MECHANISM.

This mechanism is shown in the accompanying three illustrations, of which Fig. 1 shows the complete shedding mechanism; Fig. 2 shows the top and bottom cylinders, also the vibrator and jack attachment; Fig. 3 shows the box mechanism for raising and lowering the shuttle boxes.

a, indicates arch of loom frame; *b*, the loom frame; *c*, the bolts for fastening the arch *a*, on to loom frame *b*; *d*, indicates the top cylinder for operating shedding mechanism; *e*, the bottom cylinder for operating shed-

k, is a small rod running across the top of jacks for holding them down on the rod *k*.

l, chain cylinder gear, fastened to the chain cylinder *l'*, by means of a soft set screw (not shown), so that provided any catch occurs no other breakage but the breaking of said soft set screw will result; *l''*, the boxes for holding chain cylinder and which can be raised or lowered by set screws *l'''*.

m, two elliptical gears for transferring the characteristic fast and slow motion to chain cylinder *l'*. To the right of these two elliptical gears *m*, are seen two spur

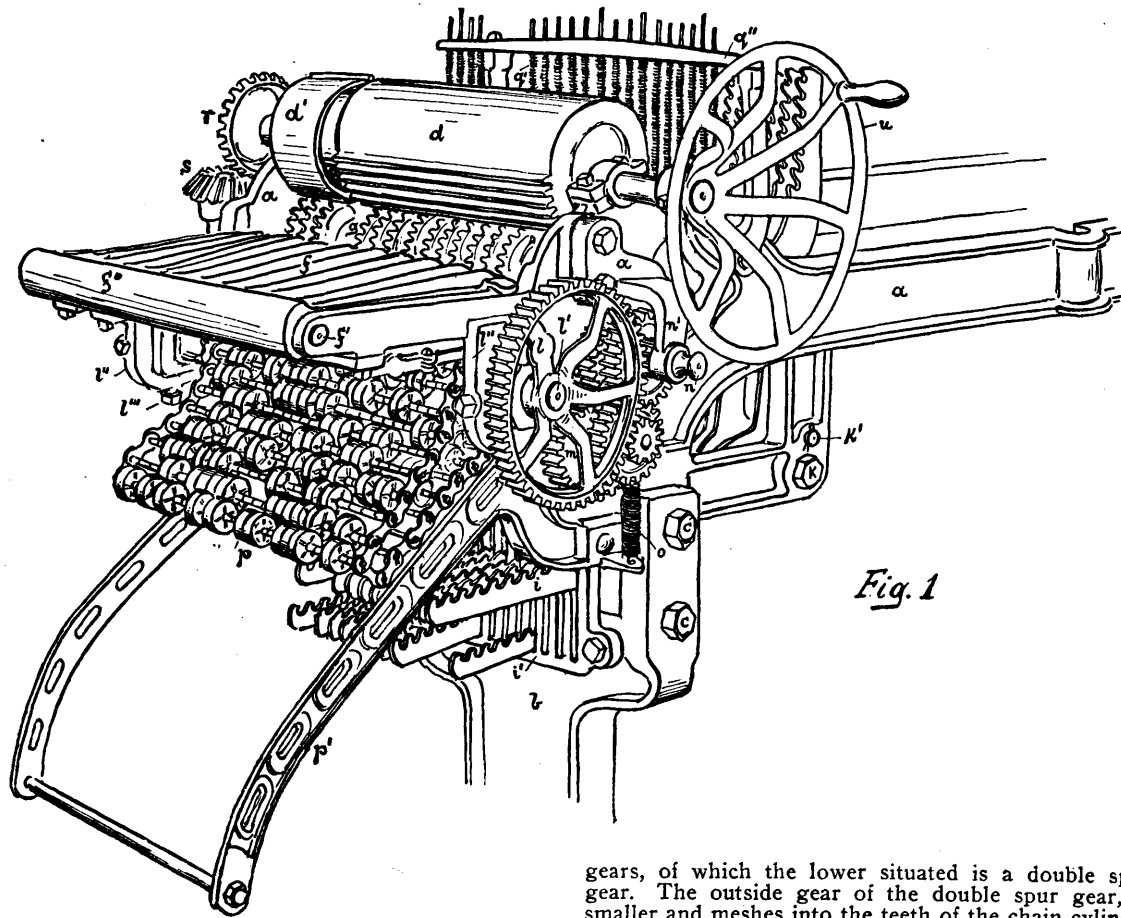


Fig. 1

ding mechanism; *d'*, the part of top cylinder for operating shuttle boxes; *e'*, the part of bottom cylinder for operating shuttle-boxes; *f*, the vibrator levers; *g*, the vibrator gears; *h*, the vibrator connectors; *i*, the harness jacks; *j*, the comb for keeping them in proper position.

Vibrator lever, gear and connector are the same for shedding and box mechanism, with the exception of the long connector *h'*, used for raising single box.

j, arbor of harness jacks, fulcrumed to rod *k*, fastened to the lower extension of arch *a*, of the loom frame.

gears, of which the lower situated is a double spur gear. The outside gear of the double spur gear, is smaller and meshes into the teeth of the chain cylinder gear *l*.

n, the reverse key, held in position by casting *n'*, bolted on to loom frame *a*. This reverse key acts as a shaft for all the upper sections of previously referred to three sets of gears. It has a double key set in its shaft. When the loom is in motion and the chain cylinder running forward, one of the lips fastens the top elliptical gear and also the previously referred to outside situated upper gear, which meshes with the chain cylinder gear *l*. If required to reverse the chain cylinder the reverse key *m*, is drawn out, in turn liberating the top elliptical gear and fastening the middle spur

gear, which meshes with the bottom double spur gear, thus in turn reverses the chain cylinder gear and its cylinder.

Spring o , connects to the lock knife o' . (See Fig. 3.) This lock knife is operated by means of finger o'' , fastened to rod o''' by a set screw, and which finger in turn is operated by a cam (not shown) fastened on the bottom cylinder e .

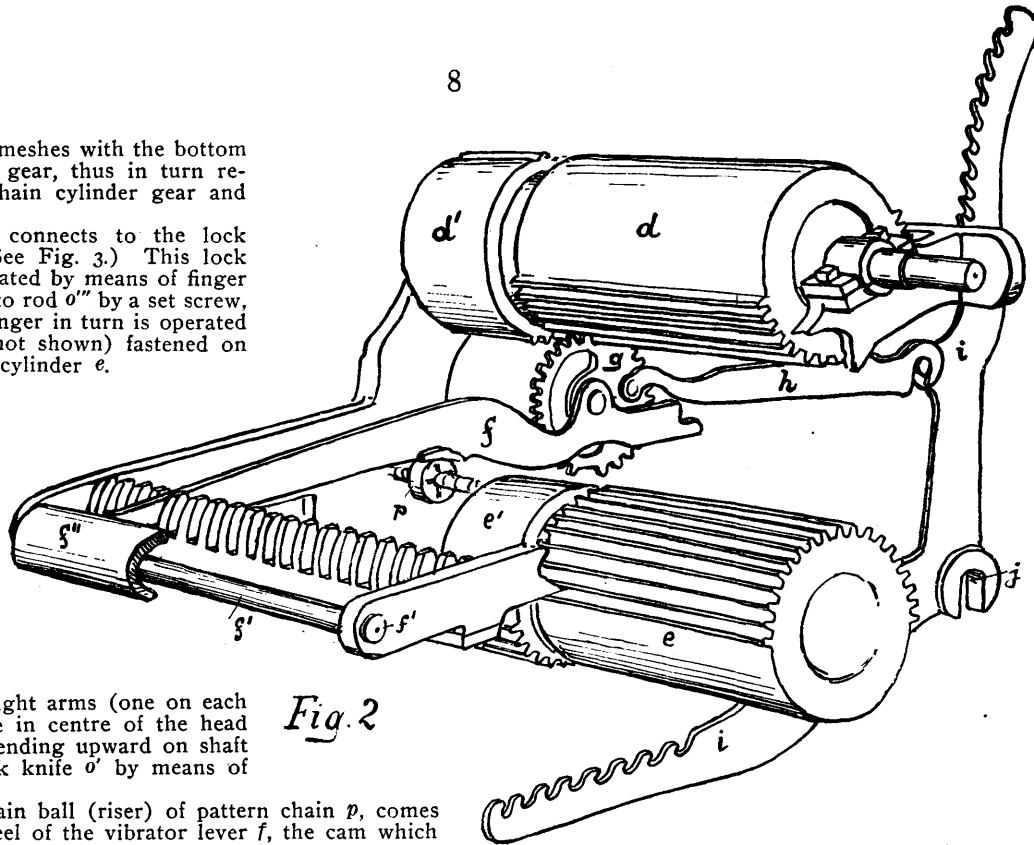


Fig. 2

Three upright arms (one on each end and one in centre of the head motion) extending upward on shaft o''' hold lock knife o' by means of set screws.

As the chain ball (riser) of pattern chain p , comes under the heel of the vibrator lever f , the cam which

operates the finger o'' of the lock knife must be on its highest part, which causes the knife to be out, allowing the vibrator lever f , to change according to pattern chain. As the low part of the cam comes around, the spring o will immediately pull the lock knife in between the ends of the vibrator lever f , holding them steady while vibrator gears g , are rotating.

p' is the chain rack for holding the chain in position and away from the jacks i .

Vibrator levers f , are fulcrumed on rod f' , and held in position by shell f'' .

Every vibrator connector h , has connected to it a follower-lever q , the object of which is to keep connector h , from flying back when the harness rises. Every follower-lever is pressed down by means of a spring q' , held in position by rack q'' and turns on shaft q''' . Cylinders d and e , are driven by bevel gears r and r' , which in turn are driven by bevel gears s and s' , keyed to upright shaft t , driven either from crank shaft or bottom shaft of the loom as required.

u , is a hand wheel used by the operator for turning harnesses by hand when necessary.

h' , is the lever for a single box lift (box No. 2); v , compound lever for raising box 3 and 4; v' , brace for holding compound lever in position; v'' , the pulleys around which box chain v''' , runs for raising the boxes. (Crompton and Knowles Loom Works.)

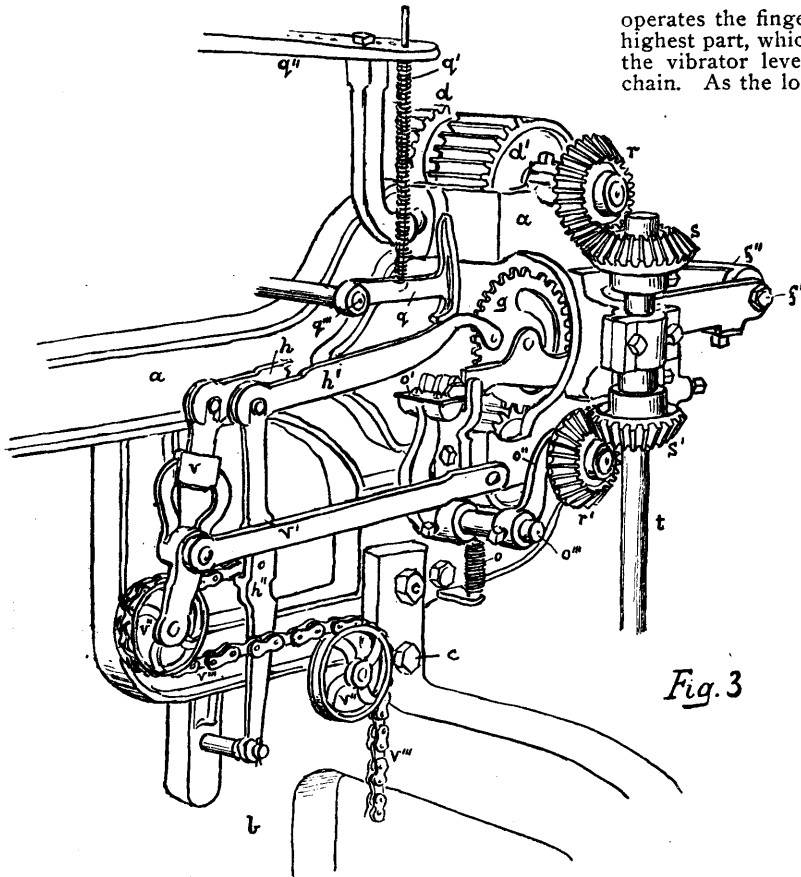
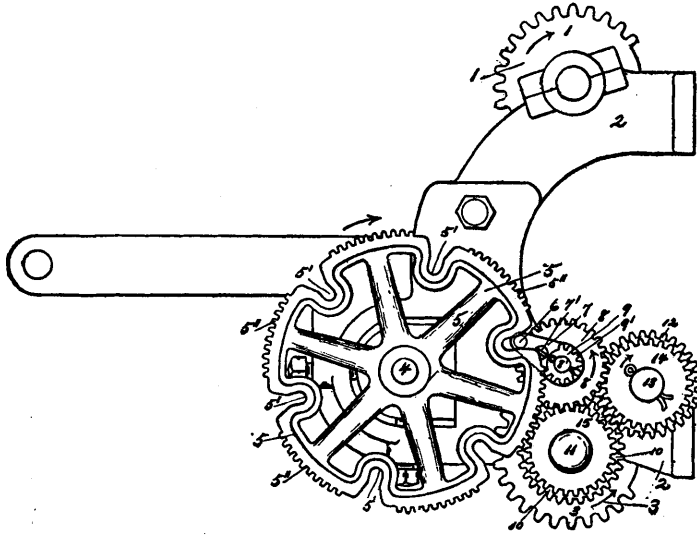


Fig. 3

PATTERN MECHANISM OF THE KNOWLES LOOM.

In the accompanying drawing is shown a front elevation of a detached portion of the head of the Knowles loom, sufficient to illustrate the nature of the device.

Numerals of reference indicate thus: 1, is the upper cylinder gear, journaled in the upper portion of the head frame (arch) 2, and 3 is the lower cylinder gear, journaled in the lower portion of the head frame 2. 4, is the pattern cylinder shaft journaled in the frame 2. On the front end of said shaft 4, is fast the pattern cylinder gear 5, which is provided with a series of equidistant notches 5', in its periphery. In this instance there are 6 notches. The portions of the periphery of the gear 5, between the notches 5', are provided with gear teeth 5". For a predetermined distance on each side of the notches 5', the teeth 5", are left off, and these portions of the periphery of the gear 5, are plain, as well as the notched portion. The outer ends of the notches 5', are beveled, or made flaring to allow of the ready admission and with-



drawal of the driving pin 6, on the arm or plate 7, secured to the gear 8, in this instance by a screw 7'. Said gear 8, is journaled on a stud 8'.

The plate 7, secured to the gear 8, has a mutilated pinion 9, made integral therewith, or secured thereto. Said pinion 9, is provided with nine teeth, corresponding to the number of spaces between the teeth 5", on each section of the periphery of the gear 5, and the teeth on the mutilated pinion 9, are adapted to mesh with, and communicate a slow motion to the gear 5, through the revolution of the gear 8, when the pin 6, is free from engagement with the slots 5', in said gear 5.

Continuous motion is communicated to the gear 8, from the upper or lower cylinder gear, in this instance from the lower cylinder gear, either in a forward or in a backward direction, by the ordinary system of circular gears, as shown in the drawing. Said system of gears consists of a gear 10, connected and adapted to move with the lower cylinder gear 3, by the sliding key 11, in the ordinary way. Said gear 10, meshes with and drives a gear 12, loose on a stud 13, fast in the head frame, and a third gear 14, made integral with the gear 12, or secured thereto, meshes with, and drives the gear 8.

A fourth gear 15, is journaled on the same shaft as the gear 10, and meshes with the gear 8, and runs loose, except when it is desired to reverse the pattern chain mechanism, when by means of the sliding key 11, the gear 15, is connected and made to revolve with the cylinder gear 3, and turn the gear 8, in the reverse direction, leaving the gear 10, loose.

From the description in connection with the drawing, the operation of the pattern mechanism, for communicating a continuous fast and slow motion to the pattern cylinder shaft 4, and to the pattern cylinder, not shown, will be readily understood.

When the loom is running properly the revolution of the cylinder gear 3, will cause the gear 10, connected therewith, to revolve in the direction indicated by the arrow, also the gear 12, and the gear 14, fast thereto, and the gear 8, and through the gear 8, the arm 7, carrying the pin 6, and the mutilated pinion 9. At every revolution of the gear 8, the pin 6, will enter into one of the slots 5', in the periphery of the gear 5, and communicate to said gear a fast motion for a part of its revolution. As soon as the pin 6, leaves the slot 5', the teeth 9', on the mutilated pinion 9, will engage with the teeth 5", on one section of the periphery of the gear 5, and communicate a slow motion to said gear, for a part of its revolution. This operation is repeated, and a continuous fast and slow motion of the gear 5, and also the pattern cylinder shaft 4, and of the pattern cylinder, not shown, is obtained.

In case it is desired to reverse the motion of the pattern cylinder shaft 4, the slide pin 11, is drawn out, causing the gear 15, to revolve with the cylinder gear 3, and turn the gear 8, in the opposite direction, and also the plate 7, carrying the pin 6, the gears 10, 12, and 14, running loose.

This mechanism does away with the elliptical gears as used in the older style of looms, and which are expensive to make, obtaining a continuous fast and slow motion with the ordinary system of circular gears.

The explanation thus given covers one of the most important, if not the most ingenious, inventions of the Knowles Loom Works. They never left their original idea of operating the harness, but continuously improved the method of driving the chain cylinder. Their object is to have a continuous motion of said chain cylinder without the use of elliptical or eccentric gears and yet have a fast and slow motion of said cylinder.

In the new device they have both; when the chain is moving from one bar to the other the motion is very fast, but as the cylinder gears are changing the harness from one pick to the other the chain cylinder motion is slow, thereby gaining speed of the chain cylinder without the use of elliptical gears, thus removing any possibility of harness skips and reducing the wear and tear on the machinery to the lowest possible amount. (*Crompton and Knowles Loom Works.*)

PATTERN MECHANISM FOR KNOWLES NARROW WARE LOOMS IN WHICH REVERSE GEARS ARE NOT USED.

The object of this mechanism is (also) to communicate a continuous fast and slow motion to the pattern chain cylinder.

By means of this mechanism, is done away with the system of reverse gears, the pattern cylinder gear being driven directly from the shaft of the head motion cylinder gear, by a pinion and pin fast on said shaft. Provision is also made for turning the pattern cylinder and chain in a reverse direction, by mounting the pattern cylinder gear loose on the pattern cylinder shaft, and combining therewith a snap handle, fast on said

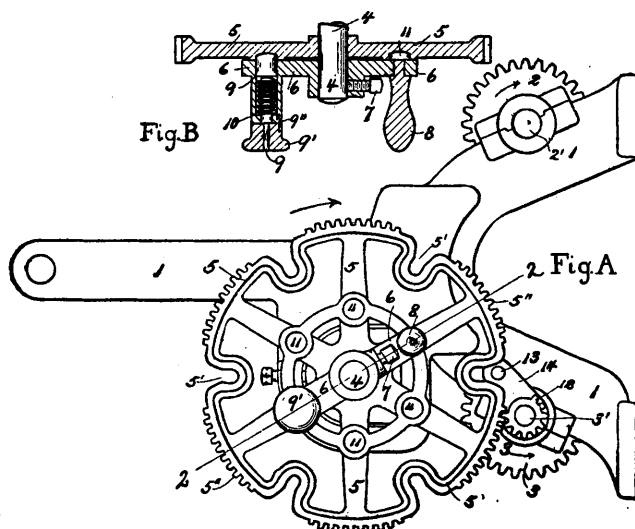
shaft, and provided with a spring actuated pin which engages holes or recesses in the pattern cylinder gear, to cause said gear to revolve with the pattern cylinder shaft.

As mentioned before, this improvement can be used on a Knowles loom, where reverse gears are not needed; it is an excellent motion, the same as is produced by the aid of eccentric or elliptical gears, namely, a fast motion as the chain is passing from one bar to the other and a slow motion when the gears are changing the harness. Reverse gears are not needed on any plain loom where the harness chain is of short repeats.

In the accompanying drawings a detached portion of the head of the Knowles loom is given, sufficient to illustrate the nature of the mechanism.

Referring to the drawings: Figure A is a front elevation of a portion of the head of said Knowles loom, and Fig. B is a sectional detail, through the pattern cylinder gear and the snap handle, taken on line 2, 2, Fig. A.

1, is the head frame; 2, is the upper cylinder gear, and 3, the lower cylinder gear; the shafts 2', 3', of which are journaled in boxes on the head frame 1, and 4, is the pattern cylinder shaft, journaled in the frame



1, in the usual way. On the front end of said shaft 4, is loosely mounted the pattern cylinder gear 5, which is provided with a series of equidistant notches 5', and with gear teeth 5'', on the periphery of the gear, intermediate the notches. The teeth 5'', are left off for a predetermined distance on each side of the notches 5', and these portions of the periphery of the gear, as well as the notched portions, are plain, and the outer ends of the notches 5', are beveled or made flaring to allow of the ready admission and withdrawal of the driving pin.

On the end of the cylinder gear shaft 4, outside of the cylinder gear 5, is a snap handle bar 6, secured to said shaft, by a screw 7. The snap handle bar 6, is provided with a handle 8, and also with a spring actuated pin 9, mounted and adapted to move out or in, in a boss 6', on the bar 6. The pin 9, has an enlarged head 9', and is actuated by a spiral spring 10, inclosed within a chamber in the boss 6'. The inner end of pin 9, is adapted to extend into holes or recesses 11, in the arms of the pattern cylinder gear 5. The head 9', is provided with a pin 9'', fast therein, which extends loosely into a hole in the end of the boss 6', and when the pin 9, is withdrawn, it may be

turned so as to cause the end of the pin 9'', to bear against the end of the boss 6', to hold the pin 9, out of engagement with the holes 11.

It will be seen that by withdrawing the pin 9, so that the inner end thereof will not engage with the holes or recesses 11, in the cylinder gear 5, that the pattern cylinder shaft 4, may be turned by the snap handle bar 6, to turn the pattern cylinder and chain, without turning the cylinder gear 5.

The pattern cylinder gear 5, is driven directly from the shaft 3', of the lower cylinder gear 3, by a pinion 12, fast thereon, and meshing with the gear teeth 5'', on the pattern cylinder gear 5, to communicate a slow motion thereto, and by a pin 13, on an arm or plate 14, secured to, or made integral with the pinion 12, which pin engages the notches 5', in the cylinder gear 5, to communicate a fast motion thereto. It will thus be seen that by means of the pin 13, and the pinion 12, a continuous fast and slow motion is communicated to the pattern cylinder gear 5, and in this instance from the shaft of the lower cylinder gear.

When it is desired to disconnect the pattern cylinder gear 5, so that the pattern cylinder shaft 4, and pattern chain may be turned without turning said gear, the spring actuated pin 9, is withdrawn from engagement with the cylinder gear 5, and the pattern cylinder shaft 4, turned by means of the handle 8, on the snap handle bar 6. (*Crompton and Knowles Loom Works.*)

MECHANISM FOR OPERATING SHEDDING AND DROP-BOX PATTERN INDICATORS FOR KNOWLES LOOMS.

On the Knowles fancy loom the box motion and the shedding motion are driven by the same device.

The purpose of this mechanism is to provide means by which certain bars of the box-pattern indicators may be repeated without constructing successive similar bars, and at the same time to so connect the box-pattern mechanism with the harness-pattern mechanism that the two will not be thrown out of time with each other when the harness-pattern mechanism is reversed in the operation of picking out imperfect work or otherwise.

The box-pattern mechanism consists of two sets of indicators—a main and auxiliary set—each driven by a pin-wheel and a star-wheel, and each pin-wheel fitted to be slid into or out of engagement with its respective star-wheel, according to indicators, moved by the opposite star-wheel.

This feature is accomplished by driving the box-mechanism pin-wheel shaft from the harness-pattern-indicator shaft or its driving mechanism, so that when the harness-indicators are reversed, the box-pattern mechanism is reversed.

Referring to the accompanying drawings: Fig. 1 is a side view of the working parts of the mechanism detached. Fig. 2 is an end view of some of the parts shown in Fig. 1, looking in the direction of the arrow a, same figure. Fig. 3 is an opposite end view of some of the parts detached, looking in the direction of the arrow b, in Fig. 1. Fig. 4 is a section on line X, Fig. 3, looking in the direction of arrow c, same figure. Fig. 5 is a detail of the reverse key shown in Figs. 3 and 4, and Fig. 6 is a central longitudinal section of the shaft 3, and parts mounted thereon.

Numerals of reference in the accompanying illustrations refer to the following parts: 1, represents the harness-pattern barrel provided with notched flanges 2, to carry indicators (not shown) made up of chain-bars, links and rolls of the ordinary construction. The barrel 1, is fast upon shaft 3, and upon the end of shaft 3, is secured a gear-wheel 4, driven by a set of reverse gears.

Loose on the end of the shaft 5, Figs. 1 and 4, through which power is applied, are a pair of gears

6, and 7, which are splined to receive the end of reverse keys 8, (see Figs. 4 and 5,) seated in a spline in the shaft 5. The stem 9, of the reverse key 8, is fitted flush with the surface of the shaft, the projection 10, being fitted to engage the spline in the gears, either of which may be driven with the shaft 5, according as the key 8, is pushed in to engage gear 7, or pulled out to engage gear 6, the gear which is out of engagement with the key being loose upon the shaft. The gears 6 and 7, are confined upon the shaft 5, laterally by the flange 11,

end of the spring 13, is secured a pin 14, which projects through a slot in the collar 12, and is pressed by the tension of the spring 13, into notches 9, in the face of the stem 9, of the key 8. The notches 9, are so placed as to hold the key 8, in proper position for engagement with the respective gears 6 and 7. To avoid the possibility of both gears being engaged at the same time by the key 8, and consequent damage to some of the parts of the mechanism should power be applied, the gears 6 and 7 are chamfered to the depth of the

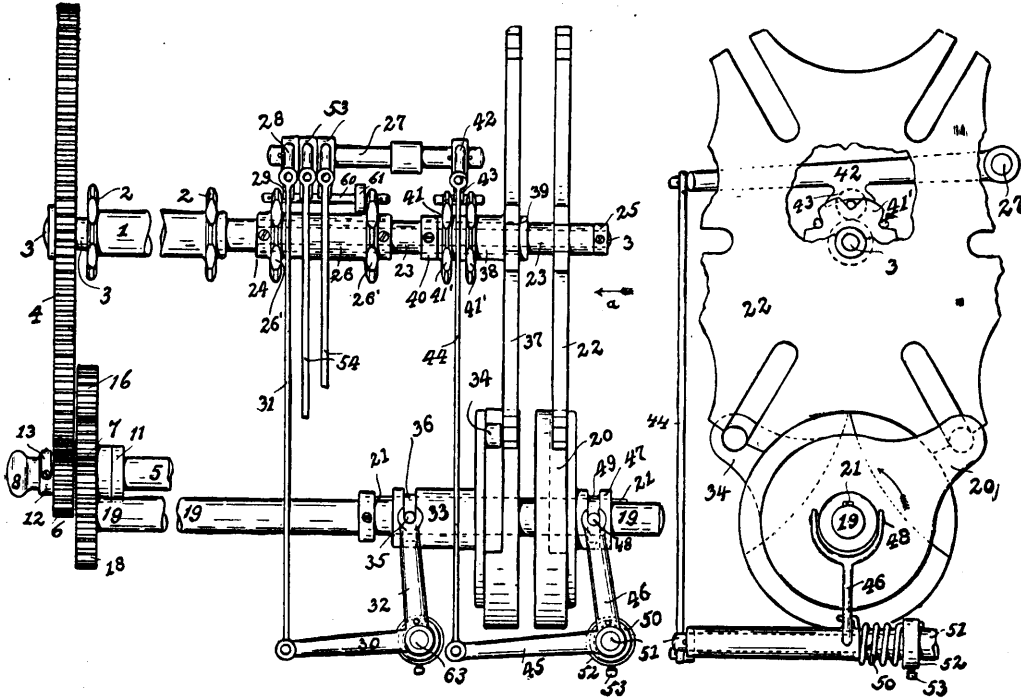


Fig. 1.

Fig. 2.

integral with the shaft and the collar 12, fast upon the outer end of the shaft (See Fig. 4). Coiled partially

spline at their adjoining faces for a length equal to the length of the projection 10, on the stem of key 8, so that in sliding the key 8, it leaves the spline of one gear when it enters that of the other. Mounted upon a stud 15, is a gear 16, which meshes with gear 7, of the driving-shaft 5, and which is fast to the hub of a second gear 17, which is loose upon the stud 15 (See Fig. 4). Gears 7 and 16 are enough larger than 6 and 17, so that the teeth of the latter clear each other when 7 and 16 are properly meshed.

The stud 15 and shaft 5 are so situated with reference to shaft 3 that gears 6 and 17 are both in mesh with gear 4. Gears 7 and 16 are of the same size, and gears 6 and 17 are of the same size, and so proportioned to gear 4, that one complete revolution of gear 6 or gear 17 turns shaft 3 through the angular space between two contiguous notches in the harness-pattern barrel-flanges 2.

When the key 8 is pushed into engagement with gear 7, the harness-pattern barrel 1 is driven through the intermediate gears 16 and 17 in its normal direction, with the loom running forward. When the key 8 is pulled out into engagement with gear 6, the harness-pattern barrel is driven directly through gear 6 in the reverse direction. This construction is used, for the reason that the harness-acting mechanism cannot be turned backward, the object being to reverse the harness-pattern indicators, while the loom or its harness-actuating mechanism is turned in the process of picking out imperfect work, &c.

The box-mechanism pin-wheel shaft is geared to

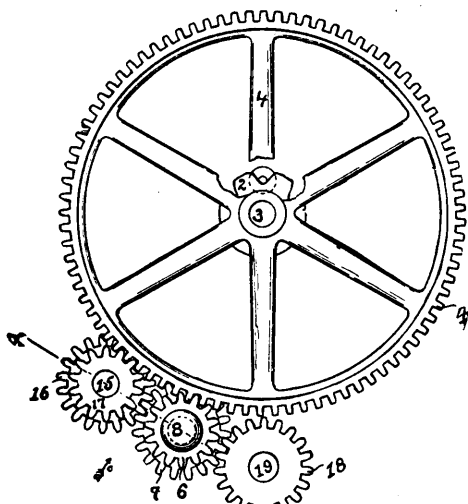


Fig. 3.

around the collar 12, is flat spring 13, fastened to the collar at one end and free at the other. To the free

reverse gear 7, by putting gear 18, of the same size as gear 7, and fast upon the end of pin-wheel shaft 19, in mesh with gear 7. Shaft 19 projects for some distance beyond the harness-pattern barrel 1 (See Fig. 1). Near the opposite end of the shaft 19 from gear 18 is mounted a pin-wheel 20, free to slide upon the shaft, but compelled to rotate in unison with it by means of the feather 21, set in the shaft. Pin-wheel 20, is fitted to engage a star-wheel 22, integral with sleeve 23, which is mounted loosely upon a continuation of harness-indicator shaft 3, and which is confined laterally on the shaft by a shoulder 24 and a collar 25, fastened on the end of the shaft 3 (See Fig. 1). Fast upon the end of sleeve 23, which adjoins shoulder 24, is the main pattern-barrel 26, of the box-mechanism, provided with notched flanges 26' to carry indicators, made up of chain bars 60, rolls 61, and links (not shown) similar to those employed in the harness-pattern indicator, and of ordinary construction. Pivoted on a stud 27, above and at the rear of main box pattern-barrel 26,

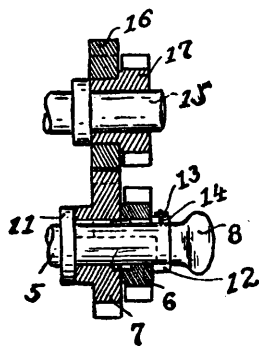


Fig. 4.

is a lever 28, provided with a foot 29, adapted to be engaged by the main pattern-indicators. A link 31 connects the outer end of lever 28 with arm 30 of a bell-crank lever 30, 32, pivoted on a stud 63, below shaft 19. Arm 32 of the bell-crank lever 30, 32, is forked about the hub 33 of a pin-wheel 34, which is mounted upon shaft 19, similarly to pin-wheel 20. Resting in the fork of arm 32 is yoke 35, which is fitted loosely in the groove 36 in the pin-wheel hub 33. Pin-wheel 34 is fitted to engage a star-wheel 37, integral with a sleeve 38, which is mounted loosely upon sleeve 23, and which is confined laterally by flange 39 integral with sleeve 23 and a collar 40 fastened upon said sleeve. Sleeve 38 carries the notched flanges 41' of the auxiliary pattern-barrel 41 of the box mechanism, over which, on stud 27, is pivoted a lever 42, similar to lever 28, and provided with a foot 43, adapted to be engaged by auxiliary pattern-indicators. A link 44 connects the outer end of lever 42 with arm 45 of a bell-crank lever 45, 46, pivoted on a stud 51 below shaft 19. Arm 46 of the bell-crank lever 45, 46, is forked about the hub 47 of pin-wheel 20, and carries a yoke 48, fitted loosely in the groove 49 in hub 47. A spring 50 is coiled about the shank of stud 51, one end of which is fast in a collar 52, fastened by a set-screw 53 to stud 51, and the other end of which engages arm 46 of the bell-crank lever 45, 46. The spring 50 is of sufficient strength, and its tension is so adjusted, by turning collar 52 on the stud 51, that when no indicator roll is under the foot 43, the spring 50 slides the pin-wheel 20 on shaft 19, into engagement with star-wheel 22. Pin-wheel 34 is slid on shaft 19 out of engagement with its star-wheel 37 by a similar spring coiled on the stud 63 of bell-crank lever 30, 32, when no indicator-roll is under foot 29 of lever 28. The arms of the bell-crank-levers and the levers 28 and 42 are so proportioned to the distance through which the levers are moved, by lifting the feet 29 and 43 from resting on a bar to resting on a roll, that such motion slides the pin-wheels on their driving-shaft the right distance to be properly in or out of engagement with their star-wheels.

The indicators for the box-shifting mechanism are placed on the same bars with the pin-wheel indicators on the main pattern-barrel of the box-mechanism, and the levers 53 for transmitting the indications to the

box-shifting mechanism are pivoted on the same stud 27 with lever 28. Depending from levers 53 are links 54 (shown broken off), with which the levers 53 are connected to the box-shifting mechanism. (Not shown and of ordinary construction.)

The pin-wheels 20 and 34 are so set on the feather 21, that the auxiliary pin-wheel 34 has completed the action on its star-wheel 37, when pin-wheel 20, begins to act on its star-wheel 22, both actions occupying something less than a complete revolution of pin-wheel shaft 19.

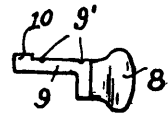


Fig. 5.

The pin-wheels and star-wheels are so proportioned that one movement thereof turns the pattern-barrels through the angular space between two contiguous notches.

The operation of the box-pattern mechanism is as follows: Figs. 1 and 2 represent the main pattern-barrel 26 as in engagement to be actuated and the auxiliary pattern barrel 41 as at rest. Suppose the action of pin-wheel 20, which is just beginning, brings up a pattern-bar which it is desired to repeat. A roll on the bar lifts lever 28, which, through link 31 and bell-crank lever 30, 32 slides pin-wheel 34 into engagement with its star-wheel 37. On the succeeding revolution star-wheel 37 and the auxiliary pattern-barrel 41 will be turned one space, bringing a roll under lever 42, which, through link 44 and bell-crank lever 45, 46, slides pin-wheel 20 out of engagement with its star-wheel 22, so that the revolution is completed without moving the main pattern-barrel 26. The main pattern-barrel 26 will continue to rest and the auxiliary pattern-barrel to run as long as each succeeding action of the auxiliary pattern-surface pin-wheel 34 brings up a roll under lever 42. The desired number of rests having been reached, an empty bar is presented under lever 42, which allows spring 50 to slide the pin-wheel 20 into engagement with its star-wheel 22 in season to turn the main pattern-barrel 26 on the same revolution, when the parts are returned to the position shown in the drawings, and the operation may be repeated.

When it is desired to turn the harness-pattern indicators backward in the operation of picking out imperfect work or of finding the pick, the reverse key 8 is pulled out, reversing the motion of gear 4 on the harness-pattern shaft 3, and also that of gear 18 and pin-wheel shaft 19, so that the box-mechanism indicators, with no attention whatsoever from the operator, are always kept in time with the harness-indicators, no matter which way or for how many picks the harness-pattern mechanism is turned.

If the box-pattern mechanism were driven independently of the harness-pattern mechanism, and it were left to the operator to keep count of the number of pattern-bars reversed, or even to reverse independently the box-pattern mechanism whenever the harness-pattern mechanism was reversed, the operator would easily get confused and get the two pattern-mechan-

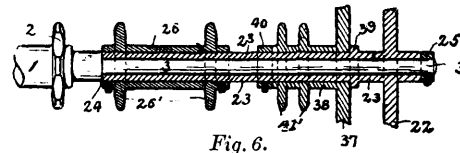


Fig. 6.

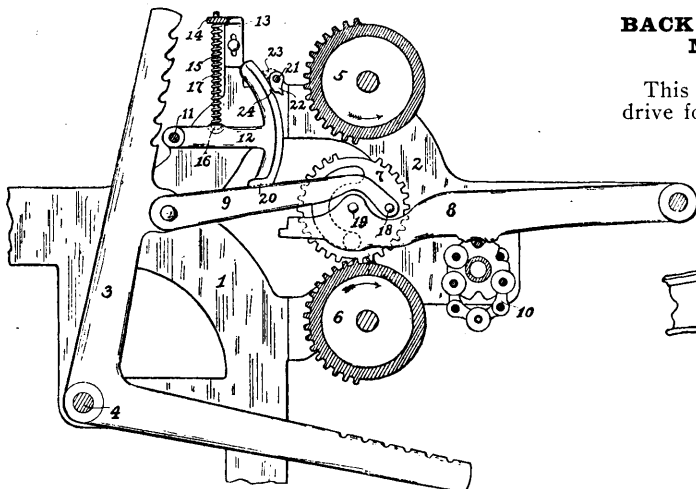
isms out of time with each other, thus putting the wrong filling in the shed.

Instead of connecting-gears 18 and 7 as shown in Fig. 3, gears 18 and 4 could be connected with equal facility; but sometimes on said loom the gear 4 is replaced with a star-wheel similar to star-wheels 20 and 34, and its pin-wheel is driven by a set of reverse gears. (Crompton and Knowles Loom Works.)

ATTACHMENT TO THE SHEDDING MECHANISM OF THE KNOWLES LOOM.

The object of this motion is to keep the vibrator connector (after the cylinder has raised the harness) from falling back.

The accompanying illustration is a sectional view of this motion, taken between and parallel to the arches or elevated part of the loom frame; it also shows the jack and vibrator connected, which is used on all their open shed looms. The method of operation of this motion will be best explained by quoting numerals of references of the various parts shown in the accompanying illustration, and of which 1, represents a portion of the arch of the loom frame, and 2, the head frame. 3, is a harness lever, pivoted on the shaft 4, which extends across the arch space and has a bearing in each arch. 5 and 6, are the cylinder gears; 7, the vibrator-gear; 8, the vibrator-lever; 9, the connector;



and 10, the pattern-chain. 11, is a rod which extends across the arch-space, and on which is pivoted an independent follower 12, for each vibrator-gear connector 9, in the loom. 13, is an arm extending above the arch and carrying across the arch-space a plate 14, through which passes freely the rods 15, the heads 16, of which, rest in sockets on the followers. Confined between the plate 14, and the heads of the rods 16, are coiled springs 17, which act to press the followers downward upon the connectors 9.

The operation is as follows: The harness-levers and the box-motion levers are reciprocated by the partial revolution of the vibrator-gear 7, a roll on the pattern-chain lifting the vibrator-gear into engagement with the top cylinder-gear 5, throwing the vertical arm of the harness-lever outward, and a tube on the pattern-chain letting the vibrator-gear into engagement with the lower cylinder-gear 6, and throwing the harness-lever in the opposite direction.

Our illustration represents the lower cylinder-gear just beginning to act on the vibrator-gear. As the vibrator-gear revolves, the end of connector 9, is lifted by the crank-pin 18, a distance equal to the radius of the crank-pin path described about the centre 19, and at the same time the connector is pushed to the left. The coil-spring 17, by its compression allows the rod 15, to rise with the follower and connector, and when the crank-pin 18, passes the centre and the end of connector 9 drops, the force of the spring keeps the follower pressing on the connector. The top of connector 9, is rounded, and the saddle 20, of the follower is correspondingly hollowed to help keep these parts in alignment.

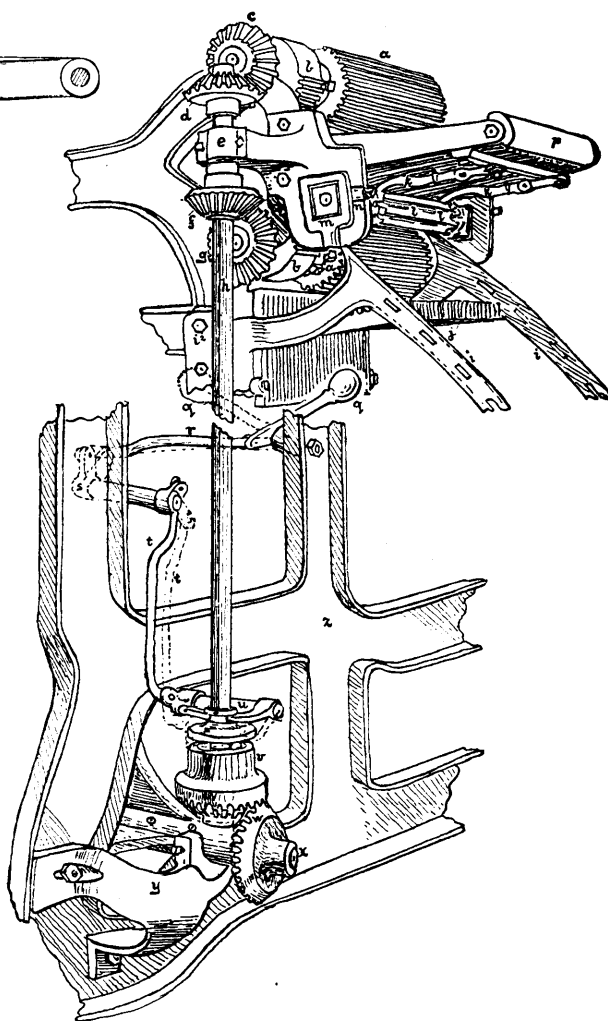
The head of the spring-rod is made to fit a socket in

the follower, to facilitate the insertion or removal of the rod and springs for the purpose of renewing worn-out springs, or for other reasons.

When it is desired to take out the vibrator-lever gear and connector from the loom, it is necessary to hold the follower up out of contact with the connector. To accomplish this, the rod 21, is placed in ears on the arches and extended across the arch-space, on which are pivoted individual latches 22, for each follower, which may be raised into the position shown in dotted lines 23, where, in conjunction with notches 24, in the face of the followers, the followers may be held up out of the way, as desired. It is also sometimes desirable to run the loom with part of the vibrators out, in which case the latch prevents the follower from dropping down and letting the spring and rod fall from their positions, or avoiding the necessity of removing the followers to prevent such derangement. (*Crompton and Knowles Loom Works.*)

BACK VIEW OF THE KNOWLES SHEDDING MECHANISM DRIVEN FROM BOTTOM SHAFT.

This accompanying illustration shows bottom shaft drive for head motion, which is generally used on the



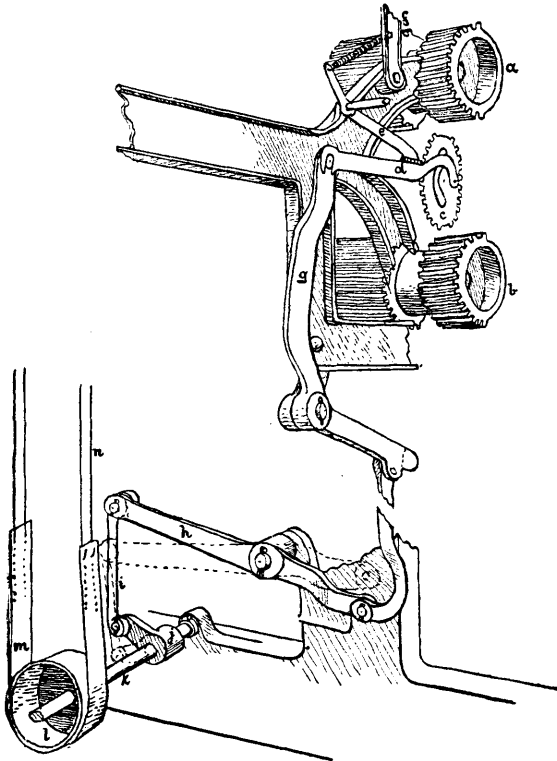
Knowles heavy worsted loom. A description of the mechanism is best given by quoting letters of references, and of which *a*, shows the long driving gears,

commonly called the cylinder gear. They are chilled in casting, and are very hard; they are made with the part that operates the harness adjustable, so that the harness and box may be made to operate at the same time, or the harness a little in advance of the box, in order to change the shed upon the filling, before beating up. They will work perfectly at any point at or between the extremes of the slot in the shaft. Whenever the section of the top cylinder is changed, it is not necessary to make the same change with the bottom cylinder; in fact, for some fabrics it is necessary to set the top and bottom cylinders at different points.

b, indicates the box section of the cylinder gear; *c*, the bevel gear on the top cylinder; *d*, the bevel gear which drives the top cylinder; *e*, the cap which holds the upright shaft in place; *f*, the bevel gear which drives the bottom cylinder; *g*, the bevel gear on the bottom cylinder; *h*, the upright shaft which transmits motion from the bottom shaft to the head motion; *i*, is the chain rack bolted on with *v*; *j*, are the jacks that lift the harness; *k*, is the spring lever to hold the chain in position on the cylinder shaft *l*; *m*, indicates the bearing in which shaft *l*, works in; *n*, is a set screw to hold bearing *m*, in place; *o*, is a set screw to raise or lower cylinder shaft *l*; *p*, is a lock lever to hold vibrators in place; *q*, is a hand lever with which to lock or unlock the clutch gear *v*, on bottom of upright shaft; *r*, is a connector connecting with *s*, a rocking lever connecting with lever *t*, connecting with pin *u*, with which the clutch is locked or unlocked; *w*, is a driving gear to drive clutch gear *v*; *x*, is an intermediate gear which is driven from bottom shaft; *y*, is the stand that holds the intermediate shaft, and *z*, is the loom side. (Crompton and Knowles Loom Works.)

THE KNOWLES SELVAGE MOTION.

This selvage motion does the same work that is required of a skeleton harness. It is operated from the fifth vibrator in the box section, which was formerly used for the sliding pick.



a, and *b*, indicate the top and bottom cylinder; *c*, the vibrator gear; *d*, the connector; *e*, a spring drop weight; *g*, is the angle lever which connects with lever *h*; connector *i*, which in turn connects with crank *f*, which operates the selvage shaft *k*; *l*, shows the drum around which listing strap *m*, is carried, and *n*, indicates the lower strip of the selvage heddle strap. (Crompton and Knowles Loom Works.)

SHEDDING MECHANISM FOR FABRICS PRODUCED BY TWO WEAVES.

The object of the new device is to provide an automatic two-weave attachment of simple construction and operation, and which is adapted to be combined with the indicator-levers of a dobby mechanism to automatically move one-half of said levers out of engagement with their pattern-surfaces, so that they will become inoperative, and at the same time allow the other indicator-levers to engage their pattern-surfaces and become operative.

In connection with this two-weave attachment, two sets of indicator-levers are used and each indicator-lever is connected by a lifting-wire with an upper and lower hook-latch, and a single lifting-wire serves for two levers, so that if a lever of one set is inoperative to act on the hook-latches the lever of the other set is operative. Double-index pattern-bars, or bars with two sets of pins or pattern-surfaces thereon are used, one set for one set of indicator-levers and the other set for the other set of indicator-levers.

The new mechanism is intended to be used on looms for weaving any class of goods requiring two weaves, as dress-goods, blankets, &c., in which there are two different weaves.

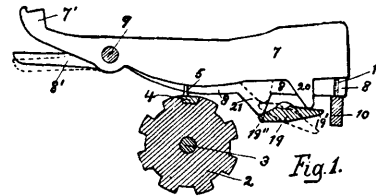


Fig. 1 is a side elevation of a portion of the dobby-frame, looking in the direction of arrow *a* Fig. 3, showing two indicator-levers, a lower hook-latch, the lower end of the lifting-wire, the end of a pattern-cylinder, a two-index pattern bar, and the double-weave attachment combined therewith. Fig. 2 is a section taken at a point indicated by line 2-2 Fig. 3, looking in the direction of arrow *a*, same figure. The lifting-wire and hook-latch shown in Figs. 1 and 3 are not shown in this figure. Fig. 3 is a plan view of the parts shown in Fig. 1, and also shows the pattern-surface, which operates the indicator-lever 29. Fig. 4 shows a section of the pattern-cylinder, two indicator-levers, a jack-lever, an upper and lower hook-latch, and a lifting-wire, and in section the upper and lower sliding lifting-bar and the stop bars; and Fig. 5 is a side view of the lifting-wire, looking in the direction of arrow *b*, Fig. 4.

Numerals of references indicate thus: 1, is a portion of one of the upright frames supporting the dobby. 2, indicates the pattern-cylinder, which is fast on shaft 3. In the longitudinal grooves or recesses of the pattern-cylinder extend the pattern-chain bars, only one of which, 4, is shown in the drawings.

On the pattern-bar 4, are two sets of pins 5 and 6, arranged in two alternate rows (See Fig 3). Extending over the pattern-cylinder 2, are two sets of indicator-levers 7 and 8. One set 7, is acted on by the

pins 5 and the other set 8, by the pins 6, in the pattern-chain bars 4. The indicator-levers are loosely mounted on a shaft 9, secured in the frames, and at their outer ends, when in lowered position, rest on the bar 10, which has pins 11, extending up therefrom between the levers 7 and 8, to guide and hold them in position.

Each one of the set of levers 7, is adapted to be engaged and raised by its set of pins 5, in case said levers are in their lowered position, while each one of the set of levers 8 is adapted to be engaged and raised by its set of pins 6, in case said levers are in their lower position, at each partial revolution or movement of the pattern-chain.

The inner ends 8' of the indicator-lever 8 extend beyond their supporting-shaft 9, and in a substantially horizontal plane, while the inner end 7' of the levers 7 extend upwardly above the ends 8' of the levers 8, as shown in the drawings. The inner ends of said levers 7 and 8 extend through slots in the grate 9'.

Arranged over the two sets of levers 7 and 8 are an upper and lower set of hook-latches 12 and 13, which hook over and are operated by the upper and lower slide-bars 14 (See Fig. 4). There is an upper latch 12, and a lower latch 13, for each pair of levers 7 and 8, and each one of the pair of levers is connected with the upper latch 12, and lower latch 13, by a lifting-

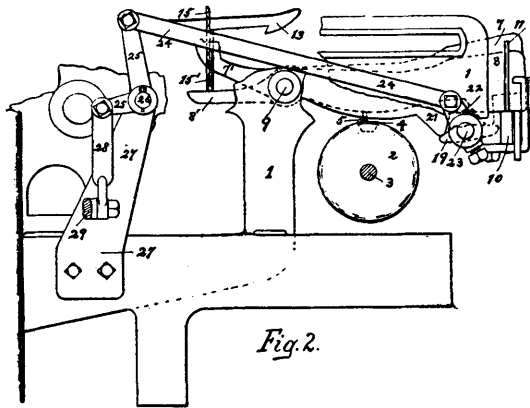


Fig. 2.

wire 15, which is made of the shape shown in Figs. 4 and 5. The lower double end 15', rests on the top of the inner end of the lever 8, while the side projecting end 15'', rests on the top of the inner end of the lever 7 (See Fig. 4). The side projecting end 15'', also extends under and is adapted to lift the lower latch 13. The upper end of the lifting-wire 15, extends under and engages the upper latch 12 to lift the same when desired. It will thus be seen that either lever 7 and 8, of the two sets of levers, when it is engaged by its pattern-pins, will lower both the upper latch 12, and lower latch 13, simultaneously.

The latches 12 and 13, are pivoted at their inner ends on the connector 16, centrally pivoted on the harness-lever, (not shown) connected with the harness-frame, and adapted to engage at its upper end the stop-bar 17, and at its lower end the stop-bar 18.

The combination of the two-weave attachment with the dobby mechanism is thus: Extending under the outer ends of the two sets of levers 7 and 8, outside of the pattern-cylinder 2, and having projecting ends or journals supported in bearings in the side frames, is a rocking plate 19, the outer edge 19', of which is adapted to engage downward projections 20, on the lower edge and near the outer end of the levers 7, so that when the plate 19, is rocked in one direction to raise the outer edge 19' thereof, all the levers 7, will

be raised at their outer ends and held up, as shown in Fig. 2, so that the pins 5, on the pattern-bars 4, can pass under the levers 7, without moving said levers. When the plate 19, is rocked in the opposite direction to raise the inner edge 19'', said edge will engage downward projections 21, on the levers 8, and raise said levers (See dotted lines, Fig. 2) and hold them out of engagement with the pins 6, on the pattern-bar 4, as before described in connection with the levers 7. At the same time the set of levers 7, are allowed to drop down on to the pins 5, on the pattern-bar 4, as the pattern-cylinder 2, revolves. It will thus be seen that as the plate 19, is rocked in one direction one set of indicator-levers, as 7, is raised and becomes inoperative and the other set, as 8, is lowered and becomes operative. As the two patterns to be woven are on the same bar and there are two indicator-levers for each upper and lower hook-latch, either indicator-lever may be made to govern the operation of the hook-latches through the lifting-wire 15, as desired, by rocking the plate 19, in one direction or the other, and in this way we can change from one weave to the other.

The lifting-wires 15, are made in such a manner that the dropping of the inner ends of either set of levers by the raising of the outer ends by the plate 19, does not affect the engagement of said lifting-wires 15, with the other set of levers or their operation by said levers.

To communicate a rocking motion to the plate 19, at the desired time to change the weave, a crank-arm 22, is connected fast on the end of the journal 23, on one end of the plate 19, through a connector-rod 24, with an angle-lever 25, pivoted on a stud 26, at the upper end of the bracket or arm 27. The other arm of said angle-lever 25, is connected through link 28, with the inner end of an indicator-lever 29, which is rigidly attached at its inner end to the link 28, to cause the angle-lever 25, to have a rocking motion and through connector 24, communicate a rocking motion to the plate 19.

The indicator-lever 29 extends over a pattern-surface on the pattern-cylinder 31, of ordinary construction

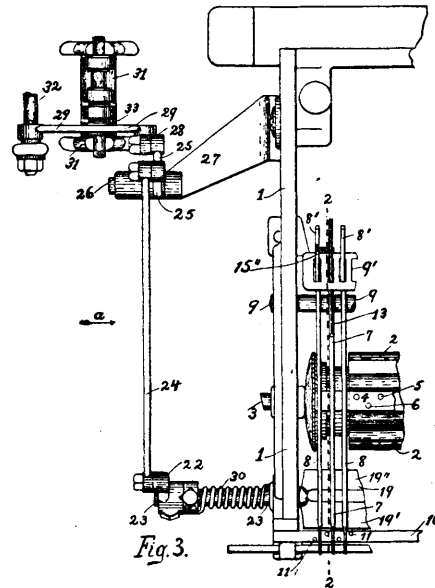


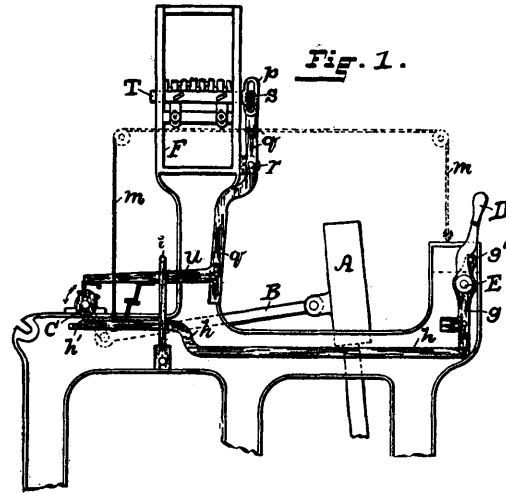
Fig. 3.

and operation, and is pivotally supported at its outer end on the rod 32. As the pattern-cylinder 31 revolves and a roll 33, thereon comes under the lever 29, said lever is raised, and through intermediate connections the plate 19, is operated.

A coiled spring 30, around the journal 23, of the plate 19, (See Fig. 3) is employed to move the angle-lever 25, over to the left, as shown in Fig. 1, when a tube comes under the indicator-lever 29.

The pattern-surface, which controls the movement of the indicator-lever 29, is so built that at the proper time, when it is desired to change the weave, the lever 29, will be raised by a roll 33, coming under it. The plate 19, will then, through intermediate connections, be automatically rocked and raised at its inner edge to raise one set of levers, as 8, at their outer ends, (See dotted lines, Fig. 2) and hold them out of engagement with the pins on the pattern-bars. At the same time the other set of levers, as 7, will be dropped at their outer ends on to the pins on the pattern-bars and through said levers and connections to the harnesses the desired shed will be made.

When a tube comes under the lever 29, the spring 30, will move the angle-lever 25, and lower the lever 29, and a reverse motion will be communicated to the plate 19, to raise the outer edge thereof and raise the outer ends of the other set of levers, as 7, and at the same time lower the outer ends of the levers 8, to change the weave and allow the levers 8, to operate



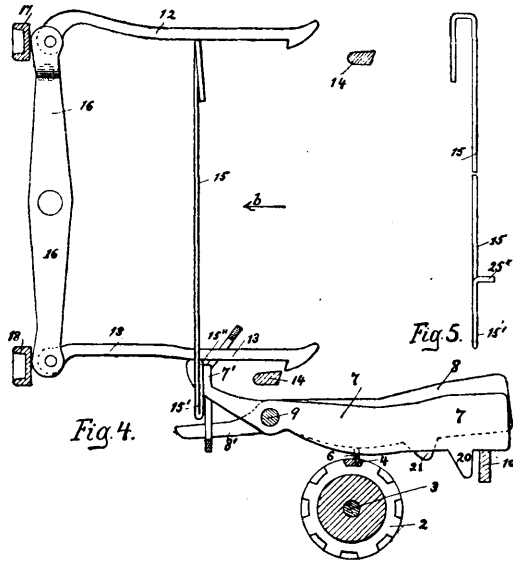
tending practically around the loom, by pulling the cord.

For a clear understanding of the improved device the accompanying three illustrations are given, and of which Fig. 1 is a skeleton view of parts of an open-shed fancy loom, showing the improvement connected with co-operating parts. Fig. 2 is a perspective view of the levers connecting with the crank-shaft of the lay of the loom. Fig. 3 is a side view of a modified form of the device.

A, indicates the lay of an open-shed fancy loom; B, the connecting-rod connecting the lay with the crank of the shaft C. The shipper of the stop-lever D, is secured to the shipper or stop-shaft E, and supported in the raised frame F, is the evener-slide T.

These parts are the essential parts of every open-shed fancy loom, and as the present improvement concerns only these parts, the other parts of the loom are omitted, so as to avoid confusion.

The preferred means for accomplishing the previously stated object consist in the lever 9, loosely mounted on the shipper-shaft E, close to the shipper-lever D. The upper projection of the lever 9, is provided with the pin 9', bearing on the shipper-lever D. To the lower end of the lever 9, is pivotally connected the arm h, the other end of this arm h, being provided with the shoulder h'. The arm h, is supported in the slotted bracket i, secured to the end frame of the loom. The bracket k, is secured to the arm h, and near this is the eye l, to which the cord m, is



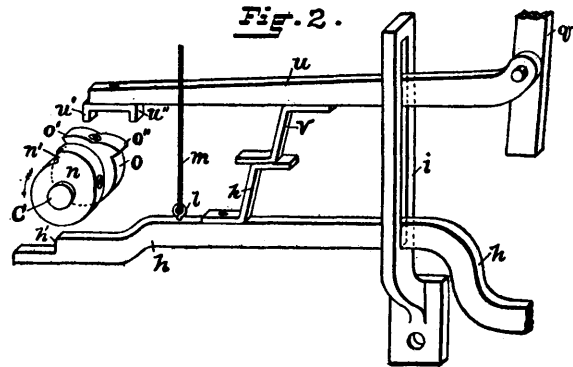
to make the required shed for the other weave, and this operation is repeated as desired. (Crompton and Knowles Loom Works.)

DEVICE FOR OPEN SHED FANCY LOOMS FOR EVENING THE HARNESSES

when a warp-thread breaks or end requires to be tied in, so as to lay the warp side by side and enable the operative to piece up the warp or tie in the ends required.

In such looms as heretofore constructed the evener-slide had to be drawn out by hand after the lay was brought into the proper position, and then the harnesses had to be brought together by hand. After the ends were tied in, the parts had to be returned to their original positions by hand before the loom was ready to start.

The object of the improvement is to perform all these operations automatically, through setting in motion a simple apparatus connected with a cord ex-



fastened. This cord m, is carried over guides along the end around part or the whole of the loom, the end of the cord being secured to any fixed place on

the loom, and at such a height that it does not interfere with the work of the operative or the loom and is within easy reach of the operative.

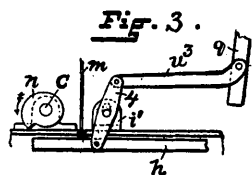
On the crank-shaft C, the wiper-cam *n*, is secured so as to rotate with the crank-shaft. The shoulder *n'* of the wiper-cam *n*, is designed to engage with the shoulder *h'*, on the end of the arm *h*, when this arm is raised. Close to the cam *n*, and also secured to the crank-shaft C, is the cam *o*, provided with the shoulders *o'* and *o''*. The evenner-slide T, is provided with the slotted head *p*. The lever *q*, pivoted to the bracket *r*, secured to the frame F, is provided at its upper end with a pin *s*, which extends through the slot in the head *p*, on the evenner-slide T. To the lower part of the lever *q*, is connected pivotally the arm *u*, which extends through the slot in the bracket *i*, and is provided at its free end with two shoulders *u'*, and *u''*. To the arm *u*, on its under side, is secured the bracket *v*.

In the normal condition, when the loom is running the arm *h*, rests in the slotted bracket *i*, and supports, by means of the brackets *k*, and *v*, the arm *u*, in the position shown in Fig. 2. The cams *n*, and *o*, revolve without interfering with the arms *h*, and *u*. When, now, to tie in ends or piece the warp the loom requires to be stopped and the warp evened, the operative pulls on the cord *m*, and raises the arm *h*, the shoulder *n'*, of the cam *n*, comes in contact with the shoulder *h'*, and pushes the arm *h*, and the lower end of the lever *q*, forward, and the pin *g'*, operates the shipper-lever D, to stop the loom. In the movement of the arm *h*, the bracket *k*, passes beyond the bracket *v*, the arm *u*, descends, the shoulder *o'*, of the cam *o*, encounters the shoulder *u'*, of the arm *u*, and draws this arm rearward and with it the lower end of the lever *q*, the upper end of which draws the evenner-slide sidewise, and as it is supported on pins entering diagonal slots, it raises the evenner-slide and operates the harnesses to even the warp in the usual manner, and by the old well-known means.

After the piecing is completed the lay A, is pushed back, thus partly rotating the crank-shaft C, and cam *o*, the shoulder *o''* comes in contact with the shoulder *u''* and pushes the arm *u*, with the lower end of the lever *q*, forward and the evenner-slide T, inward and downward into the original position. The shipper-lever D, is now drawn forward to start the loom, and, by coming in contact with the pin *g'*, the lever *q*, pushes the arm *h*, backward, the bracket *k*, coming in contact with the bracket *v*, lifts it and the arm *u*, and supports the same in the position shown in Fig. 2. By this arrangement the pull on the cord *m*, sets the mechanism in operation to stop the loom and even the harnesses, and a push on the lay puts the loom in condition to be started by the shipper-lever.

In the modified form shown in Fig. 3, the arm *h*, is connected by the lever 4, with the arm *u''*, which is pivoted to the lever *q*. The lever 4, is pivoted in the slot of the bracket *i'*, and only the cam *n*, is secured to the crank-shaft C. In this modified form the cam *n*, will have to be accurately adjusted so that the shipper motion to stop the loom and the movement of the evenner-slide will correspond with the movements of the harness-operating mechanism.

This improvement offers two good points: First, it is not necessary for the weaver to go to the side of the loom to stop the latter; secondly, it enables the weaver to operate the loom without uncoupling the head motion from the other parts of the loom and raising the harness by hand when tying up threads in the warp. (William Cavanaugh, Providence, R. I.)

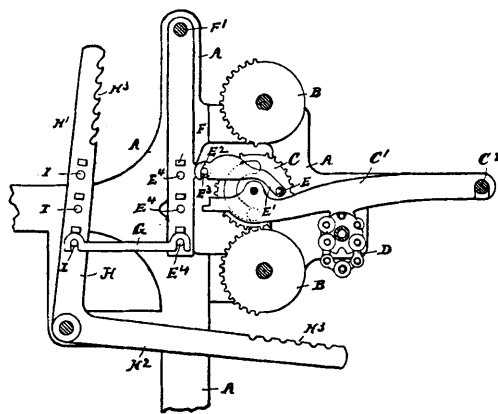


WICKS' AND ROY'S SHEDDING MECHANISM.

This device is shown in the accompanying illustration representing a side elevation of that part of the framework which supports the shedding mechanism, the frame next the beholder having been removed.

Letters of reference indicate thus: A, denotes the framework, and B, B, two-barrel-gears journaled in the framework and having gear-teeth upon a portion of their periphery, said barrel-gears being arranged one above and the other below a gear C, carried by the free end of a lever C', pivoted at one end upon a rod C², held by the frame A, so the angular motion of the lever C', will carry the gear C, up or down and bring its teeth into engagement with the teeth upon either the upper or lower of the barrel-gears B, B, the lever C', being actuated by a pattern-chain D. The barrel-gears B, B, rotate in opposite directions and the gear wheel C, will be rotated one-half a revolution in one direction or the other, as it is engaged by the upper or lower of the barrel gears B, B.

The gear C, carries a crank-pin E, to which a link E', is pivoted, having its opposite end provided with a hook E², adapted to engage a stud E³, projecting from the side of a swinging lever F, pivoted upon a rod F', held in the frame A, so the rotation of the gear C, back and forth through a half-revolution will impart an angular movement to the lever F. The lever F, is connected by a link G, with a pivoted jack H, having arms H', and H², provided with notches H³, to which the harness-straps are attached. A short distance above the studs E⁴, on the swinging lever F, and the studs I, on the jack H, are projecting lugs which extend over the hooked ends of the connecting-links, so as to prevent them from being lifted and disengaged from the studs during the operation of the loom. The lever F, and arm H', of the jack are provided with a series of



studs E⁴, and I, in order to allow the hooked link G, to be shifted from one to the other of the studs to vary the extent of the angular motion of the jack, so as to vary the motion of the harness-frames and produce what is known as an "angular shed" in the warp.

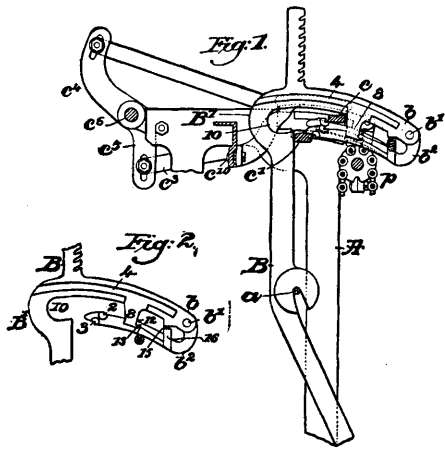
We thus describe the arrangement of a single lever, a rotating gear with a single jack, and intermediate lever F, which comprise the actuating mechanism for a single harness-frame, the several parts being duplicated for each harness-frame contained in the loom.

The novelty of the new device consists in actuating the jacks indirectly from the rotating crank-wheels C, with the use of an intermediate lever F. It is similar in its construction to the Knowles shedding mechanism, with the addition of lever F, and link G. (J. F. Wicks and B. S. Roy, Worcester, Mass.)

IMPROVED CONSTRUCTION OF HARNESS-LEVERS IN CONNECTION WITH LIFTER AND DEPRESSOR, ETC., FOR CROMPTON LOOMS.

Prior to this, the jacks have been provided with guiding-surfaces located remote from their fulcrum-points, usually more remote from the said fulcrum-points than the knives or one of them, and in practice much difficulty has been encountered by reason of the sticking of the jacks in contact with the said guiding-surfaces, so that the jacks do not move easily and quickly, nor with certainty, thus greatly interfering with the proper and rapid operation of the loom. To obviate this difficulty, is the object of the present improved construction of the device.

Fig. 1, in section, shows a sufficient portion of a Crompton loom, having the improvements added. Fig. 2 shows part of a lever and its jack as resting on a projection of the pattern-chain. Letters of reference indicate thus: A, the loom frame having a rod *a*, on which are mounted the slotted hubs of the levers B, having a latterly-extended arm *b*, which receives the pivot *b'*, for a notched jack *b''*, having at its upper edge a notch 2 (See Fig. 2), to be engaged by a de-



pressor or knife *c*, and at its under side a notch 3, to be engaged by an elevator or knife *c'*, said depressor and elevator being each made as bars, to the ends of which may be connected, respectively, sets of links *c''*, attached in turn in an adjustable manner to arms *c''*, *c''*, of a rock-shaft *c''*. The arms *b*, of the levers have each a guide-surface (shown as on a lug 8), which is arranged intermediate the elevator and depressor and the fulcrum of the jack, and is of sufficient length to overlap the jack *b''*, and act as a lateral guide therefore to prevent twisting or lateral movement of the jack out of place, the edge of said lug also serving the purpose of an evening-surface, it being acted upon by the outer edge of the depressor *c*, the inner edge of the elevator, by the action of its edge against one edge of the lever B, serving as the second guiding surface to effect the evening of the levers and of the shed, Fig. 1, showing the said depressor and elevator acting as eveners.

In order that the lever with the depressor arranged above the jack and the elevator below the jack at the same edge of the lever may have sufficient range of movement, said lever is shown as having an offset B', to thus provide a recess 10, in which the depressor may stand when the shed is open.

The top of the elevator *c'*, (shown in Fig. 1), is made of such shape as to come in contact with the under side of such jacks as are engaged with the depressor *c*, such contact aiding in keeping the hooks of the jacks in engagement with the edge of the depressor during the movement of the depressor and while the elevator is being moved outwardly, and at the same time said lifter, by slightly lifting the jacks engaged by the depressor, causes them to bear more lightly on the rolls or protuberances of the usual pattern-surface, and consequently the wear of the jacks and of the pattern-surface is lessened.

In the present construction the jack is made much shorter than before, and the shorter the jack the less its weight, said jack preferably terminating short of the lever.

The lug 8, carried by one arm *b*, acts not only on one side of the hooked jack pivoted upon it, but also against one side of the jack of the lever next to it.

Each of the notched jacks is provided (see Fig. 2,) with a stop pin or projection 12, which engages a toe 13, of the lug 8, said pin preventing the jack from dropping down horizontally when not held up by the pattern chain or surface *p*. The pin 12, and toe 13, aid in keeping the jack in place on the lever when it is removed from the loom.

The arm *b*, has, as shown, at its under side a small pin or projection which acts as a guide for a spiral spring 15, one edge of which acts against a seat 16, on the jack *b''*, said spring acting normally to keep the jack pressed toward the pattern-surface.

The arms *b*, of the upright levers are provided at each end with wearing-surfaces 4, which contact the surface of one arm with the corresponding surface of an adjacent arm, all the arms being kept pressed together by bars, adjustably attached to a part of the loom-frame by suitable bolts *c''*.

By reference to Fig. 1, it will be seen that the jacks may be readily withdrawn from engagement with both the depressor and elevator, and the harness-lever removed from the loom, for since both the elevator and depressor are arranged at the same side of the lever, and since they are not confined to the jacks by reason of traveling in slots in the jacks or otherwise, but so engage the jacks that the latter may be readily disconnected from the same by moving said elevator and depressor into close proximity one with the other, the lever may have a lateral movement sufficient to withdraw the end of jack from between and from engagement with the elevator and depressor, and the entire lever and its attached jack thereafter lifted bodily from position without necessary removal of either the elevator or depressor. To facilitate this removal, the jack may be sprung to one side far enough to disengage its stop-shoulder from the hook on the lug 8, which will thereby permit the jack to drop down into a vertical position.

The gist of the improvement may be thus stated shortly: First, a spring holds the finger on the chain at all times; second, the finger is made shorter than before and the jack can be removed from the loom without taking the depressor knife out, a feature not possible to be done with the jacks used heretofore. (*Crompton and Knowles Loom Works.*)

THE CROMPTON HARNESS-FRAME-MOVING DEVICE FOR WITCH-TOP LOOMS.

The inventors of this new device, Messrs. H. Wyman and A. A. Gordon, claim that mechanism for this purpose as theretofore constructed has been defective in that connections interposed between the harness frames and the spring-controlled levers are so made and attached to the levers in such a manner, that the conec-

tions wear so rapidly when joined to the levers as to entail expense in repairs, besides loss of time, this excessive and rapid wear being due chiefly to the fact that the connection tips on the lever at the point of their junction, owing to the particular lines of their movement.

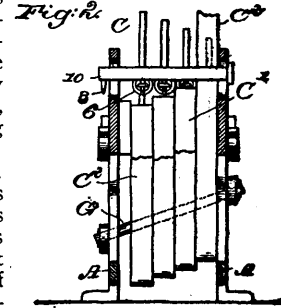
In the newly-constructed device the spring-controlled levers are provided with sectors, against which the connections bear, one end of each spring being connected to the end of the lever farthest from the sector and also to the frame-piece. In this way all side-wise or swaying movements of the connections is overcome, and also the wear on the connections reduced to the minimum.

Heretofore spring-controlled levers have been arranged side by side on the same fulcrum rod; but by separating the levers into two sets and mounting them on two fulcrum rods, so that the strap attaching end of one lever points to the right and the other to the left of a vertical plane at a right angle to the series of harness frames, the builders of the new device are enabled to get two rows of levers in the line occupied by the connections leading to the harness-frames, and thus are enabled, by having two rows of levers, to make the harness connections broader than if using but one row, and by providing one end of each lever with a sector the connections may be sustained on a flat surface during the movements of the levers.

The levers have notches at their outer ends at different distances from their fulcra to receive the buckles or loops to which is attached one end of the springs used, the adjustment of a buckle or loop into one or the

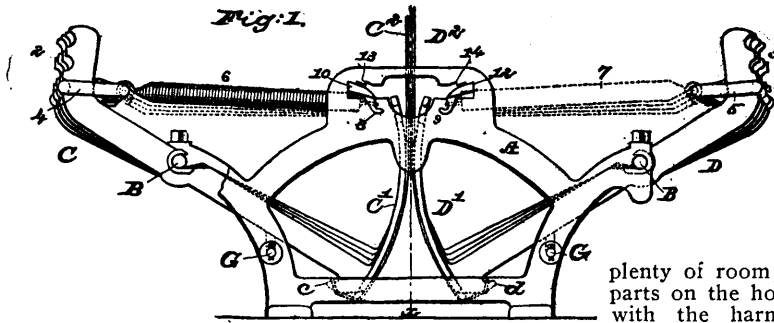
of levers C, D, having sector-shaped ends C', D', being sufficiently wide to receive against their faces the connections C², D², one end of each of said connections being suitably attached, respectively, to one of said levers C, D', the means employed being the projections c, d, over which the straps are hooked. The ends of the two series of levers are made to face each other, just enough space being left to permit the (connection) straps C², D², to come between them, as in Fig. 1, the straps attached to the levers being attached in alternation to the successive harness frames. Parts of the sides of the levers may touch, or substantially so, and thus obviate twisting strains.

The outer ends of the lever C, D, are notched, as at 2, 3, to receive the loops 4, 5, attached by springs 6, 7, (fully shown at the left in Fig. 1) to hooks 8, 9, of rods or bars 10, 12, mounted in notches of the frame



A, and, as shown in Fig. 1, there are a series of bar-holding notches 13, 14, in either of which the said bars may be placed when it is desired to alter at one operation the tension of all the springs. The open slots in the hubs of the levers to fit the rods B, are in such direction that the springs 6, 7, act normally to keep the levers on said rods, and to enable the levers of the series to be moved over different distances by the springs when acting to move the harness frames, the stop rods G, G, are set at an inclination, as represented, to the fulcrum rods B, B.

This new device is designed for looms having witch tops, i. e., device for raising the harness and which in turn have to be pulled down by springs. The straps in the new device, running from the spring-levers with springs attached, give plenty of room; therefore do away with the wearing parts on the hooks, springs, and all straps connected with the harness. (Crompton and Knowles Loom Works.)



other of said notches providing for greater or less tension of the springs. The ends of the springs most remote from the notched ends of the levers are connected to a spring-holding bar, and the frame where this bar is located has a series of notches whereby the bar may be quickly adjusted in its position to at one operation vary the tension simultaneously of all the springs.

The back stop for the levers is made as a bar or rod, which occupies a position at an angle to the fulcrum rod for the levers, so that the said levers may occupy different positions in order that the front and back harness frames may occupy different horizontal planes, the back harness frame or the one farthest from the breast beam of the loom having the greater movement. The levers have their hubs slotted to be applied to or removed from the fulcrum rod without disturbing the latter, and the strain of the spring is such as to keep the levers seated on their fulcrum rod.

For a clear understanding of the construction of this improved device the accompanying illustrations are given, and of which Fig. 1, in side elevation represents a sufficient portion of a loom to illustrate the invention; Fig. 2, a section thereof in the line x, Fig. 1.

The supporting frame A, has two fulcra B, B, on which are mounted the slotted hubs of the two series

SCHEID'S SHEDDING MECHANISM.

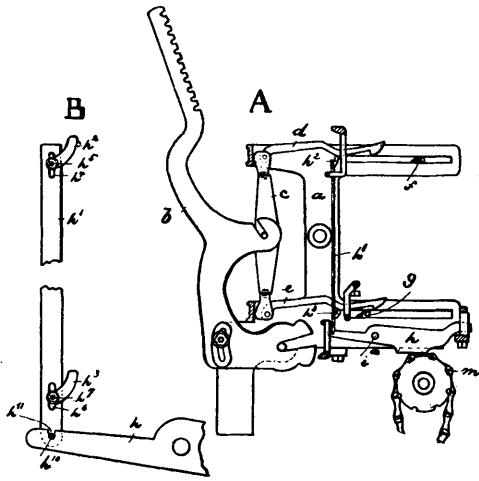
Fig. A, is a side elevation of a dobby provided with the improvements, and Fig. B, an enlarged detail view of one of the hooked jacks operating levers and its adjustable supporting arms.

The frame a, the harness lever b, the connector c, the hooked jacks d, and e, and the lifters f, and g, are of usual construction. The lifting lever h, pivoted at i, to the frame a, and operated by the pattern surface m, in the usual manner, is provided near its inner end with an upwardly extending rod h', the horizontally arranged pin h¹⁰, of arm h', resting in the vertical slot h¹¹, of lever h. Near the upper end of said rod h', is arranged an elongated vertical slot h¹², in which is adjustably secured, by means of bolt and nut h¹³, or in any other desired manner, the arm h¹⁴, adapted to bear on the under side of the upper hooked jack d.

In the lower portion of the rod h', is also arranged an elongated vertical slot h¹⁵, in which is adjustably secured, by means of bolt and nut h¹⁶, the arm h¹⁷, which latter bears against the under side of the lower hooked jack e.

It is a well-established fact that the ordinary supporting means for the hooked jack, during the frequent

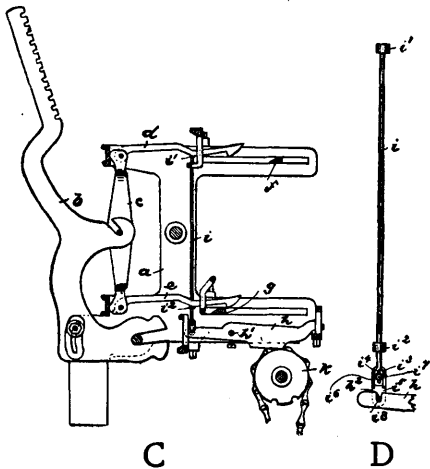
usage of the dobby, get worn off very rapidly and must be substituted by new ones from time to time to insure a perfect operation of the machine. This is avoided in



the new device, having arranged the arm h^2 , and h^3 , supporting the hooked jacks, adjustable on the carrying or supporting rod w . As soon as the top portion of the said arms is worn off the nuts of the bolts h^5 , and h^7 , are loosened and the arms slid upward and turned outward in their respective slots to the height and position required, and the nuts are then again tightened up.

A further improvement of this dobby is shown in the accompanying illustration, of which Fig. C is a side elevation of a dobby provided with an improved jack-supporting rod, which is the gist of the present improvement; Fig. D, an enlarged detail view of the same, illustrated in connection with a portion of its lifting lever.

In said drawings, a , is the dobby frame; b , the harness lever, carrying the connector c , to the outer end of which are pivotally secured the upper and lower hooked jacks, d , and e , adapted to be engaged by the lifters f , and g , respectively.



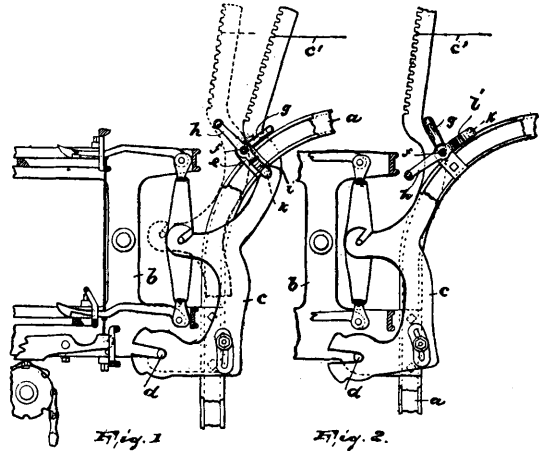
The lifting lever h , pivoted as at h^1 , and operated through pattern chain k , is provided at or near its inner end with a vertically-arranged slot h^2 , in which

rests the pin i^3 , projecting horizontally from link i^2 . To said link is adjustably secured, by bolt and nut i^1 , the flattened lower portion i^4 , of the supporting rod i , which is for that purpose provided with an elongated slot i^4 , through which the tightening bolt i^1 , passes. The supporting rod i , is either round or flat, and is provided with an upper and lower collar or lug i^1 , and i^2 , adapted to support the upper and lower jacks respectively. The link i^2 , can be provided with projecting flanges i^5 , as shown in Fig. D, to obtain a more secure and firmer joint between the said link and the flattened portion i^4 , of rod i , if so desired.

Should, during the operation of the machine, the jack-supporting collars or lugs i^1 , and i^2 , partially wear off, the tightening nut and bolt i^1 , is loosened, the rod raised up to the required height and the bolt and nut again tightened. By this simple means the frequent changing of the jack-supporting rods and their respective collars is fully avoided and the device thus rendered more durable and economical. (Adam Scheid, Harrison, Assignor to Robert Atherton, Paterson, N. J.)

BIRCHALL'S HARNESS-LEVELING DEVICE.

Fig. 1 is a side elevation of a dobby with certain portions removed and others shown in section (ar-



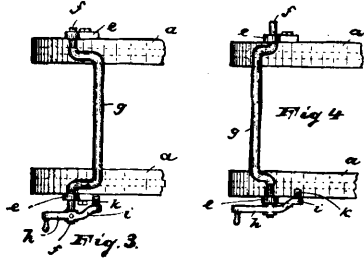
ranged on a portion of a loom-frame), and provided with the improved leveling device. Fig. 2, is a view similar to Fig. 1, illustrating the position of parts when the leveling device is in operation; and Figs. 3 and 4 are top plan views of the leveling device as shown in Figs. 1 and 2 respectively.

In said drawings a , represents a portion of the loom-frame, and b , the dobby-frame secured thereto, and provided with the cross-rod, serving as a fulcrum for the harness-levers c , the latter ones connected with the harness of the loom through the cords c' .

On each side of the dobby, and secured to the loom-frame a , in any desired manner, is a bracket e , serving as bearings for the ends f , of the crank-shaft g , of the leveling device.

On one end of said crank-shaft is secured the crank or handle h , provided with an arm i , on which is arranged a horizontally-inwardly projecting pin k , adapted to engage and bear on the loom-frame a . The said crank-shaft g , when in normal position, Figs. 1 and 3, does not fully touch the harness-levers, and bears on the loom-frame a , but is allowed a lateral motion in its bearings e , sufficient, when pushed inward, after being turned from right to left, to bring the said pin k , over and above and into engagement with the said loom-frame, as shown in Figs. 2 and 4.

In operation when the warp-threads from necessity of repairing or the harness-threads for any other reason have to be brought to one level, the operator



stops the machine and turns the crank-shaft *g*, by means of the handle *h*, from right to left, until the pin *k*, is over and above the loom-frame *a*. The crank-shaft is then pushed inward and the handle *h*, released. The pin *k*, bearing on the loom-frame, prevents the crank-shaft from returning to its normal position, and thus holds the harness and warp threads in a level. When the necessary repairs are done, the crank-shaft by means of its handle is pulled outward and allowed to return to its normal position. (Thomas Birchall, Assignor to Robert Atherton, Paterson, N. J.)

ALVORD'S SHEDDING MECHANISM.

This shedding mechanism is shown in its sectional elevation in the accompanying illustration. Examining this drawing we find the harness-lever 1, hung on shaft 2, retained in place by pin 3, passed through curved slot 3', in said lever 1, and which harness-lever has the usual harness-frame connected to its ends by cording.

On the arm 4, of lever 1, is pivotally mounted at 8, a lock lever 5, the segmental arms of which are struck on a curve from the centre of shaft 2. Hook 6, is connected to a third radial arm of lock-lever 5, at a point 7, outside of pivot 8, on which lock-lever 5, is mounted. The free end of hook 6, is provided at top and bottom with two projections, between which there is a small space, forming at the upper side a notch to be engaged by the reciprocating knife 9, and at the lower side a notch to be engaged by the reciprocating knife 10, whereby the hook may be moved longitudinally.

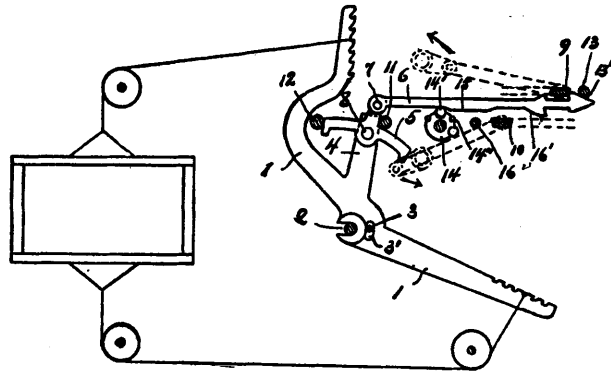
The knife 9, termed the "elevator" raises the harness-frame connected to lever 1, and the knife 10.

The "depressor" lowers the said harness-frame. The hook is vibrated by a pattern surface 14, to cause its notches to engage the reciprocating knives, a riser 14', on the pattern surface acting to raise the hook and place its upper notch in engagement with the elevator 9, and a "sinker" 14", permitting the hook to fall by reason of its own weight, thus engaging the lower notch of the hook with the depressor 10.

As the reciprocation of the knives 9, and 10, is constant, it is necessary that the hook be freed from engagement with said knives at the extreme of its movement; otherwise when once engaged by one of the knives there would be a like reciprocation of the hook and an open shed could not be formed. To effect this disengagement there is placed at a point near the position reached by the elevator 9, in its outward movement, a clearing bar 13, which co-acts with the beveled portion 13', on the upper side of hook 6, besides there is placed a clearing bar 16, at a point near the position reached by the depressor 10, in its inward movement, which clearing bar 16, co-acts with the beveled portion 16', upon the under side of the hook.

Upon the underside of the hook 6, is formed also the run 15, against which the risers of the pattern surface operate, and that end of the riser nearest the pivotal point of the hook is cut away to permit the hook to be depressed by the action of the clearing bar 13.

In order that the harness lever may be retained in either extreme position and an open shed be formed, there are provided stationary butting bars 11 and 12, which co-act with the lock lever 5, to lock the harness lever in either extreme position. These butting bars are arranged in an arc struck from centre of shaft 2, and placed one on each side of the arm 4, of the harness lever and of the radial arm of lock lever 5, and bear upon the segmental arms of said lever 5. When in this position the arm 4, and lever 5, are locked together, and the pull upon the hook 6, draws the arm 4, and moves the harness lever, the lock lever 5, having no independent movement at this time. This



movement will continue until the arm 4, of the lever 1, is brought against one of the butting bars, and at that instant the end of one segmental arm clears the opposite butting bar, and is by a slight turn of lever 5, upon its pivot, placed against the butting bar.

The tension on the warps carried by the harness frame cannot disturb the position of the parts, and the harness frame will be unmoved until the hook is moved in the return direction, at which time the lock lever 5, is turned slightly on its pivot and the end of the segmental arm freed from engagement with the butting bar. The harness frame is then free to be removed into its other position by the continued movement of the hook, the parts being locked at the end of the movement in the same way, as just described.

The operation of the mechanism is as follows: The pattern surface 14, is timed to move when the knives are at the opposite extremity of their motion to that shown in our illustration. When so timed, a hook 6, which has a sinker under it will drop on to the depressor knife, and a hook with a riser under it will be forced up and connect with the elevating knife 9. The forward movement of the knives will unlock the harness levers, and they will be moved into their opposite positions and locked in place.

An open shed will be formed and the harness frames will have been pulled positively into position. The harnesses will remain in their respective places so long as sinkers follow sinkers and risers follow risers on the pattern surface, but when a riser follows a sinker, or vice versa, the levers, and consequently the harnesses will move into the opposite position. The hooks are freed from the knives by the action of clearing bars 13 and 16, as previously described. (Clinton Alvord, Philadelphia.)

INGRAHAM'S SHEDDING MECHANISM.

This shedding-mechanism refers to for what are known as "open shed" looms, the object being to effect the movement of the heddle frames without any severe strain on the operating devices, to insure the locking of the heddle frames when the shed is open, so as to permit the jacks to be readily shifted, and to provide for lifting the depressed heddle-frames independently of the regular operating mechanism when it is desired to gain access to a warp thread in the lower portion of the shed.

Fig. 1, is a transverse section, partly in elevation, of a loom provided with the new shedding mechanism. Fig. 2, is an enlarged vertical sectional view of said heddle operating mechanism. Figs. 3 and 4, are like views of parts of the mechanism, in different positions, and Fig. 5, is a transverse section on the line 1-2, Fig. 2.

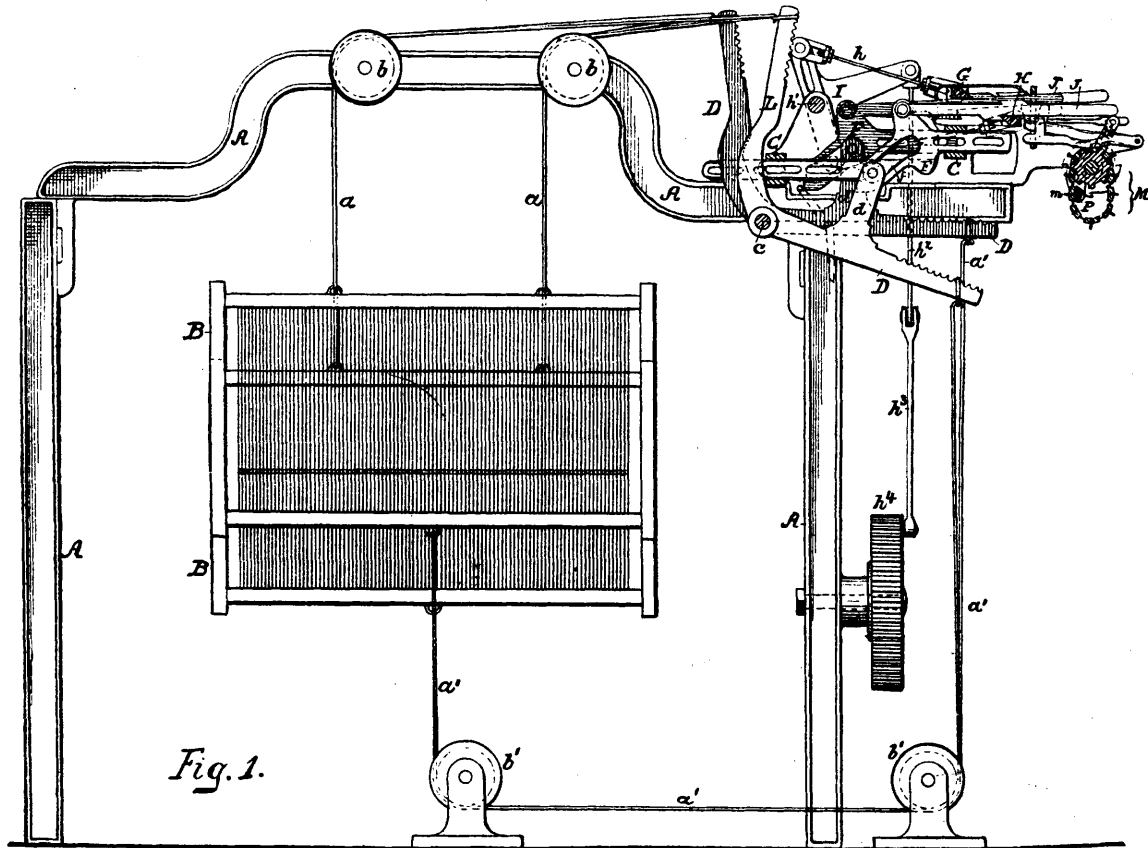


Fig. 1.

A, represents part of a frame of a loom, and B, represents heddle frames to which are connected cords a , a' , passing over pulleys b , b' , said cords being connected to heddle-levers D, mounted on the frame of the loom, and these heddle-levers being in the form of bell-cranks, one arm of each lever being connected to the upper cords a , of its corresponding heddle frame, and the other arm to the lower cord a' , of the same. Each heddle-lever has on its lower arm an upwardly projecting stud a , the upper end of which carries an antifriction roller d' , (see dotted lines Fig. 2) which is adapted to an inclined slot f , in slide F, guided in transverse bearings C, on the frame of the heddle operating mechanism, so that, as these slides are

moved to and fro, their inclined slots, acting on the antifriction rollers carried by the studs d , of the heddle-levers, will cause said heddle-levers to vibrate upon the fulcrum shaft c , and will thus raise and lower the heddle frames B, and the path in which the roller is forced to travel by the action of the inclined slot will be curved, and will be almost at right angles to the thrust imparted by the inclined portion of the slide F, by which means the up and down thrusts upon the slide F, is lessened, as compared with a thrust directly across the line of movement of said slide.

At each end of the inclined slot of each slide F, is an offset f' , and when the slide is in either of its extreme positions, the antifriction roller on the stud d , of the heddle-lever occupies one of these offsets and the heddle frames are thereby effectually locked in their extreme positions corresponding to the "open shed," the strain upon the heddles having no effect in

moving the slides from the positions to which they have been adjusted.

In order to provide for the effective guidance and lateral retention of the slides F, and yet permit said slides to be arranged closely together, the top and bottom edges of the guiding portion of each slide are beveled or V-shaped, and the guide-bars C, have like beveled or V-shaped grooves for the reception of these beveled edges of the slides as shown in Fig. 5.

The movement of the slides F, to effect the rise and fall of the heddle-frame demanded by the required shedding of the warp, is derived from reciprocating bars G and H, which are carried by guide blocks g , the latter being connected by rods h , respectively to the upper and lower arms of a three-armed lever I,

hung to a transverse shaft h^1 , the third arm of said lever being connected by a rod h^2 , and link h^3 , to a spur wheel h^4 , driven from any suitable part of the loom.

Hung to each of the slides F, is a jack J, which has, on its upper and lower edges, lugs i, i' , facing in opposite directions, and each of these jacks J, is under the control of a finger k , on a pivoted arm K, which is acted upon by the pins m , of a pattern-chain M, carried by a pattern-drum N, the intermittent move-

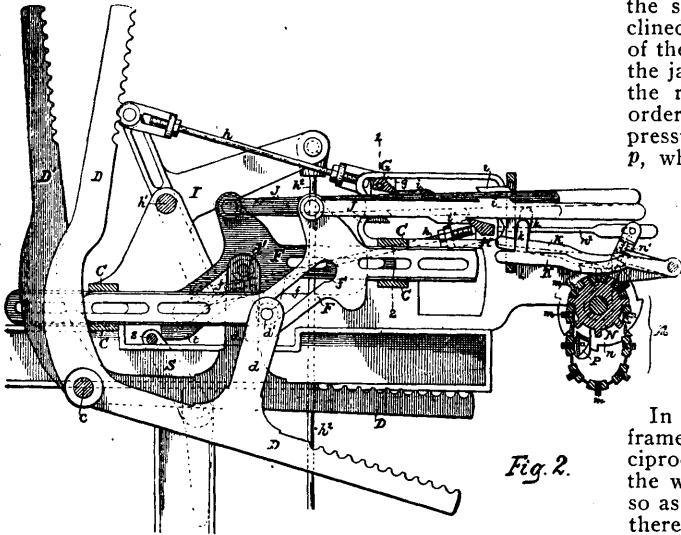


Fig. 2.

ment of the latter being effected by any suitable means, for instance by means of a ratchet-wheel n , on the drum shaft, acted on by a pawl carried by an arm n' , hung to said shaft, and vibrated by the bar H, through the medium of a rod n^2 , as shown in Fig. 2. When the parts are in the position shown in Fig. 2, the bars G and H are at the extremes of their rearward movement, and are about to move forward, that is to say, the bar G is about to move to the right and the bar H to the left. The jacks of the slides F of those heddle frames which are to be lifted have been raised so that their lugs i , are in engagement with the bar G, while the jacks of the slides of those heddle frames which are to be lowered, have been dropped so that their lugs i' , engage with the bar H, the jacks of the slides of those heddle frames which are not to be raised

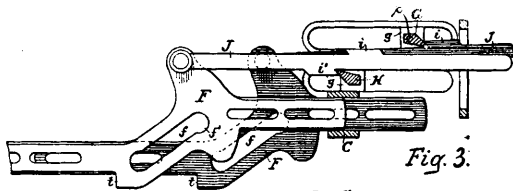


Fig. 3.

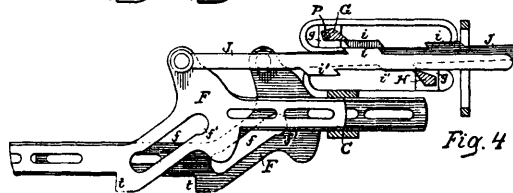


Fig. 4.

being allowed to remain down, and the jacks of the slides corresponding to the heddle frames which are not to be depressed being allowed to remain up. As the bars G and H move forward, corresponding move-

ment is imparted to those slides whose jacks are in engagement with the bars, as shown in Fig. 3, the movement of the heddle-frames from one position to the other being effected by the slides, which, owing to their inclined slots, so act upon the heddle-levers, that the movement of the latter is affected easily and smoothly and without shock or jar upon the operating portions of the device, the heddle-frames being finally locked in their extreme positions (that is to say with the shed open) owing to the off-set ends of the inclined slots in the slides. On the backward movement of the slides G and H, the pattern-chain is shifted and the jacks J, are raised and lowered in accordance with the requirements of the pattern. (See Fig. 4.) In order to permit the upper bar G to yield against the pressure of the jacks from below, said bar has journals p , which are free to turn in the guide-blocks q , the preponderance in weight being in advance of the journals, so that the acting edge of the bar G will fall into engagement with the lugs i , of the jacks, as soon as said bar is fully retracted.

To prevent the links of the pattern-chain from being carried around by the under side of the drum N, there is mounted adjacent to the latter, a deflecting shoe P, which so acts upon the depending portion of the chain, as to press its links out of the spaces between the teeth of the drum, as shown in Fig. 2.

In order to effect the raising of the lower heddle-frames without corresponding movement of the reciprocating bar G, when it becomes necessary to raise the warps constituting the lower portion of the shed, so as to tie up a broken thread, or for other purposes, there is mounted at one side of loom a lever S, shown by dotted lines in Fig. 2, this lever carrying a transverse bar s , which acts upon downwardly projecting lugs t , upon the slides F, of all the depressed heddle-frames, so that on operating the lever S by hand, an outward movement of all of these slides can be effected independently of the regular operating devices.

It will be observed that the reciprocating bars G and H act only upon one side of the lugs i, i' , of the jacks J, so that said lugs are free to move away from the reciprocating bars when the slides are moved by the evener-bar. By so connecting the lever S, the leverage for raising the heddle-frames when desired, is so increased that this operation may be easily performed. This is of great importance, especially where the loom has a large number of heddles. (Fairmount Machine Works.)

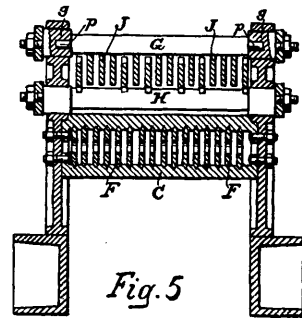


Fig. 5.

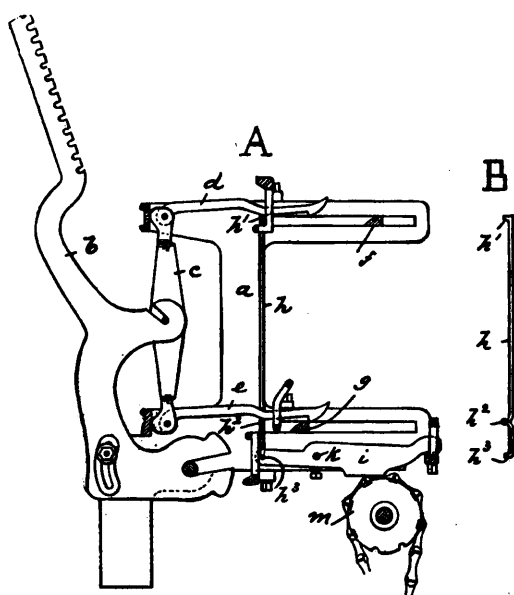
EASTWOOD'S SHEDDING MECHANISM.

Referring to the accompanying drawings, Fig. A, is a sectional side elevation of a dobby provided with the improvements; Fig. B, a detail view of one of the jack supporting rods.

In said drawings, a , represents the frame; b , the harness lever; c , the connector pivotally secured to said lever b ; d , and e , the upper and lower hooked jacks, respectively, pivotally secured to the said connector, and f , and g , the lifters.

Pivoted, as at k , is the lifting lever i , acted upon by the pattern surface or chain m , in the usual manner. To the inner end of said lever i , is pivotally secured the upwardly extending rod h , which for that purpose

has its lower end bent horizontally, as at h^3 , Fig. B, and rests with said portion h^3 , in a horizontally arranged hole of lever i . The upper end of rod h , is also bent horizontally, as at h' , and bears with said



horizontal portion under the upper jack d , while the lower jack e , rests upon the loop h^2 , projecting horizontally from and integral with the rod h . (Alfred Gartner, Newark, N. J., Assignor to Benjamin Eastwood, Paterson, N. J.)

ECCLES'S HARNESS MECHANISM FOR OPEN SHED LOOMS.

In many fancy patterns the weaving requires one, two, three, or four heddles out of a set of ten or more to remain open for several picks, and thus an open shed prevents the unnecessary movement and chafing of the warp-threads.

By the present mechanism the heddle-frames are all liberated at each pick.

The invention consists of an automatically-operated clamp that will rigidly clamp all the heddle-levers open for the flight of the shuttle and automatically liberate them just as the lifter and depressor starts on the return stroke that opens the shed.

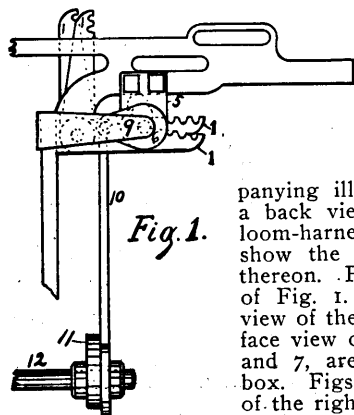


Fig. 1.

Of the accompanying illustrations Fig. 1, is a back view of so much of a loom-harness frame as will show the mechanism mounted thereon. Fig. 2, is an end view of Fig. 1. Fig. 3, is an edge view of the spring. Fig. 4, is a face view of Fig. 3. Figs. 5, 6, and 7, are views of the cam-box. Figs. 8, and 13, are views of the right-angle harness-lever. Figs. 9, and 10, are views of the pressure-pin. Figs. 11, and 12, are views of the eccentric cam.

The construction of the mechanism is as follows:

1, represents the right-angle harness-lever; 3, the double-hook moving jack. The jacks are controlled by a pattern-chain and operated by a lifter and depressor. To the lever 1, is fixed a bearing-surface 2. In a series of levers these surfaces bear one against the other, as shown in Fig. 2, which shows a series of ten levers nested one against the other at the bearing-surfaces 2.

4, indicates a fixed bearing placed at the right-hand side of the last lever in the series. 5, indicates a stand or hanger for the clamp-pin 7, and forms a part of the cam-box 6. 7, is a pressure-pin, the flanged end of which presses against the surface 2, on the lever 1. The plain end of pin 7, on the left is pressed by the spring 9. By means of a pin 13, the pressure-pin 7, is fixed to the part 6, of the cam-box. To that part of the cam-box 6, is an arm 8, and from which is a connecting-rod 10. 11, is an eccentric grooved cam, mounted on the crank-shaft 12.

The operation of the new motion is as follows: Motion being given the cam 11, by shaft 12, as soon as the shed is opened the cam-box is closed as shown in Figs. 2, and 6. This closing of the cam-box allows the spring 9, through the pin 7, to press all the levers 1, together at 2, and clamp them tight, holding the shed open for the passage of the shuttle and a cross of the warp yarn on the previous pick until the next pick is crossed on. As the lifter

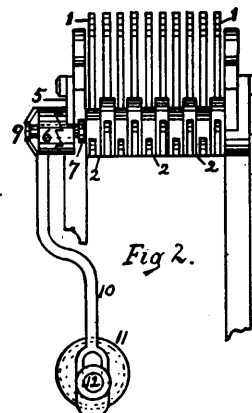


Fig. 2.



Fig. 3.



Fig. 4.

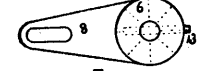


Fig. 5.

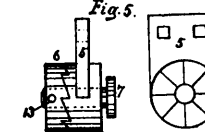


Fig. 6.

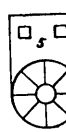


Fig. 7.

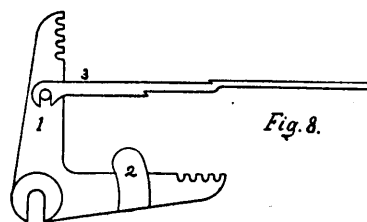


Fig. 8.

and depressor hooks on the jacks for a change of the shed, the cam 11, through rod 10, and cam-box 6, acting against the inclined cams of the box, press apart the cam-box 6, which draws to the left the pin head 7, and relieves all the levers, and they are free to be moved in either direction, up or down, when they are again clamped as before described.

The cam-box shows eight bearing-surfaces; however a less number may be used. (James Eccles, Philadelphia.)



Fig. 9.



Fig. 10.



Fig. 11.



Fig. 12.



Fig. 13.

OLDHAM'S SHEDDING MECHANISM.

One of the principal objects sought to be secured in the construction of this dobby is the locking of each heddle-frame either at the highest or lowest point that it assumes in the weaving operation, and giving to each jack or lever a positive movement in either direction in order to operate each heddle-frame independently when called into action by the pattern-chain, and also the locking of the whole number of heddle-frames used in the weave in the position in which they have been placed for an intermittent period.

This means the production of an open shed or the establishment of a uniform line, at which the upper and lower warps will be held to insure the shuttle's flight and many other advantages in the weaving operation.

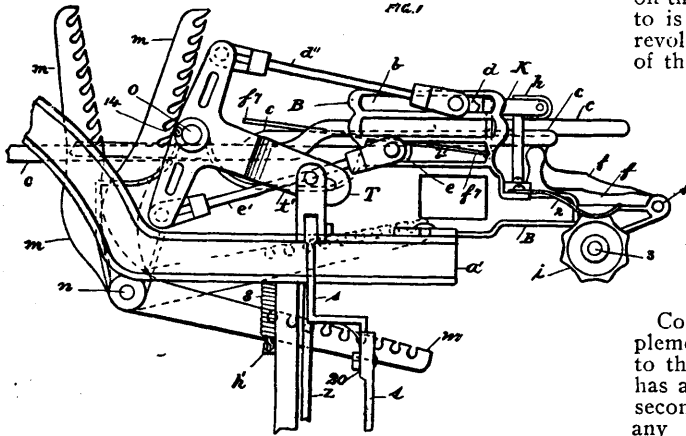


Fig. 1, is a side elevation of the principal working part of the device, represented as mounted on one end of the arch of the loom-frame and showing the jacks in their two directly opposite positions, or when the heddle-frame is at its highest and lowest point. Fig. 2, is a top plan view of the same. Fig. 3, represents a skeleton of the locking-frame in its operative position in connection with independent notched bars connected with the jacks, the locking frame being shown in section, holding the jack at its full forward movement, and the dotted position of the two parts illustrating the jack at the point of its full backward movement.

Letters of references indicate thus: a' , represents the loom-arch, to the appropriate side of which on the top the dobby is securely mounted. B , indicates one of the two side-frames of the dobby-frame. Upon the inner ends of the side-frames B , is secured a shaft n , which gives a bearing to each of the levers or jacks m .

Directly forward of the shaft n , journaled in the two side-frames, is a rock-shaft o , to the outer end of which, at the proper side of the frame, is secured a T-shaped rocker-arm T , and in opposite position upon the other end of said shaft is a lever t . Pivotaly connected by means of an integral boss or projection m' , upon one side of the upwardly-directed arm of each jack m , is a long draw-bar c , provided with two notches c' , and c , or teeth upon its upper edge, and the bottom edge of each of said draw-bars c , is constructed with a single notch or projection C^2 . The said notches are for engagement with the transverse knives d , and e , located one above and the other below the notched draw-bars c , and sliding with a reciprocating movement in suitable openings b and b' , in the side-frames B . These knives are connected by the rods to the T-shaped rocker-arm T , and the lever t .

In the extreme outer end of the two side-frames B , of the machine are pivoted loosely on the shaft i , small

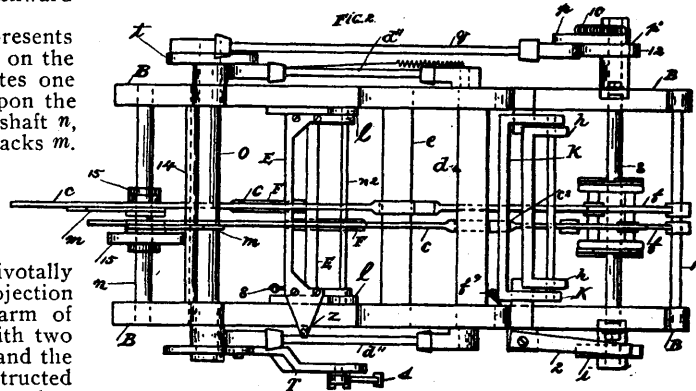
levers or feelers f , corresponding in numbers to the draw-bars c , and upon which the outer ends of the said bars rest, the feelers or levers being raised by means of the risers on the pattern-chain, the sinkers of the chain allowing for the fall of the levers or feelers in keeping with the character of the weave. A spring 2 , secured to one of the sides of the machine, has its free end resting in one of the suitable curved depressions in the periphery of the hand-wheel i , secured on one end of the shaft 3 , by which the pattern-chain cylinder is rotated.

To the main arm T , is connected a depending-rod 8 , adjustable at 20 , and the same is pivoted at its bottom end to an eccentric gear that meshes with a similar gear, secured on the power-shaft of the loom. Pivoted on the frame in the rear of the eccentric gears referred to is a lever provided at its free end with a loosely-revolving roller, which is engaged at each revolution of the eccentric gear by the cam-piece. A vertically-moving rod Z , is secured to said lever, the upper end of which is connected to a frame E , pivoted by means of the rod n^2 , on the stationary cross-girt l . A spring 8 , has one end secured to the stationary rack h' , and connects with frame E . Upon one end of shaft 3 , is secured an arm p , supplied with a pawl p , a spring 10 , connecting said arm and pawl and causing the latter to constantly be in engagement with the teeth of the ratchet-wheel 12 .

Connected to the upper end of the arm p , is a supplemental connecting-rod q , whose rear end is pivoted to the lever t , and the front connecting part or head has an integral foot, which rests upon the face of the second rear tooth engaged by the pawl and prevents any recoil to the pattern-chains. Supplemental or auxiliary notched connecting-rods F , are pivoted near the rear ends upon suitable bosses or projections m^2 on the jacks m , their forward ends provided with suitable shoulders f^2 , and notches f^2 , for engagement with the pivoted locking-frame E .

A transverse rod 14 , directly in the rear of the rock-shaft o , the two ends of which are secured in the two side frames, is covered with rubber, thereby limiting the forward movement of the jacks and furnishing a cushion for the latter to strike against.

The whole series of jacks are assisted in being supported in an upright position by means of the clamps

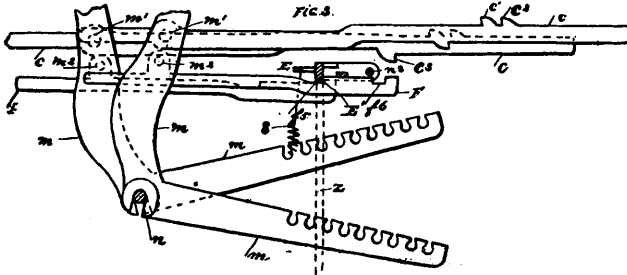


or guards 15 , placed each side of the series and bearing against the two outer jacks, these clamps being rigidly secured on the shaft n .

Pivoted on the rack or grate h , is a hold-back or locking-frame K , placed transversely over the draw-bars c , for engaging the notches c^2 , and the outer ends of said draw-bar c , and it is provided with an arm f' , by

which the hold-back can be liberated from all the draw-bars by the operator.

In the operation of the machine motion is communicated from the drive-shaft of the loom by means of the eccentric gears, and communicated to the T-shaped lever by means of the adjustable arm *s*, and at each revolution of the gear to which the said arm is con-



nected, a proper amount of vibrating motion is imparted to the same, and by means of the connections *u''*, and *e'*, to the reciprocating knives *d*, and *e*. In the forward movement of the knife *d*, all of those draw-bars that have been raised by the movement of the pattern-chain will be in such a position as to cause the notches *c'*, of the draw-bars to be engaged by the upper knife *d*, and its forward movement will pull the draw-bars forward, thereby drawing the respective jack to which they are attached to its full stroke.

The opposite result will come to those draw-bars that are depressed by the directly opposite movement of the lower knife *e*, engaging those notches *c''*, or projections on the bottom edge of the draw-bars. During the reciprocating movement of the knives the pivoted locking-frame *E*, will be elevated by means of the previously referred to cam, roller, lever, and vertical rod *Z*, so as not to engage the notches *f'*, and shoulders *f''*, of the auxiliary notched connecting-rods *F*, to the jacks *m*. When the stroke of the two knives is complete, the frame *E*, is forced by its own weight and assisted by the spring *8*, to drop in the rear of the shoulders *f''*, or into the notches *f''*, of the proper connecting-rods *F*, and remaining there until the harness is to make another change, when the whole series of rods *F*, will be simultaneously liberated.

The locking-frame *E*, has its lower edge rounded slightly, as shown at *E'*, Fig. 3, so as that if unusual strain is exerted on any of the bars *F*, the locking-frame *E*, will rise slightly against the tension of the spring *8*, and free the bars *F*, so as to prevent breaking any of the working parts of the machine.

The spring *8*, must be sufficiently strong to preserve at all times under ordinary circumstances an even shed-line. The supplemental spring *f''*, connected to the locking-frame *K*, serves to form an additional hold on all those draw-bars connected with the jacks carrying the upper shed by engaging the upper notch *C''*, of each of them in their forward position. The spring *f''*, secured thereto, connects with one of the side-frames *B*, and an operating-rod *f'*, serves to unlock it from all the draw-bars it engages from the opposite side of the loom. This is for evening the shed.

In case the pattern of weave requires a long pattern-chain the weight and momentum of the pattern-chain cylinder has a tendency to overlap or override to the following pick when the usual form of ratchet and pawl is used, but not so in this case. The integral foot prevents any further rotation of the pattern-cylinder than a single tooth of the ratchet-wheel.

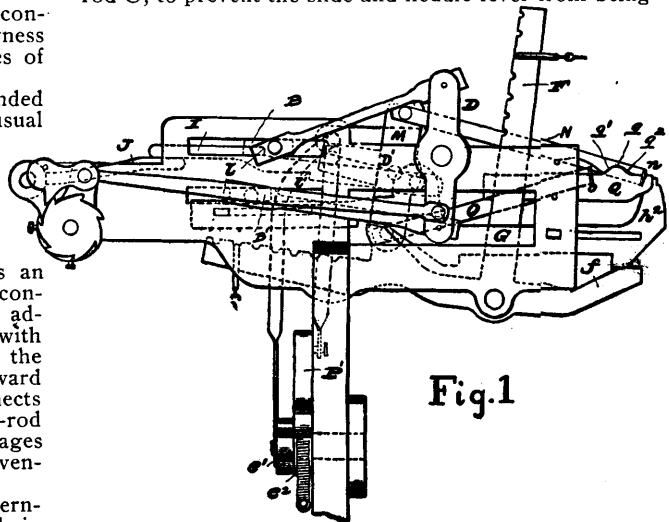
It very often happens the loom is revolved backward, which would result in breaking any positive locking-device, the locking-frame *E*, having the bev-

eled edge *E'*, and the safety-spring *8*, in this case instantly releasing the transverse locking-frame from all the supplemental draw-bars *F*, as hereinbefore explained, thus overcoming the danger of breakage when the loom is reversed. (*George Oldham, Philadelphia.*)

GOODYEAR'S SHEDDING MECHANISM.

To enable the reader to understand the mechanism the accompanying drawings are given, and of which Fig. 1, is an elevation looking at one side of the mechanism. Fig. 2, is a longitudinal sectional view of it.

The operation of the mechanism is as follows: With the parts in the positions shown in illustrations, the cam *e'*, first draws the rods *N*, *O*, toward each other to enable them to be raised by the projection of the cam-guide *Q*, above the path of the head *h'*, of the cam-slide *G*, the pattern-cylinder lifts the finger *J*, to raise the jack *I*, so its shoulder *l*, is in the path of the primary impelling-bar *B*, and the cam *e'*, moves the levers *D*, *D'*, and the bar *B*, so as to impel the jack *I*, and the slide *G*, in the direction indicated by the arrow in Fig. 2. When the slide *G*, has been impelled to a point where the head *h'*, moves beyond the end of the rod *O*, the cam *e''*, moves the levers *P*, *M*, to separate the ends *n*, *o*, of the rods *N*, *O*, and allow the ends to descend into the path of the head *h'*, so that the end *o*, will take position behind the head *h'*, of said slide. Before the cam *e'*, completes its revolution, it withdraws the bar *B*, from engagement with the primary impelling-jack *I*, and the end *o*, of rod *O*, engages with the head *h'*, so as to complete the movement of the slide *G*, in the direction indicated, this movement of the slide being completed by the time the cam *e'*, has made a full revolution, at which time the pattern-cylinder releases the finger *J*, so that the finger and jack *I*, will drop or fall by gravity. As the cam-slide *G*, is moved in the manner described, its incline *h'*, rides against the incline *f'*, and this pressure turns the double heddle-lever to move the heddle-frames. As the slide *G*, completes its stroke, the head *h'*, is engaged by the rod *O*, to prevent the slide and heddle-lever from being



moved accidentally. As the cams *e'*, *e''*, continue to rotate, the cam *e''*, operates the lever *M*, to again move the rods *N*, *O*, and cause the ends *n*, *o*, to approach and ride upon the inclines *q'*, *q''*, *q*, of the guide *Q*, thus lifting the rods out of the path of the head *h'*, of said slide *G*, and the cam *e'*, now moves the levers *D*, *D'*, in a manner to draw the primary impelling-bar *B'*, into engagement with the shoulder *l'*, on the lower side

of the jack I, which, it will be remembered, was lowered on the completion of the first stroke or movement of the slide G.

This primary impelling-bar B', now impels the slide G, in the reverse direction until the head h², thereof, passes the end n, of the bar N, at which time the cam

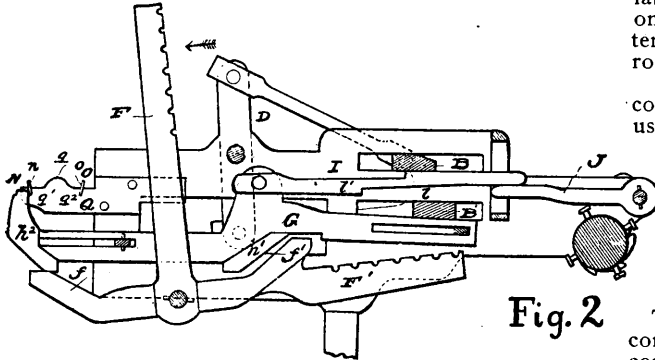


Fig. 2

e², moves the lever M, to separate the ends n, o, of the rods, and cause the end n, to take position behind the head h². The cam e', now retracts the bar B, and the cam e², impels the rod N, to force its end against the head h², and to cause the rod N, to impel the slide G, to the full limit of its stroke or until the slide again assumes the position shown by Fig. 2. As the slide G, is impelled in the direction referred to its incline h, rides against the incline f, to rock the double lever F, F', and cause it to again move the heddles. (Robert B. Goodyear, Philadelphia.)

EVANS'S SHEDDING MECHANISM.

The gist of the improved mechanism is found in doing away with a great amount of chain stuff, the arrangement of the new device acting as a multiplier on each bar.

It will put in as many repeats of one pattern as required by the design by one chain, then start another chain to weave another pattern as the fabric calls for. The change from one chain to the other, i. e., the multiplier, is worked from the first jack, which jack can be used solely for that purpose.

In the usual construction of the harness-operating mechanism, known as the "dobby," having two rows of indicator-fingers is operated from one row of pegs, and the other set from the other row of pegs on the same bar. The first set of indicator-fingers operates the lower jack-hook, and the second set operates the upper jack-hook. The lifting-knives move alternately at each successive pick of the loom, and when the jack-hooks engage with them, the corresponding harness is raised and lowered. One row of pegs on the bar of the pattern-chain determines which harness and warp-thread shall be raised for a certain pick, and the other row of pegs on the same bar determines the raising of the warp-threads for the next succeeding pick. One bar of the pattern-chain, therefore, represents two picks in the woven fabric, and the pattern-chain must have a sufficient number of bars to control the springing of the warp for the pattern of the whole length of the fabric.

In the weaving of a variety of fabrics, such as handkerchiefs, towels and similar goods, the length of pattern-chain required is objectionable on account of its cost of labor in pegging and the power and mechanism required to carry and operate it.

The object of the present invention is to so con-

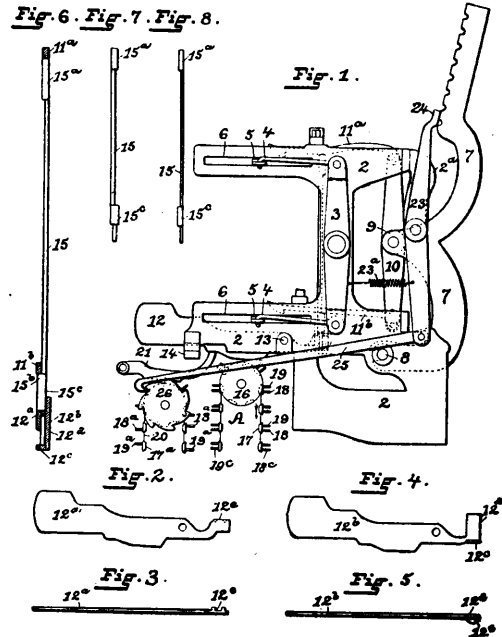
struct the doobby that fabrics, such as towels or handkerchiefs, in which stripes or borders of one peculiar pattern or weave are followed or preceded by a field of another pattern or weave can be produced with a short length of pattern-chain.

In a loom provided with a doobby constructed after this invention the pattern for the main portion of the fabric is represented by one of the two rows of pegs on each of the bars of the pattern-chain, and the pattern for the cross-borders is represented by the other row of pegs on the same bar.

Instead of using each bar of the pattern-chain to control the warp of two successive picks, as is the usual method employed heretofore, in the pattern-chain used in carrying out this invention each bar controls the springing of the warp for one pick only, and yet by use of a controlling mechanism, a short pattern-chain, or for some weaves a cylinder provided with a pattern-surface, will be sufficient to weave fabrics of any desired length in which two kinds of patterns of weaves are used at pre-determined intervals.

The controlling mechanism may also be arranged to control the harness-operating mechanism in the old construction of the doobby where two adjacent indicator-fingers operate the one, the lower and the other the upper jack-hooks.

Fig. 1, is a side view of a doobby provided with the improvements. Fig. 2, is a side view, and Fig. 3, a top view, of one of the pair of indicator-fingers. Fig. 4, is a side view, and Fig. 5, a top view, of the other of the pair of indicator-fingers. Fig. 6, is an edge view, on an enlarged scale, of a needle for operating the jack-hooks, showing the upper and lower hooks, and the two parts of the indicator-fingers in section. Fig. 7, is a face view, and Fig. 8, an edge view, of the needle on the scale of Fig. 1. Fig. 9, is a diagrammatic representa-



tion of the indicator-fingers, the pattern-chain, the auxiliary chain and their relative relation to each other, showing also the indicator-finger on one side through which the mechanism for operating the auxiliary chain is set in motion.

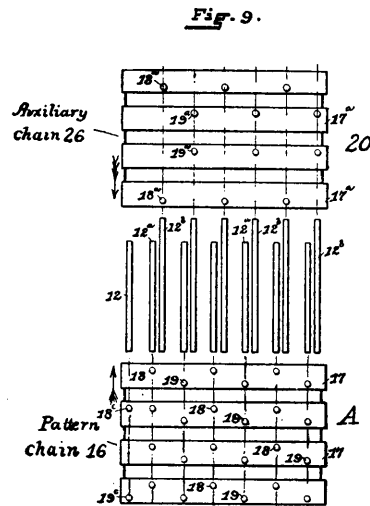
To illustrate the invention as clearly as possible and avoid confusion, the doobby part of the loom only is shown.

Of the accompanying illustrations, numeral of reference 2 indicates the end frames of the dobbie, secured to or forming part of one of the end frames of the loom. The vibrator-arm 3, is secured to a shaft supported in the end frames 2. The ends of this vibrator-arm 3, are connected by the rods 4, with the lifter-knives 5, and these slide in the slotted ways 6.

The harness-lever 7, is the first one near the frame. The other harness-levers required to weave the patterns are not shown, but all are pivotally secured on the shaft 8, the ends of which are supported in the end frames 2. To the bracket 9, forming part of the harness-lever 7, is pivoted the connector-arm 10, and to each end of the same are pivotally connected the jack-

hook 11a, to the upper end and the jack-hook 11b, to the lower end. The indicator-fingers are pivoted on the shaft 13, supported in the end frames 2, and rest on the bar 14, extending from one end frame to the other.

On referring to Fig. 6, it will be seen that the needle 15, supports jack 11a, on the upper end 15a, and the jack 11b, on the shoulder 15b, at its lower end, and that the needle is supported by the indicator-



finger 12a, by a shoulder formed by the enlargement 15c, of the needle and by the lateral projection 12c, of the indicator-finger 12b. The indicator-finger 12a, is provided on one side with two projections (shown in Fig. 3), so as to form the groove or space 12e, and the indicator-finger 12b, is provided with the projection 12c (shown in Fig. 5), and also with the upward-projecting flat piece 12d. The lower end of the needle 15, passes through the space 12e, between the finger 12a, and the flat projection 12d, on the finger 12b. By this construction either of the fingers 12a, or 12b, may lift the jack-hooks independent of the other, but both the short ends of the indicator-fingers 12a, and 12b, must be depressed before the needle can descend and permit the jack-hooks to engage with the lifting-knives.

The object of this improved construction of a dobbie and the mode of operating the same is best explained thus:

Referring to Fig. 1, it will be seen that the sprocket-wheel 16, is placed below the indicator-fingers 12, and that the primary pattern-chain A, on which the transverse bars 17, are secured, is supported and operated by the sprocket-wheel 16. On the bars 17, are secured two lines of pegs, each forming a pattern-surface. The row of pegs 18, on the forward edge of the bar corresponds to the harnesses required to be operated to weave one pick of a pattern—the cross-stripe, for instance—and the row of pegs 19, on the rear edge of the bar corresponds with the harnesses required to be operated to weave one pick of the other pattern—the field or body, for instance. These pegs are placed so that they register always with a certain one of the parts of the indicator-fingers throughout the series—that is to say, the pegs may register with either of the parts 12a, or 12b. This is clearly shown in Fig. 9, wherein the pegs 18, and 19, are so placed that they will operate the

parts 12a, of each pair of indicator-fingers, the pegs of each row being arranged in the alternation shown. Now, in this condition, the pegs cannot operate the needle 15, because it requires both of the short ends of the parts 12a, and 12b, to be depressed to permit the needle 15, to descend and permit the jack-hooks to engage with the lifting-knives 5. If now, by any suitable mechanical means the weighted end of one of the two part indicator-fingers—in the present instance the part 12b,—be raised so as to depress the short end connected with the needle 15, then when the pattern-peg registering with the other half passes under the same, it will operate the needle to connect the jack-hooks with the lifter-knives and the proper harness will be operated. The means designed for thus operating the half of the indicator-fingers consists in the auxiliary or indicator chain 20, on which the transverse bars 17a, are secured. On each of these bars 17a, one row of pattern-pegs only is secured. The pegs 18a and 19a, are placed near one or the other edge of the bars 17a, the same as are the pegs 18 and 19, on the bar 17, so that the co-acting pegs will operate the respective halves of the indicator-fingers at the same time, the pegs 18a, corresponding to the pattern of the pegs 18, on the primary pattern-chain A; but they are laterally placed so that while the pegs 18, on the primary pattern-chain register, say, with the half 12a, the pegs 18a, register with or operate the other half, 12b, of the indicator-fingers, and the levers 21, pivotally secured at one end and bearing on the halves 12b, of the indicator-fingers, being raised when the pegs 18a, pass under the same, will raise the weighted outer end of the half 12b, of the indicator-fingers and thereby permit to connect the jack-hooks with the lifter-knives 5, and operate the desired harnesses. The row of pegs 18a, operates to unlock one of a pair of the indicator-fingers, and the row of pegs 19, operates the other one of the pair of indicator-fingers, the pegs 19a, performing the corresponding office for the pegs 19, because the needle is supported by two adjacent indicator-fingers forming the pair and cannot be lowered to engage the jack-hook if only one is used or the jack-hooks if, as shown in the drawings, two are used, until the weighted outer ends of both indicator-fingers are raised and the inner ends of both are lowered with the needle.

When now the row of pegs 18a, has raised the outer ends of one of the pairs of indicator-fingers corresponding with the pattern, then the row of pegs 18, can operate the other one of the pair of indicator-fingers, and thus lower the needle and the jack-hook or jack-hooks so as to connect the harness required to be operated to weave the pattern corresponding with the row of pegs 18. The row of pegs 19a, performs the corresponding office for the rows of pegs 19, on the pattern-chain.

The first indicator-finger 12, which is the one nearest the end frame, and the first harness-lever 7, are preferably used to operate the auxiliary or controlling pattern-chain 20, but they are not in any wise altered and both may be used to control the operation of a harness when the auxiliary or controlling pattern is not required, or when the auxiliary or controlling pattern-chain is operated by some other moving part. In the preferred construction, as shown in Fig. 1, the end frame 2, is provided with the arm 2a, near the lower end of which is pivoted the lever 23, the upper end 24, of which lever is bent inward so as to bear on the harness-lever 7. To the lower end of the lever 23, is pivotally secured the ratchet-bar 25, the hook on the front end of which engages with the ratchet-wheel 26. The spring 23a, is secured at one end to the frame 2, and at the other end to the lever 23. (William Evans, Fall River, Mass.)

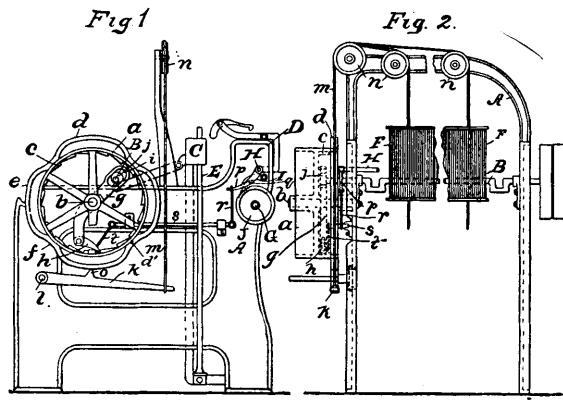
PERHAM'S SHEDDING MECHANISM.

This motion is for a roller loom, easy in its action, doing away with the cams on bottom shaft, placing them on the crank shaft, obtaining a cheaper and yet a more durable device.

The device can be readily and quickly adjusted by the operative to conform to the desired pick, and in a similar manner to be adjusted in any order required for a particular pattern.

Of the accompanying illustrations Fig. 1, is an end view of the improvements represented as operatively connected with a loom, only so much of the latter and its equipments being shown as is necessary to explain the invention. Fig. 2, is a front view of the same, a part of the central portion being shown as broken out.

Letters of reference indicate thus: A, designates the loom-frame. B, is the crank-shaft, by which the lay C, is operated through suitable connections. D, is the breast-beam. E, designates the picker-sticks. F, the harness. G, the cloth-roll. H, a rod extending parallel with the breast-beam and connected with



the stopping mechanism, and I, a holding pawl co-operating with a ratchet-wheel J, on the cloth-roll to prevent the latter from turning backward.

a, designates a broad-rim wheel, arranged to turn on a stud d, secured to the loom-frame and provided on the interior of its rim with a circle of ratchet teeth c, which may be an integral part of the rim, or be formed on a ring detachably connected with the rim.

Upon the outer surface or periphery of the rim-wheel a, are detachably and adjustably secured a series of cam-rings a', adjustably and removably held by means of a spline d'. The said cam-rings are provided on their peripheries with a plurality of rises e, and falls f, according with the number of ratchet-teeth c, to the pattern to be woven.

The means for detachably and adjustably securing the cam-rings upon the rim-wheel are not shown in

the illustration, as any suitable device may be employed for this purpose.

Upon the stud b, is fulcrumed a lever g, to the end of one arm of which is pivoted a pawl h, adapted to take into the teeth of the ratchet-ring described. The other end of said lever g, is provided with an elongated slot i, in which an eccentric j, on the crank-shaft operates, so that at each rotation of the crank-shaft the lever g, and its attached pawl h, will be actuated so as to engage the ratched-teeth c, and move the rim-wheel a, to the extent of the distance between two of the said ratchet-teeth.

k, designates a lever (as many as there are sets of harness to be operated), fulcrumed at its rear end, as at l, and has a cord m, attached to its other end, which cord extends over pulleys n, and is connected at its other end with the harness F, to be raised. On the lever K, there is a projection o, which rests upon the periphery of the cam-ring a', so that in the rotation of the rim-wheel with the said rings secured thereto, the rises and falls of the said rings will act upon the levers k, and through their connections with the harness raise the latter and allow them to be depressed, it being understood that a rise e, on a cam ring a', will operate to raise a heddle, under the arrangement shown, and that a fall f, will allow the heddle to be lowered, through any of the common and known means employed for the purpose, such as springs, weights, or connections with other heddles which operate to depress one set of heddles when another set is raised.

The finger p, employed on the rod H, of the common stopping mechanism, which is provided with a pin q, extending under the holding-pawl I, is elongated, as shown in Fig. 1, and thereto is attached one end of a cord r, the other end of which is connected to one of the angular ends of a rock-rod s, the other angular end of the said rock-rod being connected, by means of a cord t, with a pawl h, so that as the rod H, is rocked and the pin q, on the finger p, operates to raise the pawl I, the said finger will also, through the medium of its connections, operate to raise the pawl h, and so arrest the movement of the rim-wheel a, and its adjuncts.

The levers k, might be arranged above the rim-wheel and the cam-ring a', thereon, and the connections of the harness with the lever be made from the lower part of the latter and operate to depress the same.

With this invention it will be seen that we are enabled to operate the harness-controlling mechanism directly from the lay-operating crank shaft, and greatly simplify and cheapen the cost of construction, making the machine easy of operation and of stopping and starting, and providing plenty of room for the cloth-roll and warp-beam. Besides this, the improvements provide a construction which is most ready of examination and manipulation by the weaver in case of need of turning the mechanism back or otherwise moving it without moving other parts of the loom to correspond with the required pick; and moreover, the mechanism is such as to materially lessen the momentum of the moving parts, so that the loom can be stopped quicker than heretofore without undue shock or jar. (Charles Foster Perham, Lowell, Mass.)

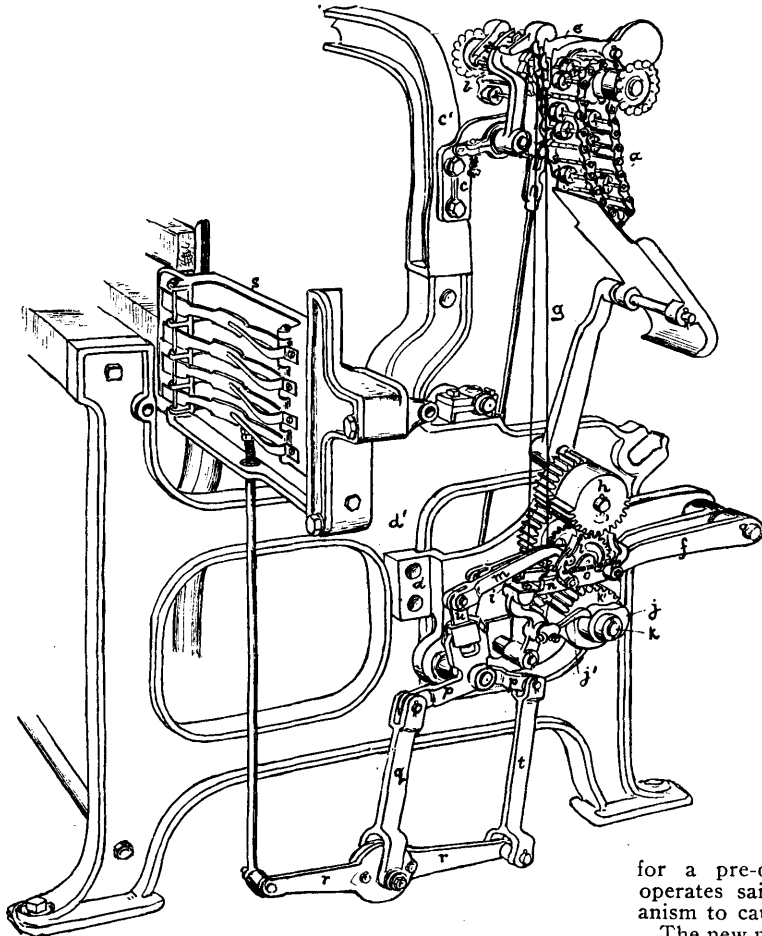


BOX MOTIONS AND SHUTTLE BOXES.

THE KNOWLES GINGHAM BOX MOTION.*

(For 4 x 1 or 6 x 1 Box Looms.)

This motion, as shown in the accompanying illustration, is controlled by the box pattern chain *a*, which is operated in connection with a multiplier chain *b*, by a cam on the bottom shaft (not shown). The stand *c*, for the box pattern and multiplier mechanism is bolted to the arch *c'*, and the stand *d*, for the box motion itself is fastened to the loom side *d'*. The box motion is also run from the bottom shaft. This causes



a complete movement of all the parts once in two picks and prevents the boxes from changing when the shuttle is in the dead box.

When a roll of the pattern chain *a*, comes under one of the levers *e*, which is connected with the vibrator

*See also article on "Mechanism for Operating Shedding and Drop-box Pattern Indicators for Knowles Looms" in previous chapter.

lever *f*, by rod *g*, it raises the vibrator lever *f*, into connection with the top cylinder gear *h*. In order to prevent any skips, a lock-knife *i*, closes in under or over the vibrator lever *f*, as soon as it has been raised or lowered to its correct position, the lock-knife *i*, being operated by a cam *j*, (and lock-knife finger *j'*) on the shaft *k*, of the bottom cylinder gear *k'*.

Whenever the vibrator gear *l*, is raised into contact with the top cylinder gear *h*, the vibrator gear *l*, is turned through half a revolution, carrying the vibrator connector *m*, from the left to the right and locking it as it comes into the line of centres; in addition to this there is a lock-lever *n*, and spring *o*, which holds the connector *m* in place.

The motion of the vibrator connector *m*, in connection with the angle lever *p*, raises the boxes. The front lever *q*, using the end of the compound lever *r* as a fulcrum raises two shuttle boxes *s*. The back lever *q*, using the centre of the compound lever *r*, as a fulcrum raises one shuttle box *s*.

In the case of the 6 x 1 box loom there are two levers which raise two boxes each, and one that raises one box.

The adjustment of the box is effected by means of an adjustable tip *u*, which connects the vibrator connector *m*, to the angle lever *p*. (*Crompton and Knowles Loom Works.*)

MULTIPLIER MECHANISM FOR KNOWLES LOOMS.

This invention relates to that class of looms which are provided with an auxiliary or multiplier pattern-chain in addition to the main pattern-chain. By means of the auxiliary or multiplier pattern-chain, certain bars of the main pattern-chain of the drop-box-indicating mechanism may be repeated without constructing successive similar bars in said main pattern-chain.

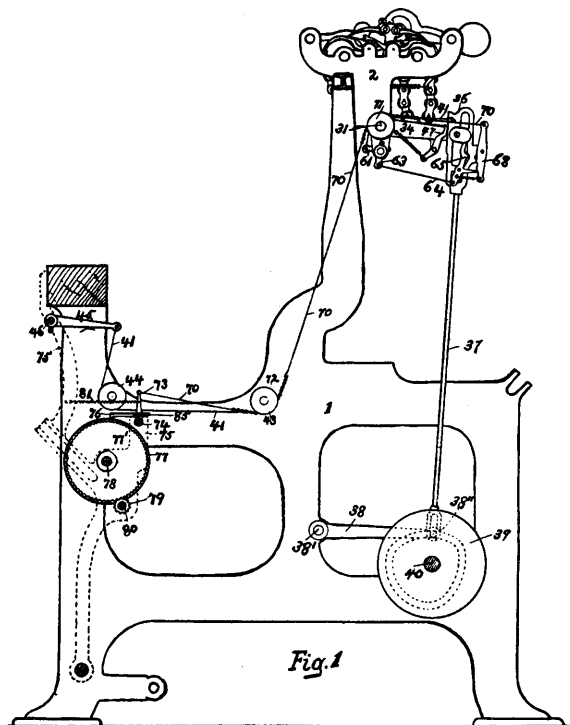
The object of the present invention is to provide a supplemental mechanism, to be combined with the main-pattern-chain and auxiliary or multiplier pattern-chain mechanism, which will operate automatically to stop,

for a pre-determined time, the mechanism which operates said pattern-chains and to start said mechanism to cause the pattern-chains to operate.

The new mechanism may be combined with any loom of the class referred to, and is designed particularly for looms for weaving handkerchiefs, cotton blankets, etc., in which a solid color is put into the body of the goods for a certain number of picks.

In using the improvements on looms of the class referred to, the inventor of the new device, Mr. Wm. Wattie, combines the same with the cloth-take-up friction-roll, so that after a certain amount of cloth is taken up, the mechanism will operate automatically to start the mechanism which drives the pattern-

chains. The new mechanism is also combined with indicating mechanism on the main pattern-chain cylinder, so that said indicating mechanism will automat-



ically operate the new mechanism to stop the mechanism which drives the pattern-chains when desired. In the accompanying drawings a multiplier mechanism for a 6x1 box-loom is shown.

Fig. 1, shows a loom side from the inside, the rear view of the box-pattern indicating mechanism, and the supplemental mechanism combined therewith. Fig. 2, is a rear view of the box-pattern indicating mechanism and a portion of the improvements, looking in the direction of arrow *a*, Fig. 4. Fig. 3, is a front view looking in the direction of arrow *b*, Fig. 4. Fig. 4, is a plan view looking in the direction of arrow *c*, Fig. 2. Fig. 5, is a section on line 5-5, Fig. 4, looking in the direction of arrow *a*, same figure. Fig. 6, is a detail of the indicating-disk on the friction take-up roll-shaft and the engaging finger or lever, looking in the direction of arrow *d*, Fig. 7. Fig. 7, is a plan view of the parts shown in Fig. 6, looking in the direction of arrow *e*, same figure; and Fig. 8, is a perspective view of one of the adjustable indicating cams or switches on the indicating-disk. Figs. 2 to 8, inclusive, are shown on an enlarged scale compared to Fig. 1.

In the drawings, 1, indicates the loom side, on the upper part of which is secured the stand or frame 2, on which are supported the several parts of the drop-box pattern-indicating mechanism. The drop-box pattern-indicating mechanism is in this instance, as before stated, arranged for a 6x1 box-loom. In the pattern-indicating mechanism, 3 is the main-pattern-chain cylinder, loosely mounted on a stud 4, secured in the frame 2. Cylinder 3, has grooved or notched heads or ends 3', and carries the main pattern-chain

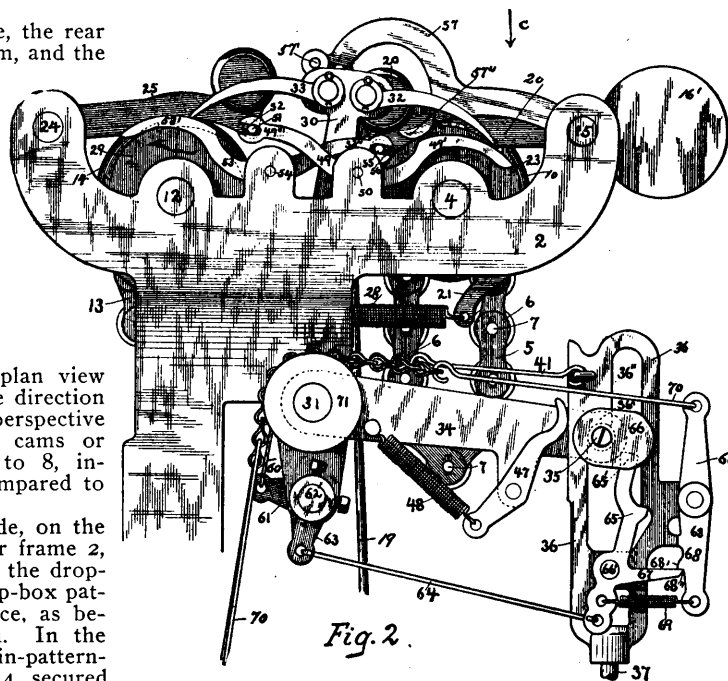
5, made up of links 6, which connect the bars 7, upon which are mounted rolls 9, and tubes 8. The cylinder 3, is provided with a hand-wheel 10, by means of which said cylinder is turned in either direction, as desired.

The auxiliary or multiplier pattern-chain cylinder 11, is loosely mounted on a stud 12, secured in the frame 2, and carries the auxiliary or multiplier pattern-chain 13, made up of links 6, bars 7, rolls 9, and tubes 8, similar to the main pattern-chain 5. The auxiliary pattern-cylinder 11, is provided with a hand-wheel 14, to turn the same as desired.

On a stud 15, secured in the upper part of the frame 2, on the outside of the stud 4, are pivoted, in this instance, three shuttle-box indicator-levers 16, 17, and 18, which are operated by the main pattern-chain 5. The outer ends 16', 17' and 18' of said levers are enlarged as shown, to act as weights, and the inner end of each of said levers is pivoted to the upper end of the connector-rods 19 (see Fig. 3,) leading to the vibrator levers of the box-motion, (not shown) of any ordinary construction and operation, and which is arranged at the lower part of the loom. Upon said stud 15, is also pivoted one end of the weighted indicator-lever 20 and one end of the lock-lever 21, which is provided with a convex portion 21', adapted to extend into the concave portions 22', in the stop-wheel 22, fast on the pattern-chain cylinder 3. (See Fig. 5.)

On the stud 4, and next to the frame 2, is loosely mounted a ratchet-wheel 23, which is secured to the main pattern-chain cylinder 3, and through said ratchet-wheel said main pattern-chain cylinder is operated.

On a stud 24, fast in the opposite end of the frame 2, from the stud 15, is pivoted one end of a weighted indicator-lever 25, which is acted on by the auxiliary or multiplier pattern-chain 13. On the stud 24, is also pivoted one end of the lock-lever 26, provided with a convex portion 26', adapted to extend into concave portions 27', in the stop-wheel 27, secured to



the auxiliary pattern-chain cylinder 11. The lower end of the lock-lever 26, is secured to the lower end of

the lock-lever 21, by a spring 28, (see Fig. 5,) which acts to move said levers toward each other and hold them in engagement with their respective stop-wheels 22 and 27.

A ratchet-wheel 29, is mounted loosely on the stud 12, and is secured to the auxiliary pattern-chain cylinder 11, and through said ratchet-wheel 29, said auxiliary pattern-chain cylinder is operated.

The mechanism for operating the ratchet-wheel 23, to communicate motion to the main pattern-chain 5, and for operating the ratchet-wheel 29, to communicate motion to the auxiliary pattern-chain 13, consists of a lever 30, fast on a rock-shaft 31, journaled in the lower part of the frame 2. This lever 30, carries at its upper end two oppositely-extending pawls 32 and 33, pivoted thereon. The pawl 32, is adapted to engage the teeth of the ratchet-wheel 23, of the main-pattern-chain cylinder 3, and the pawl 33, is adapted to engage the teeth of the ratchet-wheel 29, of the auxiliary pattern-chain cylinder 11.

On the other end of the rock-shaft 31, is fast the inner end of an arm 34. Motion is communicated to

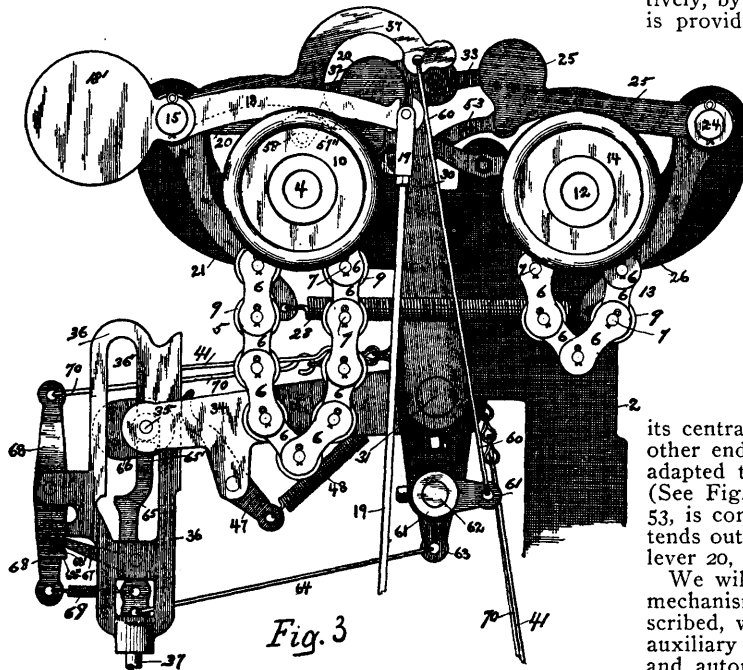


Fig. 3

said arm 34, and through rock-shaft 31, to the arm or lever 30, carrying the pawls 32 and 33.

A give-way or lock connection intermediate the arm 34, and the driven part of the loom, from which said arm is operated is provided, and means to automatically operate said give-way connection to disconnect the arm 34, and immediately stop the movement of the pattern-surfaces in case the filling gives out, and the filling-stop-motion shaft acts to stop the loom. In this instance, the outer end of the arm 34, is provided with a pin or screw 35, which is adapted to engage a notch 36', in the slotted head 36, on the connector-rod 37 (See Fig. 2). The lower end of said rod 37, is connected with a lever 38, pivoted at 38', and carrying a pin 38'', which extends into a groove in a cam 39, fast on a driven shaft 40 (See Fig. 1). A continuous up-and-down motion is communicated to said rod 37, and through the arm 34, to the rock-shaft 31, and the arm 30, carrying the pawl 32 and 33.

From the head 36 of the connector-rod 37, a chain or cord 41 leads over a pulley 42, loose on the rock-

shaft 31, and over pulleys 43 and 44, mounted on the loom side (see Fig. 1), to an arm 45, fast on the filling stop-motion shaft 46. The rocking of the stop-motion shaft 46, will, through arm 45, and cord 41, draw the head 36, on the rod 37, toward the front of the loom and cause the pin 35, to be disengaged from the notch 36', and be moved into the longitudinal slot 36'', in the head 36, to allow said head and the connector-rod 37, to move up and down without moving the arm 34, so that the pattern-indicating mechanisms may be instantly stopped, though the loom may continue to run.

A pawl 47, pivoted on the arm 34, and bearing at one end against the inner edge of the head 36, and attached at its other end to one end of a spring 48, acts to push outwardly the head 36, on the rod 37, and hold the pin 35, in the notch 36', to form a give-way or lock connection between the connector-rod 37, and the arm 34.

In order to regulate the operation of the ratchet-wheels 23 and 29, of the main pattern-chain cylinder 3, and the auxiliary pattern-chain cylinder 11, respectively, by the pawls 32 and 33, a pawl guard or shield is provided for each pawl to keep the same out of

engagement with its ratchet-wheel when desired. The pawl 32, which operates the ratchet-wheel 23, of the main pattern-chain cylinder 3, is provided with a pawl guard or shield 49, pivoted at about its central point on a pin 50, in the frame 2, in such a manner that the end 49', which acts as a guard for the pawl 32, will extend under said pawl (See Fig. 2). The other end 49'', of said shield 49, is connected by a pin 51, to a boss 52, which extends out from the free end of the weighted indicator-lever 25, of the auxiliary pattern-chain 13. The pawl guard or shield 53, for the pawl 33, which operates the ratchet-wheel 29, of the auxiliary pattern-chain cylinder 11, is pivoted at about

its central point on a pin 54, in the frame 2, with its other end 53', which acts as a shield for the pawl 33, adapted to extend under the outer end of said pawl (See Fig. 2). The inner end 53'', of said pawl-guard 53, is connected by a pin 55, to a boss 56, which extends out from the free end of the weighted indicator-lever 20, of the main pattern-chain 3.

We will now proceed to describe the supplemental mechanism combined with the mechanisms before described, whereby both the main pattern-chain and the auxiliary pattern-chain will be automatically stopped and automatically started when desired.

On the stud 15, is pivotally mounted one end of an indicating-lever 57, which, in this instance, is located between the indicator-lever 20, and the lock-lever 21 (See Fig. 4).

The main pattern-chain cylinder 3, is provided with indicating-surfaces to act on said lever 57. Said indicating-surfaces may form a separate row of tubes and rolls between the heads or ends 3', of the cylinder 3, or, as in this instance, the indicating surface or roll 58, may be substituted for one of the tubes 8, which extend into the notches or grooves in the ends 3', of the cylinder or barrel 3 (See Fig. 4). In this way it is not necessary to use a longer barrel or cylinder. The inner end of the indicating-lever 57, is provided with a pin 57', which extends over the top of the arm 30, which forms a stop to limit the downward motion of said lever (See Fig. 5).

A link or connector 60, attaches the end of said lever 57, to an arm 61, fast on a shaft 62, mounted in the lower part of the frame 2 (See Figs. 2, 3 and 5). A second arm 63, is also fast on said shaft 62, and is

connected by a link or connector 64, to the lower end of a switch-lever 65, pivoted at 66, on the head 36 (See Fig. 2). The upper end 65', of said lever 65, is adapted to extend under the pin or screw 35, in the outer end of the arm 34, as shown in Fig. 3, to cause said arm 34, to move up and down with the head 36, and rod 37, to operate the pattern-surfaces.

A guide plate or shield 66, is secured by the screw 35, to the end of the arm 34, as shown in Fig. 2, and extends over the slotted portion of the head 36, to hold the head in proper position relative to the arm 34. By means of the indicating-surface 58, through the lever 57, link 60, arm 61, shaft 62, arm 63, and connector 64, a positive motion is communicated to the switch-lever 65, to move the upper end 65', thereof out from under the pin 35, in the arm 34, as shown in Fig. 2, to allow the head 36, and rod 37, to move freely up and down without moving the arm 34.

The switch-lever 65, is provided with an outwardly extending arm 67, the outer end of which is adapted to ride over an inclined surface 68', on the lever 68, and extend into a notch 68", in the inner edge of said lever. A spring 69, acts to hold said arm 67, in engagement with said notch 68", in the lever 68, as shown in Fig. 2, and until said arm 67, is disengaged from said notch the switch-lever 65, will remain in the position shown in Fig. 2, in which position, as before stated, the head 36 and rod 37 are free to move up and down without moving the arm 34. Thus both the main pattern-chain and the auxiliary pattern-chain will remain at rest and the drop-boxes remain stationary while one shuttle is weaving in the body of the fabric.

To release the switch-lever 65, and allow the same to be moved back under the pin 35, to cause the arm 34 to be moved by the head 36, and rod 37 to operate the pattern-chains, the upper end of the lever 68, is connected through a connection 70, passing over a pulley 71, loose on the rock-shaft 31, and over a pulley 72, mounted on the loom side, (see Fig. 1) to a lever 73, pivoted at its lower end on a stud 74, in the stand 75, (see Fig. 6) and provided with an arm or lower lever 76, pivoted thereon to move in a horizontal plane. The free end of the arm or lever 76, is adapted to travel on the periphery of a disk 77, which is the indicating-disk, and in this instance is made integral with the gear 77', fast on the shaft 78, of the friction take-up roll.

A pinion 79, fast on a driven shaft 80, meshes with the teeth on the gear 77' (See Fig. 1). A spring 81, is attached at one end to the projection 82, on the stand 75 and at its other end to lever 73, and acts to hold projection 73', on lower part of said lever in engagement with the heel or projection 76', on the arm or lever 76, and the free end of the arm or lever 76, on the periphery of the disk 77 (See Fig. 7). Projections 73' and 76', are connected by a spring 85.

On the indicating-disk 77, are secured, in this instance, by screws 83, indicating devices or switch-cams 84, in this instance two in number.

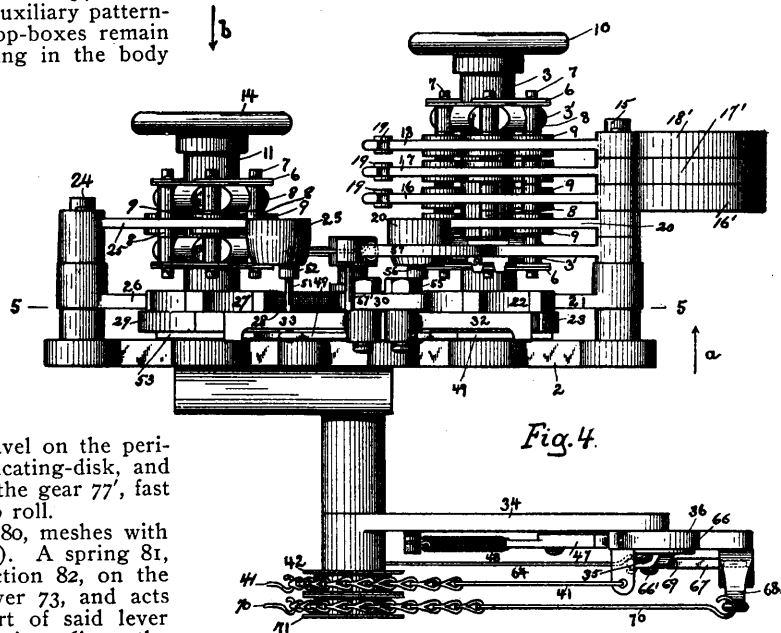
As the indicating-disk 77 revolves, the arm or lever 76 travels on the periphery thereof until it engages the curved plate 84', of the switch-cam 84, which extends over the periphery of the disk, as shown in Fig. 8. The curved plate 84', causes the arm 76, to leave the periphery of the disk 77, and the spring 81, acts to move the lever 73, on its pivot 74, and cause the free end of the arm 76, to drop into the notch 84", in the switch-cam 84, against the action of the spring 85. The movement of the lever 73, through connection 70,

moves the lever 68, inwardly at its upper end and disengages the arm 67, on the switch-lever 65, from the notch 68", in said lever 68, and allows the spring 69, to act to move the upper end 65', of the switch-lever 65, under the pin 35, in the arm 34 (See Fig. 3).

From the thus given description, in connection with the drawings, the operation of the supplemental mechanism, in connection with the operation of the main pattern-chain and the auxiliary pattern-chain mechanisms, will be readily understood.

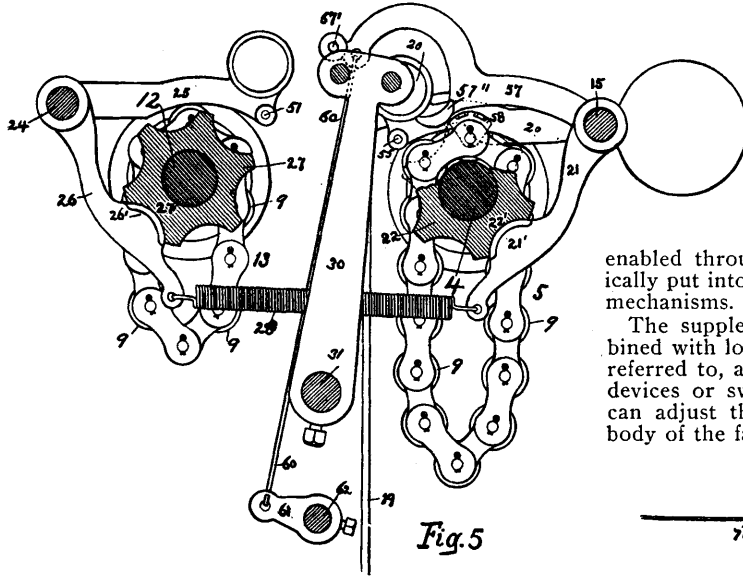
The pattern-surfaces are made up to produce the desired pattern in the fabric, and the indicators, which operate the supplemental indicating-lever 57, of the mechanism, are arranged according to the length of the body of the fabric to be woven, and the indicating devices or switch-cams 84, on the indicating-disk 77, are adjusted to correspond.

Supposing the parts to be in the position shown in Fig. 3 and the loom running, as long as a tube 8, on the main pattern-surfaces comes under the indicator-lever 20, said lever will stay down and through the pawl-shield 53, prevent the pawl 33, on the arm 30, from engaging with the ratchet-wheel 29, to turn the auxiliary pattern-chain 13, and a roll 9, on said auxiliary pattern-chain 13, being under the indicator-lever 25, (see Fig. 4) will hold said lever up and keep the end 49', of the pawl-shield 49, down, as shown in Fig.



2, so that the pawl 32, will engage with the ratchet 23, and turn the main pattern-chain 5. The next turn of the main pattern-chain 5, as shown in the drawings, will bring a roll 9, under the indicator-lever 20, (see Fig. 4) which will raise said lever and at the same time lower the end 53', of the pawl-shield 53, connected with said lever 20, so that on the return movement of the arm 30, the pawl 33, will engage with the ratchet-wheel 29, and move the auxiliary pattern-chain 13, to bring a tube 8, under the indicator-lever 25, (see Fig. 4) which will cause said lever to drop down and at the same time raise the end 49', of the pawl-shield 49, connected with said lever 25, so that on the return movement of the arm 30, the pawl 32, will be held out of engagement with the ratchet-wheel 23, thus leaving the main pattern-chain 5, at rest as long

as the multiplier-chain 13, runs and a tube comes under the indicator-lever 25. As soon as a roll 9, comes under said lever 25, the same is raised and the end 49', of the pawl-shield 49, dropped, and then the main pattern-chain 5, is operated, as before described, and so the operation continues until in the revolution of the main pattern-chain cylinder 3, the indicating surface 58, is brought under the projecting point 57', of the indicator-lever 57. The next revolution of the main pattern-chain cylinder will raise said indicating-lever 57, and, through link 60, arm 61, shaft 62, arm



63, and connector 64, move the switch-lever 65, into the position shown in Fig. 2. The switch-lever 65, will be held in this position by means of the arm 67, engaging the notch 68", in the lever 68, as above described. The head 36 and rod 37, are now free to move up and down without moving the arm 34, which operates the pawl-carrying arm 30. The body of the fabric is now woven, the main pattern-chain and the auxiliary pattern-chain remaining at rest.

The projecting end 57", of the indicating-lever 57, is so made relative to the indicating-surface 58, that it will engage said surface to operate the lever 57, in advance of the indicating-surfaces which act on the other levers over the main pattern-chain, and before the surface 58, reaches the top of the cylinder or barrel 3, (as shown in Fig. 5) the pawl-carrying arm 30, will continue to operate by the downward movement of the head 36, and arm 37, to move the cylinder 3, of the main pattern surface sufficiently to carry the indicating-surface 58, beyond the projecting end 57", of the indicating-lever 57, to allow said lever to drop at the proper time.

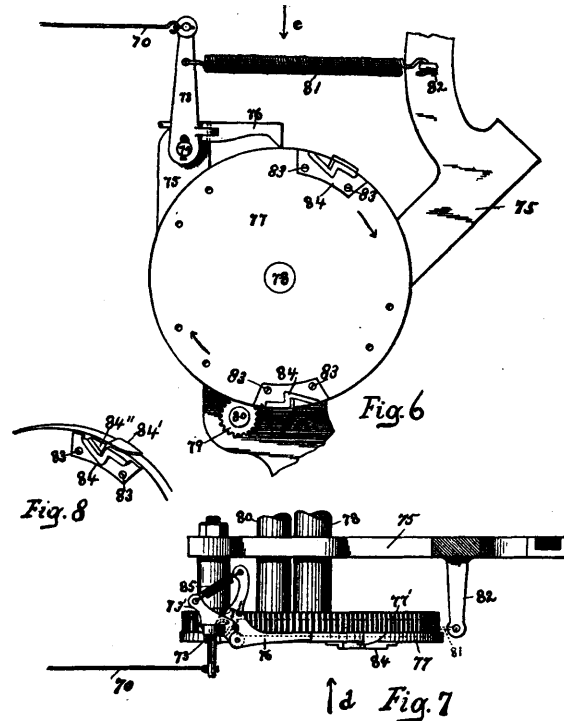
When the desired length of the body of the fabric is woven, the revolution of the indicating-disk 77, as the friction take-up roll is revolved, will bring the switch-cam 84, into engagement with the arm 76, and, through spring 81, lever 73, and cord connection 70, the lever 68, will be moved in at its upper end, releasing the switch-lever 65, which is then moved by the spring 69, into the position shown in Fig. 3, with the end 65', extending under the pin 35, in the arm 30. The main pattern-surface and the auxiliary pattern-surface are then again put into operation.

If at any time in the operation of the loom the fill-

ing runs out, the give-way or lock connection between the arm 34, and the head 36, on the rod 37, operates through the cord or chain 41, attached to the arm 45, on the filling-stop-motion shaft 46, to move in the head 36, and cause the pin 35, to extend into the upper slotted part 36', of the head 36, and allow said head and rod 37, to move up and down without moving the arm 34. After the filling is replaced the return movement of the filling-stop-motion shaft 46, will slacken the cord 41, and allow the spring-actuated pawl 47, to act to push out the head 36, and bring the pin 35, on the arm 34, into the notch 36', and hold it there to make a connection between said arm 34, and the head 36, on the connector-rod 37.

We are thus enabled, automatically, through a supplemental indicating-surface and mechanism operated thereby to automatically stop the operation of the main pattern-chain and the multiplier pattern-chain, and through an indicating-disk on the take-up-roll shaft or other driven shaft of the loom we are enabled through intervening connections to automatically put into operation the main and auxiliary pattern mechanisms.

The supplemental mechanism may be readily combined with looms of ordinary construction of the class referred to, and by means of the adjustable indicating devices or switch-cams on the indicating-disk 77, we can adjust the same according to the length of the body of the fabric desired to be woven without chang-



ing the disk. By changing the gears 77', and 79, we may vary the speed of the indicating-disk 77, to make it revolve faster or slower, as desired. (Crompton and Knowles Loom Works.)

THE KNOWLES FOUR CHAIN MULTIPLIER.

The object of this multiplier is to do away with indicator-disk on the previously explained multiplier on the take-up roll and the connections therefrom to the chain mechanisms, and to provide a four pattern-chain mechanism, which operates in connection with the main pattern-chain mechanism to start said mechanism instantly when desired, that is, to change on the pick. The fourth pattern-chain is also used in connection with the third pattern-chain as a multiplier chain in the same way as the ordinary multiplier chain is used in connection with the main pattern-chain. For example, if the third pattern-chain is weaving stripes by means of the fourth pattern-chain the stripes can be divided and additional stripes put in without increasing the length of the third chain.

In the accompanying illustrations the improvement is shown applied to a four-by-one drop-box loom combined with main and multiplier pattern-chain mechanisms.

Referring to the drawings, Fig. 1 shows a loom side, on the upper part of which is supported the box-pattern-indicating mechanism embodying the improvements and upon the lower part the box-shifting mechanism. Fig. 2 is a front view of the box-indicating mechanism shown in Fig. 1, looking in the direction of arrow *a*, Fig. 4. Fig. 3 is a rear view of the box-pattern-indicating mechanism, looking in the direction of arrow *b*, Fig. 4. Fig. 4 is a plan view looking in the direction of arrow *c*, Fig. 2. Fig. 5 is a vertical cross-section on line 5-5, Fig. 4, looking in the direction of arrow *a*, same figure. The parts shown at the left in Fig. 4 and some of the other parts are not shown in this figure. Fig. 6 is a vertical cross-section on line 6-6, Fig. 4, looking in the direction of arrow *a*, same figure; and Fig. 7 is a vertical section on line 7-7, Fig. 4, looking in the direction of arrow *a*, same figure. Figs. 2 to 7, inclusive, are shown on an enlarged scale compared to illustration Fig. 1.

In the accompanying drawings on the top of the loom side or end is supported the loom-arch stand 1, on the upper part of which is secured the stand or frame 2, on which are supported the several parts of the drop-box pattern-indicating mechanism.

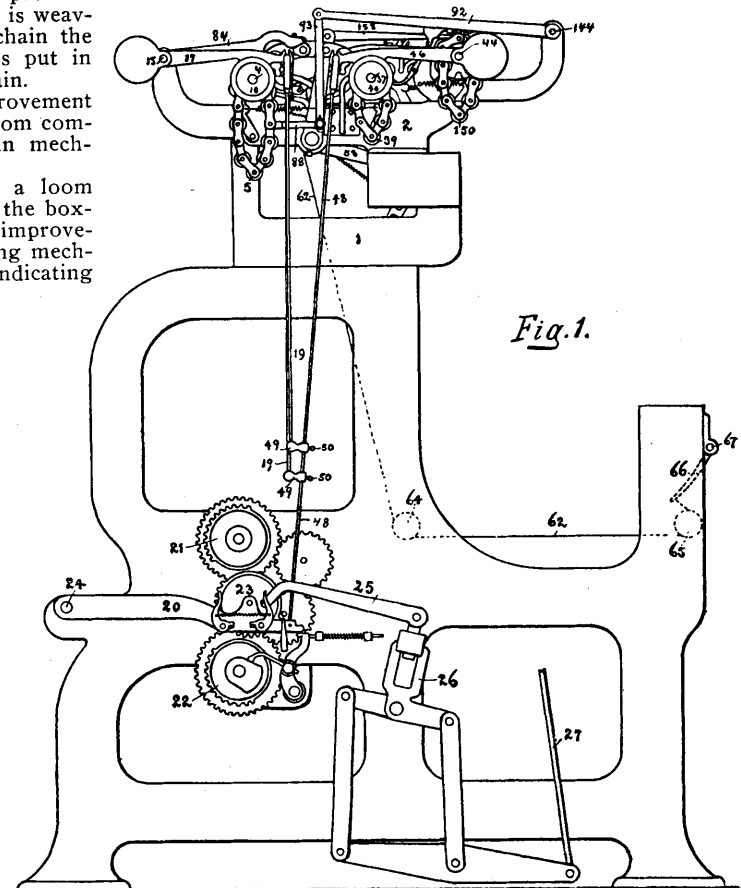
In said pattern-indicating mechanism, 3 is the main pattern-chain cylinder, loosely mounted on a stud 4, secured in the frame 2. Said cylinder or barrel 3, has grooved or notched heads or ends and carries the main pattern-chain 5, made up of links 6, which connect the bars 7, upon which are mounted tubes 8, and rolls 9. The cylinder 3, is provided with a hand-wheel 10, by means of which said cylinder is turned in either direction, as desired.

The auxiliary or multiplier pattern-chain cylinder 11, is loosely mounted on a stud 12, supported in the frame 2 and in the bracket 2', and in this instance upon the opposite side of the stand 2 from the main pattern-chain cylinder (See Fig. 4). The cylinder 11, carries the auxiliary or multiplier pattern-chain 13, made up of links 6, bars 7, tubes 8, and rolls 9, similar to the main pattern-chain 5. The cylinder 11, is provided with a hand-wheel 14, to turn said cylinder in either direction, as desired.

On a stud 15, secured in a boss 16, on one end of the stand 2, are loosely mounted the outer weighted ends of two shuttle-box-indicator levers 17 and 18, which

extend over and are operated by the main pattern-chain 5. The inner ends of the levers 17 and 18, are provided with open-end slots to receive the loops or heads 19', on the upper ends of the connector-rods 19, (see Figs. 1 and 2) which lead to the two connectors 48, to which they are adjustably attached by a collar 49 and set-screw 50 (See Fig. 1). The connector-rods 19, by reason of the open-end slots in the ends of the levers 17 and 18, can move up without raising said levers.

The connectors 48, are attached at their lower ends to the vibrator-levers 20, of the box-shifting mech-



anism shown in Fig. 1 and which consists of the upper and lower cylinder-gears 21 and 22, vibrator-gear 23, carried on the vibrator-lever 20, pivoted at its outer end at 24, and the vibrator-connector 25, pivoted at one end on the vibrator-gear 23 and at its other end to the compound lever 26, which operates the shuttle-box-lifter.

A ratchet-wheel 28, is mounted on the stud 4, and is secured to the main pattern-chain cylinder 3 (See Fig. 4). A stop-wheel 29, is also mounted on the stud 4, and secured to the ratchet-wheel 28, to turn with said ratchet-wheel. Said stop-wheel is provided with concave portions 29', in its periphery, into which is adapted to extend the convex portion 30', on the lock-lever 30, pivoted at 31, on the frame 2 (see Fig. 6), and connected by a spring 32, and link 32', to a similar lock-lever.

On the stud 12, of the multiplier pattern-chain cylinder 11, is mounted a ratchet 33, (see Figs. 4 and 7) which is secured to the multiplier pattern-chain cyl-

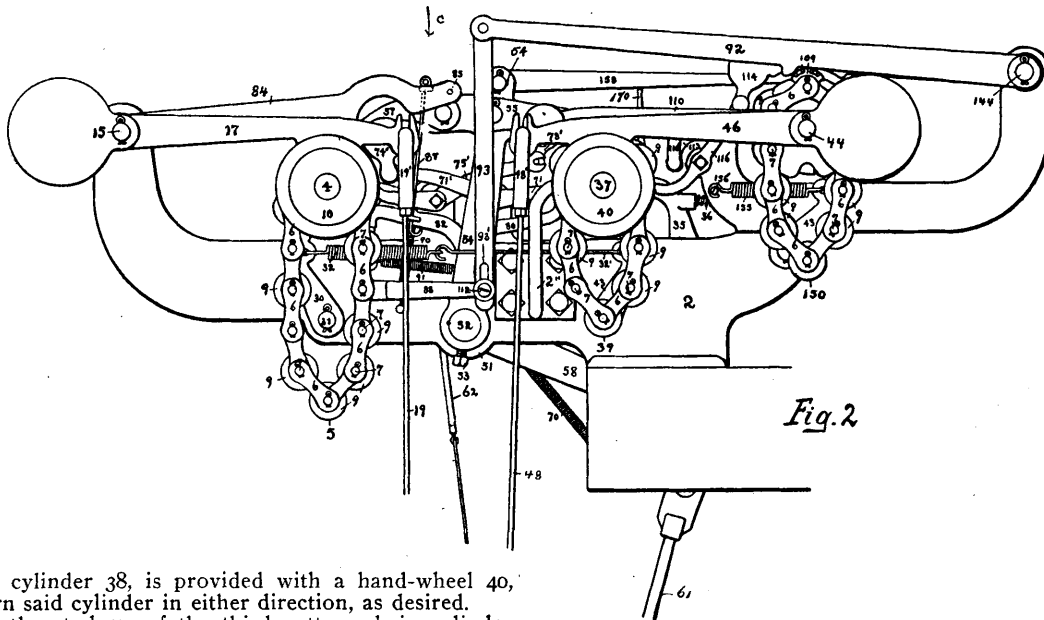
inder 11. A stop-wheel 34, (see Fig. 4) is also mounted on said stud 12 and secured to the ratchet-wheel to turn with said ratchet-wheel, and is provided with concave portions 34', in its periphery, into which extends a convex portion 35', on the lock-lever 35, pivoted at 35', on the frame 2 (See Figs. 3 and 7). A spring 36, encircling a pin 36', sliding at one end in an eye 36'', and secured at its other end to the lock-lever 35, (see Fig. 3) acts to hold said lever 35, in engagement with the stop-wheel 34.

We will now describe the third pattern-chain mechanism, combined with the main pattern-chain and the multiplier pattern-chain mechanisms above described and the shuttle-drop-box shifting mechanism and in this instance located at the front of the stand or frame 2, and in front of and in line with the multiplier pattern-chain 13.

On a stud 37, supported in the frame 2 and the bracket 2'', is loosely mounted a pattern-chain cylinder 38, carrying the supplemental pattern-chain 39, made up of links 6, bars 7, tubes 8, and rolls 9. The pattern-

It will be seen that the movement of the indicator-levers 17, and 18, on the main pattern-chain 5, through the connector-rods 19, attached to the connector-rods 48, will communicate motion to the vibrator-levers 20, of the box-shifting mechanism, and the indicator-levers 46 and 47, on the third pattern-chain 39, through connector-rods 48, attached to the vibrator-levers 20, will also communicate motion to said vibrator-levers 20, to operate the box-shifting mechanism.

We will now describe the fourth pattern-chain mechanism. On the stud 44, is loosely mounted a pattern-chain cylinder 149, carrying the fourth pattern-chain 150, made up of the links 6, bars 7, tubes 8, and rolls 9. On the stud 44, of the pattern-chain cylinder 149, is mounted a ratchet-wheel 151, which is secured to the pattern-chain cylinder 149. A stop-wheel 152, is also mounted on said stud 44, and is secured to the ratchet-wheel 151, to turn with said ratchet-wheel, and is provided with concave portions 152', in its periphery, into which is adapted to extend a convex portion



chain cylinder 38, is provided with a hand-wheel 40, to turn said cylinder in either direction, as desired.

On the stud 37, of the third pattern-chain cylinder 38, is mounted a ratchet-wheel 41, which is secured to said third pattern-chain cylinder 38. A stop-wheel 42, is also mounted on said stud 37, and is secured to the ratchet-wheel 41, to turn with said ratchet-wheel, and is provided with concave portions 42', in its periphery, in which is adapted to extend a convex portion 43', on the lock-lever 43, pivoted at 43'', on the frame 2, (see Fig. 6) and connected by a link 32', and a spring 32, to the lock-lever 30. The spring 32, acts to draw the lock-levers 30 and 43, toward each other, to hold them in engagement with the stop-wheels 29 and 42, as shown in Fig. 6.

On a stud 44, secured in a boss 45, on the frame 2, are loosely mounted the outer weighted ends of two shuttle-box-indicator levers 46 and 47, which extend over and are operated by the third pattern-chain 39. The inner ends of the levers 46 and 47, are in this instance provided with open end slots to receive the loops or heads 48', on the upper end of the connector-rods 48, and allow said rods 48, to move up without raising said levers. The lower ends of said rods 48, are attached to the vibrator-levers 20, of the box-shifting mechanism above described (See Fig. 1).

153', on the lock-lever 153, pivoted at 154, on the frame 2 (See Fig. 6). A spring 155, is connected at one end to said lock-lever 153, and at its other end to a pin 156, on the frame 2, and acts to hold the lock-lever in engagement with the stop-wheel 152, as shown in Fig. 6.

We will now describe the mechanism for operating the main pattern-chain 5, multiplier pattern-chain 13, and third pattern-chain 39, and fourth pattern-chain 150.

In the lower central part of the frame 2, in a boss 51, is mounted a shaft 52, (see Figs. 4 and 6) adapted to have a rocking motion. On the front end of the shaft 52, is secured by a set-screw 53, the lower end of the rocking pawl-carrying arm 54. Upon the upper end of said pawl-carrying arm 54, are pivoted four pawls 55, 56, 57, and 158. The pawl 55, acts as a pull-pawl and is provided with a hook 55', at its free end, which extends over and engages the teeth on the ratchet-wheel 41, to move said ratchet-wheel, and with it the pattern-chain cylinder 38, and the third pattern-chain 39. The pawl 56, is pivoted on the opposite side

of the pawl-carrying arm 54, from the pawl 55, and acts as a push-pawl, and its free end engages the teeth on the ratchet-wheel 33, to move said ratchet-wheel and with it the pattern-chain cylinder 11, and multiplier pattern-chain 13.

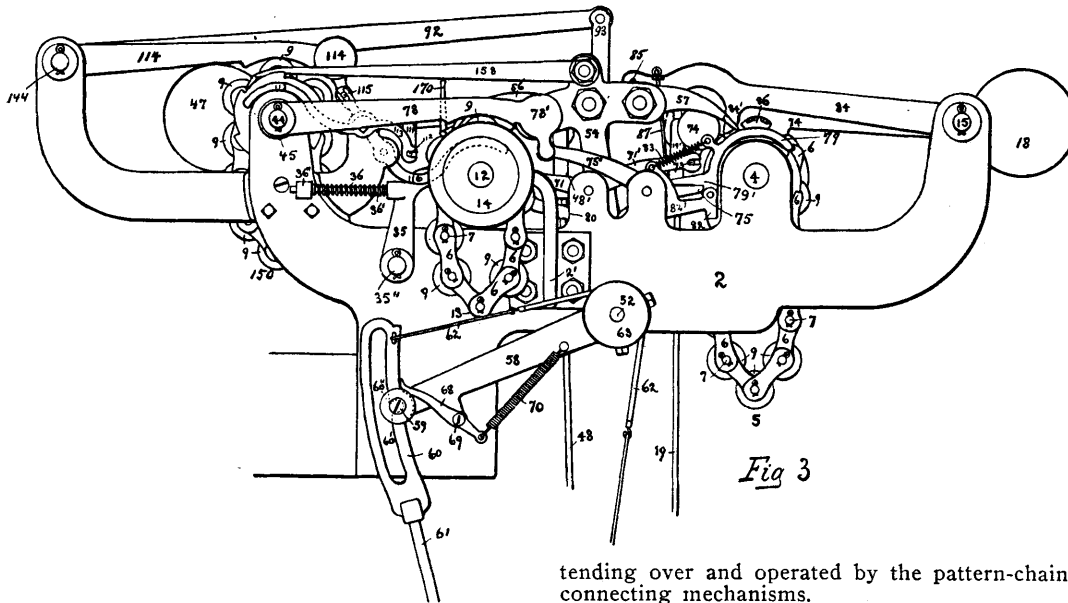
The pawl 57, is pivoted on the front of the pawl-carrying arm 54, and extends in an opposite direction to the pawls 55, and 56. Said pawl 57, acts as a push-pawl, and the free end thereof engages with the ratchet-teeth on the ratchet-wheel 28, to move said ratchet-wheel and the pattern-chain cylinder 3, and main pattern-chain 5. The pawl 158, is pivoted on the upper end of the pawl-carrying arm 54, and extends over the pawl 56, (see Figs. 4 and 6) and acts as a push-pawl, and engages the teeth on the ratchet-wheel 151, to move said ratchet-wheel and with it the pattern-chain cylinder 149, and the fourth pattern-chain 150. Upon the opposite end of the shaft 52, from the pawl-carrying arm 54, is secured the inner end of the arm 58, (see Fig. 3) which is connected through a give-way or lock connection with the driven part of the loom. Said lock connection and mechanism connected with the stop-motion shaft to automatically

connection 62, will be pulled to draw the head 60, of the connector-rod 61, to the right in Fig. 3, and move the screw or pin 59, out of the notch 60', into the slot 60'', to allow the head 60, and connector-rod 61, to move up and down without moving the arm 58, so that the pattern-indicating mechanism will be instantly stopped, though the loom may continue to run.

A pawl 68, pivoted at 69, on the arm 58, and bearing at one end against the inner edge of the head 60, and attached at its other end to one end of a spring 70, which is secured at its other end to the arm 58, acts to hold the screw 59, in the notch 60'', in the head 60, to form a lock connection between the connector-rod 61, and the arm 58.

We will now describe the mechanism for controlling the engagement of the pawls 55, 56, 57, and 158, with their respective ratchet-wheels, so that only one pattern-chain will be operated at a time—that is, the main pattern-chain, the multiplier pattern-chain, the third pattern-chain, and the fourth pattern-chain will be operated at the proper time.

The stopping and starting of the pattern-chains at the proper time is controlled by indicator-levers ex-



operate said lock connection and disconnect the arm 65, to stop the movement of said arm and the pawl-carrying arm 54, is of such construction that the movement of the four pattern-chains will cease in case the filling gives out and the filling stop-motion shaft acts to stop the loom.

The outer end of the arm 58, is provided with a screw or pin 59, which is adapted to engage a notch 60'', leading out from a vertical slot 60', in the head 60, on the upper end of the connector-rod 61. The lower end of said connector-rod 61, is connected with a cam on the bottom shaft or with some other driven part of the loom, (not shown) from which a continuous up-and-down motion is communicated to said rod 61, and, through the arm 58, to the rock-shaft 52 and the pawl-carrying arm 54.

From the head 60, of the connector-rod 61, a connection 62, leads over a pulley 63, loose on the shaft 52, (see Fig. 3) and over two pulleys 64, and 65, mounted on the loom side, (see broken lines, Fig. 1) to an arm 66, fast on the stop-motion shaft 67, so that when the loom is stopped by the stop-motion shaft in the ordinary way, in case the filling gives out, the

tending over and operated by the pattern-chains and connecting mechanisms.

As before stated, the main pattern-chain 5, is used to weave in the headings or borders and the multiplier pattern-chain 13, is used in connection with the main pattern-chain 5, to repeat certain bars of the main pattern-chain, the main pattern-chain being at rest while the multiplier pattern-chain is working and the multiplier pattern-chain being at rest while the main pattern-chain is working.

The third pattern-chain 39, is used for weaving the striped body of the fabric between the headings, and the fourth pattern-chain 150, is used in connection with the third pattern-chain 39, to repeat certain bars of said third pattern-chain, said third pattern-chain being at rest while the fourth pattern-chain is working and the fourth pattern-chain being at rest while the third pattern-chain is working. It will be understood that of the four pattern-chains only one is working at the same time.

In order to control the movement of the ratchet-wheel 33, of the multiplier pattern-chain mechanism, a shield or guard 71, is provided, which extends under the pawl 56, (see Fig. 4) to raise said pawl and prevent its engagement with said ratchet-wheel 33. The shield or guard 71, is pivoted at 72, on the stand 2,

(see Fig. 7) and has an extension or arm 71', on the opposite side of its pivot-support, the end of which is provided with an open-end slot into which extends a pin 73, extending out from the weighted end 74', of the indicator-lever 74, extending over the main pattern-chain 5, loosely mounted at its outer end on the stud 15 (see Fig. 4). It will thus be seen that the row of indicators on the main pattern-chain 5, under the indicator-lever 74, through said lever 74, pin 73, and the arm 71', and shield 71, controls the action of the pawl 56 of the multiplier pattern-chain mechanism.

A shield or guard 75, extends under the pawl 57, which moves the ratchet-wheel 28, of the main pattern-chain mechanism. The shield 75, is pivoted at 76, on the stand 2, (see Fig. 7) and has an arm or extension 75', on the opposite side of its pivot-support, the end of which is provided with an open-end slot into which extends a pin 77, extending out from the weighted end 78', of the indicator-lever 78, extending over the multiplier pattern-chain 13, and loosely mounted at its outer end on the stud 44 (See Figs. 4 and 7).

It will thus be seen that the row of indicators on the multiplier pattern-chain 13, under the indicator-lever 78, through said lever 78, pin 77, and the arm

rear extension 79', engaging with the upward extension 82', on the arm 82.

Extending over the main pattern-chain 5, is an indicator-lever 84, the outer end of which is mounted loosely on the stud 15, and the inner end provided with a pin 85, which extends over the top of the pawl-carrying arm 54, (see Fig. 4) to limit the downward motion of said lever at its free end. The indicator-lever 84, has a downward extension 84' thereon, (see Fig. 3) which is adapted to be engaged by an indicator 86, on the main pattern-chain.

The indicators which act on the indicator-lever 84, form a separate row of tubes and rolls between the heads or ends of the pattern-cylinder, or, as in this instance, the indicators may be substituted for one of the tubes which extend into the notches or grooves in the ends of the cylinder or barrel (See Fig. 4).

A link 87, connects the outer end of the indicator-lever 84, with the arm 82, forming a part of the shield 80 (See Fig. 2).

An angle-lever 88, (see Figs. 6 and 7) is pivoted at 89, on the frame 2, and is provided with a notched portion 88', in the upper end of its vertical arm, into which a downward extension 82'', on the arm 82, is adapted to extend. A spring 90, attached to the arm

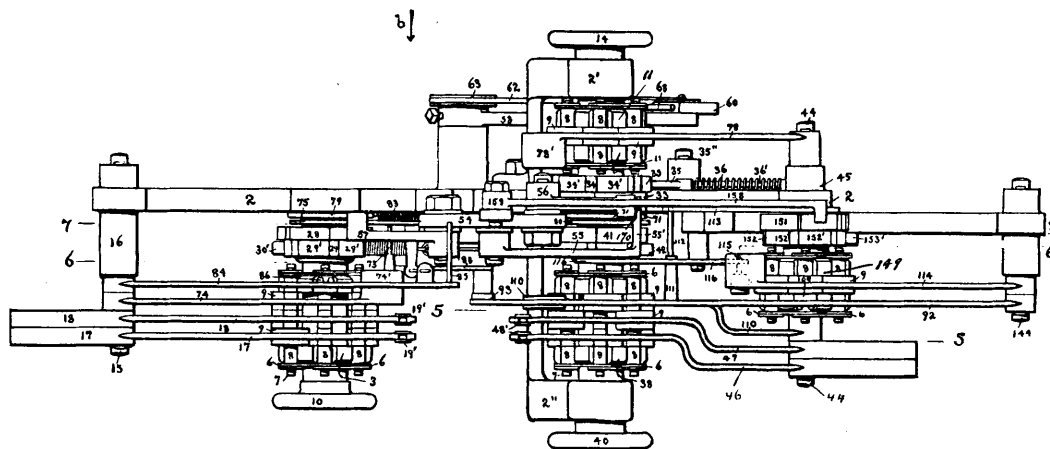


Fig. 4

75' and shield 75, controls the action of the pawl 57, of the main pattern-chain mechanism, in connection with a shield or guard 79, connected with the third pattern-chain mechanism.

We will now describe the construction and operation of the shield or guard which extends under the pawl 55, which operates the ratchet-wheel 41, of the third pattern-chain 39.

The shield or guard 80, is pivoted at 81, on the stand 2 (See Fig. 7). Said shield or guard extends under the projecting end 55', of the operating pawl 55, of the third pattern-chain 39 (See Fig. 4). Upon the opposite side of the pivot 81, of the shield 80, is an extension or arm 82, upon the outer upper end of which is pivoted the lower end of the shield or guard 79, which extends under the pawl 57, of the main pattern-chain mechanism and operates in connection with the shield 75, as above stated.

The shield 79, has a pivotal motion in a vertical plane on the supporting arm 82, and is provided with a rear extension 79', which engages an upward extension 82', on the arm 82. A spring 83, attached to the shield 79, and to the upward extension 82', (see Fig. 3) holds the shield 79, in its raised position with the

82 and to the stand 2, and a spring 91, attached to the angle-lever 88 and to the stand 2, act to hold the arm 82, and the angle-lever 88, in engagement, as shown in Figs. 6 and 7.

Upon the stud 144, is loosely mounted the outer end of the indicator-lever 92, (see Figs. 2 and 4) which extends over and is acted on by indicators on the fourth pattern-chain 10. On the inner end of the indicator-lever 92, is hung the upper end of a connector 93, which has a vertical slot 93', in the lower end thereof, through which extends loosely a screw 112, secured in the end of the lower arm of the angle-lever 88 (See Fig. 2).

In the revolution of the fourth pattern-chain 150, when the pattern-indicator 109, comes under the lever 92, said lever will be raised and with it the connector or arm 93, (see Figs. 2 and 6) causing the angle-lever 88, through the engagement of the pin 112, thereon with said arm 93, to move on its pivotal support and be disengaged from the arm 82, of the shield 80, and allow the spring 90, to act to draw down the arm 82, and with it the shield 79, so that the pawl 57, can engage with the ratchet-wheel 28, of the main pattern-chain mechanism and put said mechanism into opera-

tion. At the same time the shield 80, is raised to hold the pawl 55, out of engagement with the ratchet-wheel 41, of the third pattern-chain mechanism to stop said mechanism. As soon as the pattern-indicator 109, passes from under the lever 92, said lever drops down at its free end and with it the connector 93, the slot 93' in said connector 93, allowing the connector to drop without moving the angle-lever 88.

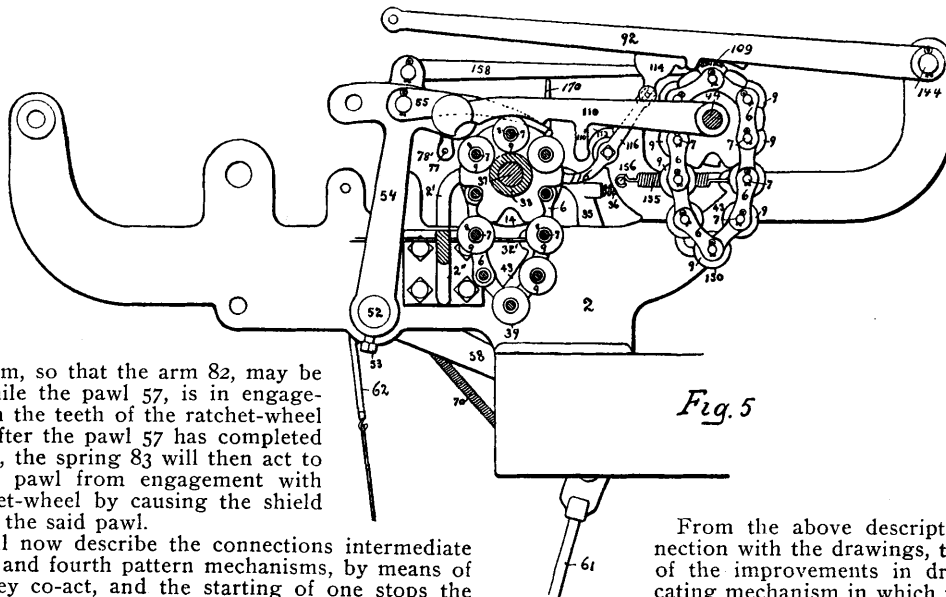
The revolution of the main pattern-chain 5, brings at the proper time the pattern-indicator 86, on said chain under the indicator-lever 84, and raises said lever 84, and through the link 87, raises the arm 82, and allows the spring 91, to act to draw over the angle-lever 88, and bring the end thereof under the arm 82, and hold it in its raised position, as shown in Fig. 7. The raising of the arm 82, raises the shield 79, under the pawl 57, of the main pattern-chain mechanism and lowers the shield 80, under the pawl 55, of the third pattern-chain mechanism, as shown in Fig. 7.

The shield 79, extending under the pawl 57, of the main pattern-chain mechanism, is pivoted to the arm 82, to have a movement in a vertical plane independent

Extending out from the inner end of the indicator-lever 114, is a pin 115, which extends into the open-end slot in one end of the shield or guard 116, centrally pivoted on the frame 2 (See Fig. 6). The opposite end of the shield or guard 116, extends under the pawl 55, which engages the ratchet-wheel 41, to operate the third pattern-chain 39.

It will be seen that in the revolution of the fourth pattern-chain 150, when a roll comes under the indicator-lever 114, said lever will be raised and move the shield 116, on its pivotal support and cause one end of the shield to be raised and the other end under the pawl 55, to be lowered to allow said pawl 55, to drop down and engage the ratchet-wheel 41, to put into operation the third pattern-chain 39.

The third and fourth pattern-chains cooperate to weave the fabric according to the pattern, the fourth pattern-chain acting as a multiplier for the third pattern-chain in the same manner that the first and second pattern-chains cooperate to weave the fabric, the second pattern-chain acting as a multiplier for the first pattern-chain.



of said arm, so that the arm 82, may be raised while the pawl 57, is in engagement with the teeth of the ratchet-wheel 28, and after the pawl 57 has completed its stroke, the spring 83 will then act to carry the pawl from engagement with the ratchet-wheel by causing the shield 79, to lift the said pawl.

We will now describe the connections intermediate the third and fourth pattern mechanisms, by means of which they co-act, and the starting of one stops the other, and *vice versa*.

On the stud 44, is loosely mounted the end of an indicator-lever 110 (see Fig. 4) the inner end of which extends over the third pattern-chain 39 (See Fig. 5). Extending down from the indicating-lever 110, is an extension 110', which has at its lower end a boss 111, extending out at right angles therefrom (See Fig. 4). In said boss is secured a pin 112, which extends into the open-end slot in one end of the shield or guard 113, centrally pivoted on the frame 2 (See Figs. 3 and 6). The opposite end of the shield or guard 113, extends under the pawl 158, which engages the ratchet-wheel 151, to operate the fourth pattern-chain 150.

It will be seen that in the revolution of the third pattern-chain 39, when a roll 9, comes under the indicator-lever 110, said lever will be raised and move the shield 113, on its pivotal support and cause one end of said shield to be raised and the other end under the pawl 158, to be lowered to allow said pawl 158, to drop down and engage the ratchet-wheel 151, to put into operation the fourth pattern-chain 150, as shown in Fig. 3.

On the stud 144, is loosely mounted the outer end of an indicator lever 114, (see Fig. 4) the inner end of which extends over the fourth pattern-chain 150.

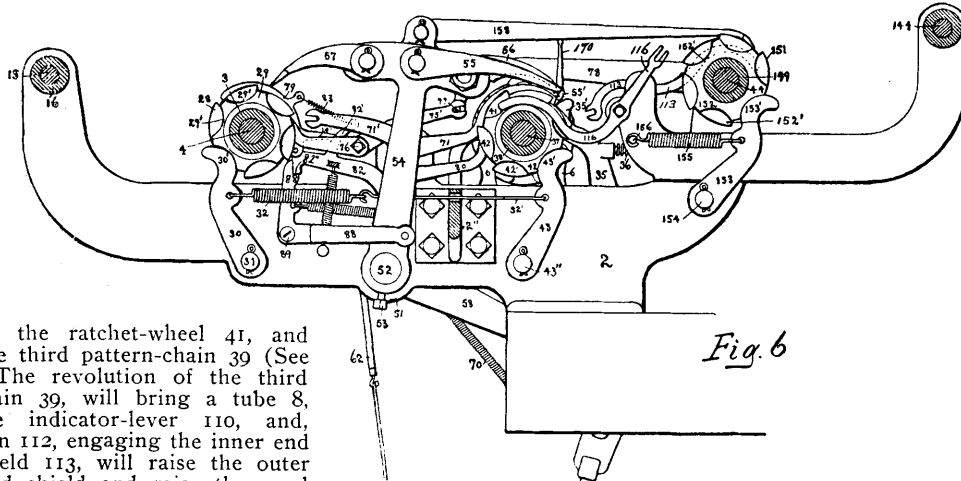
From the above description, in connection with the drawings, the operation of the improvements in drop-box-indicating mechanism in which four pattern-chains are used will be readily understood.

Suppose the loom is running, with the third pattern-chain 39, in operation, to weave the striped body of a blanket between the headings or borders, in case a blanket is being woven, the other three pattern-chains will be at rest.

When a roll 9, on the third pattern-chain 39, comes under the indicator-lever 110, (see Fig. 4) said indicator-lever will be raised, and through pin 112, engaging the inner end of the shield 113, (see Fig. 6) the outer end of said shield will be dropped to allow the pawl 158, to engage and operate the ratchet-wheel 151, of the fourth pattern-chain 150. The revolution of the fourth pattern-chain 150, will bring a tube 8, on said pattern-chain under the indicator-lever 114, and will cause said lever 114, to drop, and through the pin 115, engaging the outer end of the shield 116, will raise the inner end of said shield 116, (see Fig. 6) and raise the pawl 55, out of engagement with the ratchet-wheel 41, of the third pattern-chain mechanism, so that the third pattern-chain 39, will stop. The fourth pattern-chain 150, will continue to run and repeat the bars of the third pattern-chain 39, until a roll 9, comes under the indicator-lever 114.

The lever will then be raised, and through pin, 115, the outer end of the shield 116, will be raised and the inner end will be dropped, allowing the pawl 55,

until a roll 9, comes under the lever 84, which will raise said lever and, through pin 73, thereon engaging the arm 71', of the shield 71, (see Fig. 7) lower said

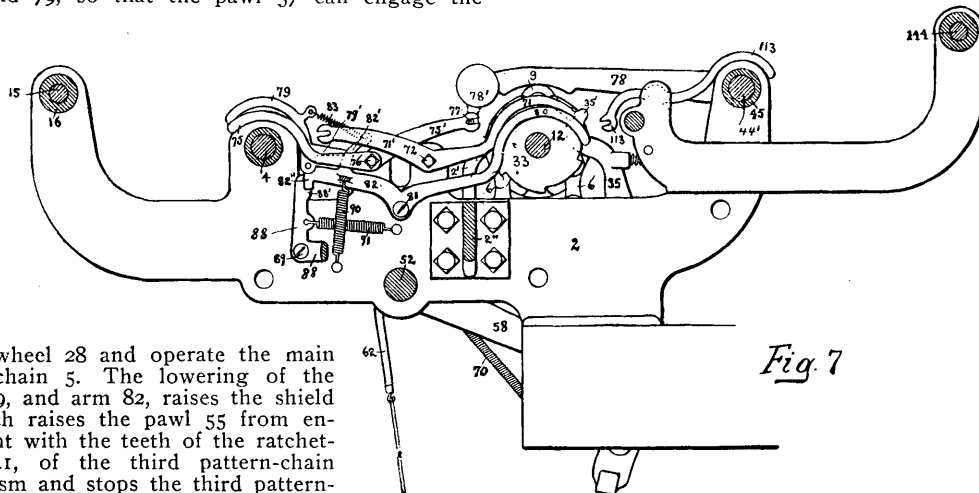


to engage the ratchet-wheel 41, and operate the third pattern-chain 39 (See Fig. 6). The revolution of the third pattern-chain 39, will bring a tube 8, under the indicator-lever 110, and, through pin 112, engaging the inner end of the shield 113, will raise the outer end of said shield and raise the pawl 158, out of engagement with the ratchet-wheel 151, of the fourth pattern-chain mechanism, and the fourth pattern-chain 150, will stop.

This operation will be repeated, according to the arrangement of the third and fourth pattern-chains, the fourth pattern-chain acting as a multiplier for the third pattern-chain and the two chains weaving the striped body of the fabric between the headings or borders. In the revolution of the fourth chain 150, when the indicator 109, thereon engages the indicator-lever 92, as shown in Fig. 5, then said lever 92, will be raised and, through connector 93, (see Fig. 2) will rock the angle-lever 88 and disconnect the upright arm thereof from the extension 82", on the arm 82, (see Fig. 7) and allow the outer end of said arm 82 to drop down, actuated by the spring 90, and with it the shield 79, so that the pawl 57 can engage the

shield 71, and allow the pawl 56, to drop and engage the ratchet-wheel 33, to operate the second or multiplier pattern-chain 39. The revolution of the chain 39, will bring a tube 8, under the lever 78, (see Fig. 7) and, through the pin 77, on said lever engaging the arm 75', of the shield 75, will raise said shield 75, and disengage the pawl 57, from the ratchet-wheel 28, so that the main pattern-chain 5, will stop. When in the revolution of the second pattern-chain 39, a roll 9, comes under the lever 78, (see Fig. 7) the shield 75, is lowered, allowing the pawl 57, to operate the main pattern-chain 5, and this operation is repeated as desired, the second pattern-chain 39, acting as a multiplier for the main pattern-chain 5, in weaving the headings or borders of the goods.

When in the revolution of the main pattern-chain 5,



ratchet-wheel 28 and operate the main pattern-chain 5. The lowering of the shield 79, and arm 82, raises the shield 80, which raises the pawl 55 from engagement with the teeth of the ratchet-wheel 41, of the third pattern-chain mechanism and stops the third pattern-chain 38, and a post or stud 170, fast at its lower end on the outer end of the extension 55' of the pawl 55 and extending under and engaging with its upper end the pawl 158, acts to hold the pawl 158, out of engagement with the ratchet-wheel 151, of the fourth pattern-chain mechanism, so that the movement of the pawl-carrying arm 54, to the right, Fig. 6, will not operate the fourth pattern-chain 150.

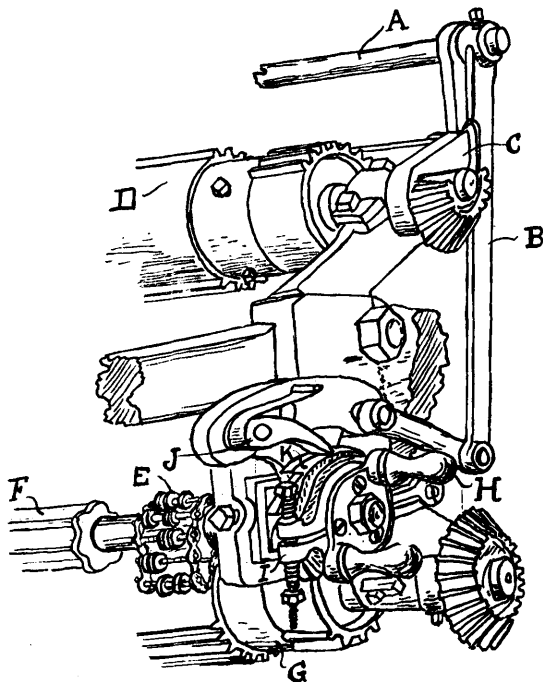
The main pattern-chain 5, will continue to operate

the indicator 86 thereon comes under the lever 84, it will raise said lever and through link 87, will raise the arm 82, of the shield 79, to allow the spring 91, to act and draw the vertical arm of the angle-lever 88 under the arm 82. The raising of the arm 82, will raise the shield 79, to disengage the pawl 57, from the ratchet-wheel 28, and stop the main pattern-chain 5, and, at the same time lower the shield 80, to allow the

pawl 55, to engage the ratchet-wheel 41, and operate the third pattern-chain 39. The lowering of the shield 80, and the pawl 55, will, through pin 170, lower the pawl 158, so that it will engage the ratchet-wheel 151, and move the fourth pattern-chain 150, once on the movement of the pawl-carrying arm 54 to the right, Fig. 6. The movement of the pawl-carrying arm 54 to the left, Fig. 6, will move the third pattern-chain 39, and bring a tube under the indicator-lever 110, to raise the shield 113, and thus hold the pawl 158, out of engagement with the ratchet-wheel 151 and prevent the turning of the fourth pattern-chain 150, on the return movement of the pawl-carrying arm 54, Fig. 6, to the right. The third pattern-chain 39 and the fourth pattern-chain 150 will then operate, as before described, to weave the striped body of the goods. It will be seen that the four pattern-chains all co-operate, and the stopping of one starts another, etc. It will also be seen that when the indicator 109, on the fourth pattern-chain 150, in the revolution of said chain comes under the lever 92, the shield 79, through connector 93 and angle-lever 88, is instantly dropped to allow the pawl 57, of the main pattern-chain mechanism to put into operation the main pattern-chain 5, and this change is made instantly or on the pick without any possibility of an extra pick or two being put into the fabric before the main pattern-chain 5, starts. (*Crompton and Knowles Loom Works.*)

THE KNOWLES SHAWL LOOM BOX PATTERN MECHANISM.

This mechanism is to be used on looms for weaving shawls and so forth where the goods have a plain body



and a striped border; the mechanism being operated by the weaver while the loom is running.

The mechanism will be best understood by referring to the following letters:—A, is the hand-shaft for calling box chain movement; attached to A, is a rod

which extends across the entire width of the loom; B, is the cam-lever which rides on the cam C; D, is the top cylinder; E, is the box pattern-chain and cylinder which is loose on the end of the harness cylinder shaft; F, is the harness cylinder; G, is bottom cylinder; H, is a handle by which the box pattern-chain can be turned independently of the rest of the mechanism; I, is a friction upon the box chain shaft; J, is the pawl which turns the ratchet K, and the box chain; the ratchet K, being fixed to the pattern-chain.

In order to operate the mechanism the weaver pulls the rod (not shown) attached to the end of the rod A. This turns the rod A, and brings the lever B, against the cam C, and as the cam revolves it turns the ratchet K, one tooth and consequently the box pattern-chain one bar.

Once pulling the handle attached to A, only turns the box pattern-chain once so that the weaver must pull the handle each time a change is required. (*Crompton and Knowles Loom Works.*)

HUTCHIN'S FANCY COTTON AND SILK DOBBY PATTERN MECHANISM.

In the new mechanism the driving of the dobbie pattern-chain, the box pattern-chain and the Knowles sliding pin wheel multiplier is trained together and so arranged that in picking out imperfect work or turning back the pattern-chains for any purpose the patterns can never get out of time with each other.

The stop motion is also connected to the pattern-chain driving so that whenever the filling breaks or runs out the pattern mechanism is automatically stopped on the pick in which the filling failed, making it unnecessary for the operator to turn back the patterns for failure of the filling.

Fig. 1 shows a plan view of the drop box pattern mechanism, and a double index dobbie pattern mechanism (of which only a portion of the pattern cylinder and its mechanism is shown), with the improvements applied to said pattern mechanism. Fig. 2 is, on a reduced scale, an end view of the parts shown in Fig. 1, looking in the direction of arrow a, same figure, and shows also the loom side, and connections to the arm on the knock-off shaft. Fig. 3 is an edge view of the frame shown in Fig. 2, looking in the direction of arrow b, Fig. 2, showing by full lines the connections shown by dotted lines in Fig. 2. The pattern mechanisms are not shown, and, Fig. 4 is a sectional detail, through the gear and slide clutch, shown at the top of Fig. 1.

1, indicates the loom side or frame, at the left of the loom; 2, the dobbie frame, supported on the upper end of the frame 1, and having the two upright side frames 3, in which is mounted the shaft 4, of the dobbie pattern cylinder 5, for the harness frames, not shown. The pattern cylinder 5, is provided with a series of longitudinal grooves or recesses 6, in which extend the bars of the pattern-chain. Only one pattern-chain bar (7) is shown, and this is provided with two rows of pattern-pins 8 and 9, arranged alternately, for what is termed a double index dobbie. The pins 8 and 9, act on the indicator-levers (not shown) of the dobbie.

The end of the pattern cylinder shaft 4, extends beyond the inner side frame 3, and has a worm gear 10, loose thereon, which is held to turn with the shaft 4, by a spring-actuated clutch device 11, consisting of a spring-actuated arm or dog 11', pivoted at one end on a plate 11'', the hub 11''', of which is fast on the shaft 4.

A coil spring 12, bearing at one end against a collar 12', fast on the end of the shaft 4, and at its other

end against the arm or dog 11', acts to keep the said dog 11', in engagement with the lugs 10', on the worm gear 10, so that the revolution of the gear 10, will revolve the shaft 4, of the pattern-cylinder 5. The shaft 4, can be turned by hand, if desired, the dog 11', slipping by the lugs 10', on the worm gear 10, and the spring 12 contracting, so that the shaft 4 and pattern cylinder 5 may be turned in either direction, independently of said worm gear 10.

Secured to the dobby mechanism frame 2, is the frame 13, which in this instance supports the drop box pattern mechanism, and also the shaft 14, which drives

A lever 19, pivoted at 20, is provided with a yoke 19', having pins or rolls which extend into the peripheral groove in the hub 16. The lever 19, is used to move said hub in one direction or the other, to secure the gear 15 to the shaft 14, or to cause it to run loose thereon, as above described. A spring 21, encircles the pivot stud 20, of the lever 19, and acts to move the lever 19 in one direction, to keep the hub 16 against the collar 18, as shown in Fig. 1 and the pin 17 in the hole 15' in the gear 15.

The lever 19, is operated automatically, to move the hub 16 and withdraw the pin 17, from the hole 15' in

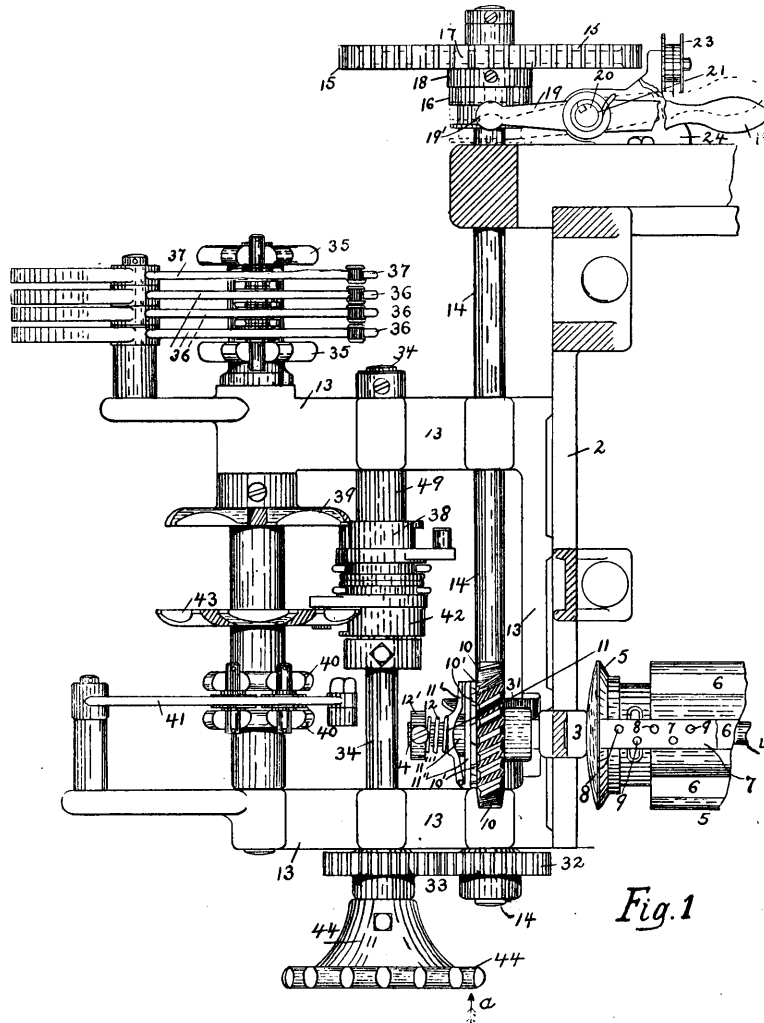


Fig. 1

the dobby pattern-chain cylinder 5 and the pattern surfaces of the drop box pattern mechanism. The shaft 14, has a gear 15, loose thereon, driven by a system of gears, or some driven part of the loom, not shown. Said gear 15 is attached to said shaft, to revolve the same, by means of a sliding grooved hub 16, and carrying a pin 17, which extends through a guide hole in a collar 18, fast on the shaft 14, (see Fig. 4) and is adapted to enter a hole 15' in the gear 15, to cause the shaft 14 to be revolved with the gear 15, and to be withdrawn from said hole, to allow the gear 15, to run loose on the shaft 14 (See Fig. 4).

the gear 15, and allow said gear 15 to run loose on the shaft 14 and said shaft to stop, by a cord or flexible connection 22, which is secured at one end to the lever 19 in front of its pivot point 20, and runs over a pulley 23 supported on an arm 24, over a second pulley 25, and a third pulley 26 supported on the loom side, to an arm 27, fast on the knock-off shaft 28, mounted to rock in bearings 29, on the front of the breast beam 30 (See Figs. 2 and 3).

On the opposite end of the shaft 14 from the gear 15, is fast a worm 31, which extends below and engages and turns the worm gear 10. The worm 31 has

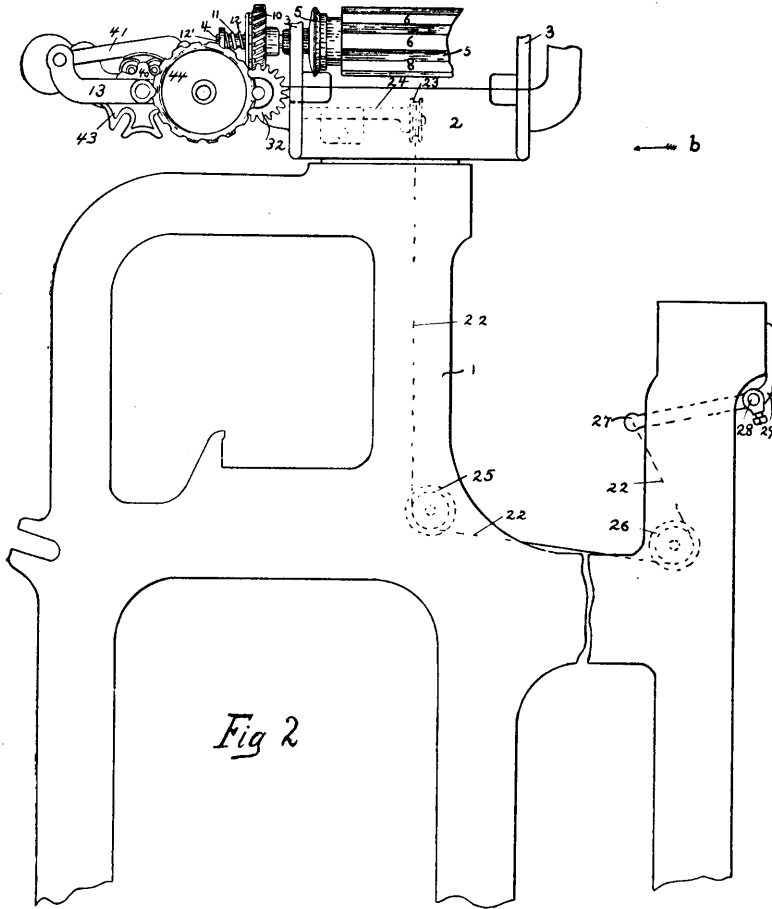


Fig 2

of engagement, or into engagement, with the star wheel 43, which operates the multiplier pattern chain cylinder 40, according to the indications of the box pattern chain, and the multiplier pattern chain. The box chain and the multiplier chain are operated in the manner fully explained in the article on the mechanism for operating shedding and drop-box pattern indicators for Knowles looms.

On the front end of the shaft 34, is fast a hand-wheel 44, by means of which both, the box pattern chain mechanism and the dobby pattern chain mechanism, through gears 33 and 32, are simultaneously turned backward or forward, the hand-lever 19, being first moved to the position indicated by dotted lines, Fig. 1, to disengage the pin 17 on hub 16 from the hole 15' in the gear 15, and allow the gear to be loose on the shaft 14. (Crompton and Knowles Loom Works.)

a dwell of one-half a revolution, as there are two sets of pins 8 and 9 on the pattern bars, and therefore a partial revolution of the worm gear 10, and pattern cylinder 5, is made only every two picks.

On the extreme end of the shaft 14 is fast a gear 32, which meshes into and drives a gear 33, fast on the shaft 34, of the drop box pattern mechanism. By means of the gears 32 and 33, the dobby pattern cylinder and the drop box pattern cylinders are connected, so that the turning of one in either direction will turn the other simultaneously.

In the drop-box pattern mechanism, 35 indicates the box pattern chain cylinder; 36, the pattern indicator levers for a series of six drop boxes, not shown. 37, is the indicator lever, connected through connectors and levers, not shown, with the pin wheel 38, splined on a sleeve 49, fast on the shaft 34, to slide said pin wheel 38, out of engagement, or into engagement with the star wheel 39, which operates the box pattern cylinder 35, in the ordinary way.

40, is the auxiliary or multiplier pattern chain cylinder, used in this instance, and 41, the indicator lever thereof, connected through connectors and levers, not shown, with the pin wheel 42, splined on the sleeve 49, to slide said pin wheel 42, out

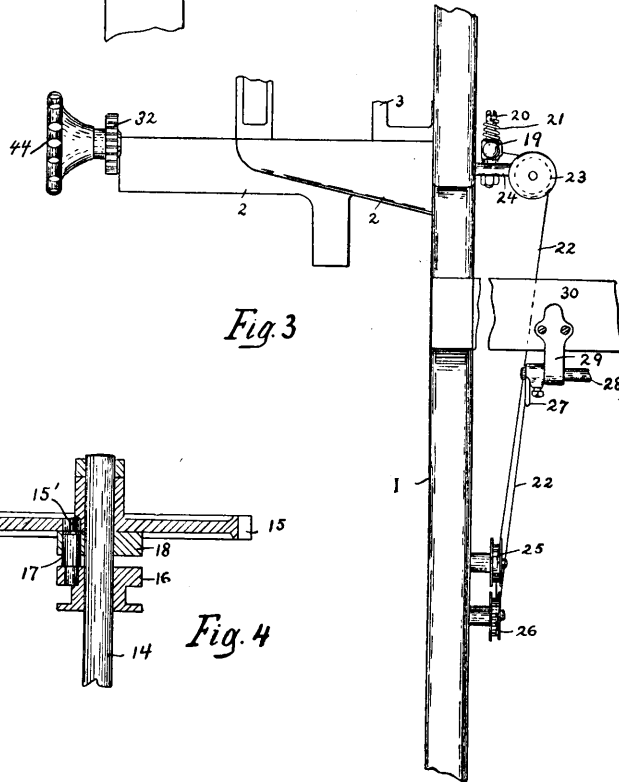


Fig. 3

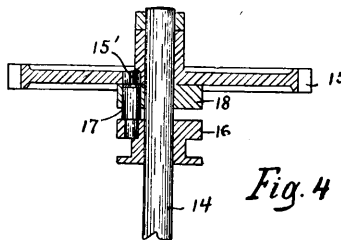


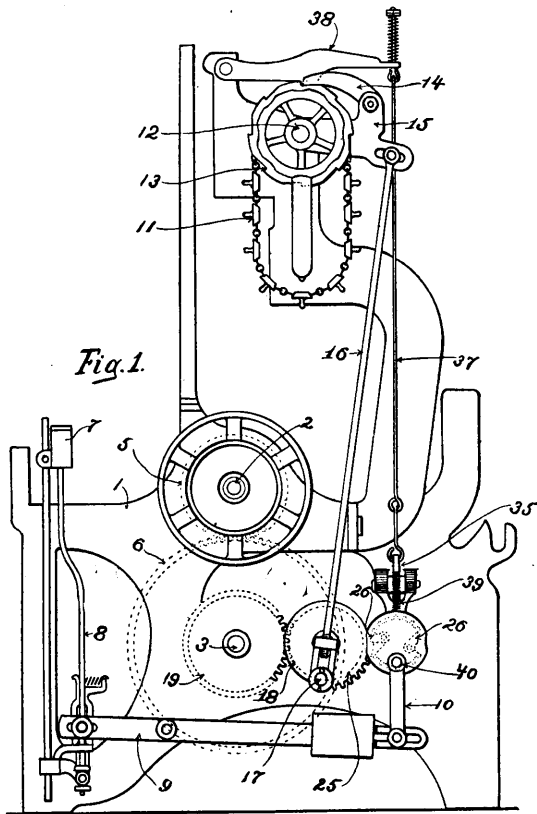
Fig. 4

BOX-MOTION FOR WITCH LOOMS.

Fig. 1 of the drawings shows in side elevation the framing of a loom having the improvement applied thereto, Fig. 2 shows in rear elevation the box-operating crank and its immediate connections, part of the support being in vertical section.

1, indicates the loom-framing; 2, the crank-shaft of the loom; 3, the cam-shaft; 5, 6, are the gear-wheels by which motion is transmitted from the crank-shaft to the cam-shaft; 7, represents the shuttle-boxes; 8, the box-rod; 9, is the box-lever; 10, is the operating connecting-rod, which joins the rear end of the said box-lever 9, with the operating-crank 40.

11, is the pattern-chain for the box-motion, it passing around a chain-barrel which is mounted on the shaft 12, the latter being supported by the elevated part of the loom-framing.



13, is the ratchet-wheel, which is connected with the pattern-barrel 12. 14, is the pawl which engages with the ratchet-wheel 13, for the purpose of actuating the pattern-barrel and pattern-chain. 15, is the swinging arm or carrier on which the pawl 14, is pivoted. 16, is the connecting-rod, which joins the said arm or carrier 15 to the crank 17, on the gear 18. 19, is a gear on the cam-shaft 3, which engages with gear 18 to rotate the latter.

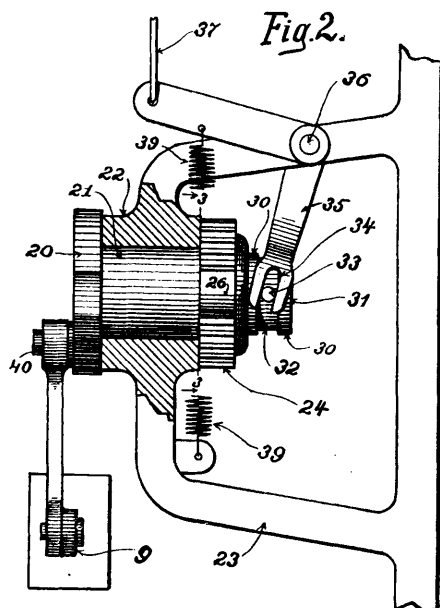
The crank 40, is carried by a disk 20, having a hub 21, which latter is mounted to turn in a bearing 22, that is provided in a bracket 23, which is applied to the loom-framing. 24, is a partially-toothed gear which is connected with the hub 21, so that the said gear and the disk 20, with its crank 40, rotate in unison. This gear has blank or toothless spaces at one hundred and eighty degrees apart, these spaces separating the teeth of gear 24 into two segments.

25, is a segment-gear which is connected with gear 18, and rotates in unison therewith. This segment-gear constitutes a moving toothed surface for engagement with the gear 24, and its teeth are sufficient in number to act, in connection with one of the gear-segments of gear 24, and with also one of the rocking teeth which are referred to hereinafter, to occasion a semirotation of said gear 24, and the hub and crank-disk which are connected therewith, so as through connecting-rod 10 to move the box-lever 9 and shift the boxes 7.

26, are rocking teeth which are applied to the partially-toothed gear 24, at the blank spaces of the latter, the said gear 24 being recessed where the said blank spaces exist for the reception and play of the said rocking teeth. Each rocking tooth 26, has a hub portion, the latter having a hole for the passage of a pivotal pin, by which to pivotally connect it with the gear 24. Each of the said rocking teeth has also a pin or projection by means of which to move the tooth on its pivot. The pins or projections of the two rocking teeth engage the cam-slots formed in the concave outer faces of the two longitudinal portions or arms of an actuating cam-piece 31, having collars 30, between which is received a ring 32, having pins 33, at opposite sides thereof playing in slots 34, in the extremities of the members of the forked depending arm of a bell-crank 35. Said bell-crank is pivoted at 36, to the bracket 23, and has joined thereto the lower end of a connection or wire 37, the upper end of which is connected with the pattern finger or lever 38, which latter rests upon the pattern-chain and is acted by the risers thereon. The said risers act, through the said pattern-finger and the other devices which have been described, to move the cam-piece 31, lengthwise in one direction—for example, toward the left in Fig. 2. For the purpose of moving the said cam-piece in the reverse direction—namely, toward the right in Fig. 2—the spring 39, is employed, it having one end thereof connected with one arm of the bell-crank 35, and the other end thereof connected with a suitable portion of the framing.

Each cam-slot has two straight portions extending parallel with the length of the cam-piece 31, and on different lines which are parallel to each other, these parallel portions being connected by inclined portions, which constitute rests to hold the respective rocking teeth 26, fixed in the respective positions which are given them by each lengthwise movement of the cam-piece, the inclined connecting portions of the slots acting as cams to rock the respective rocking teeth on their pivots. The two cam-slots are formed or disposed so that when by the lengthwise movement of the cam-piece 31, one tooth 26, is retracted—the other tooth 26 is projected. Each rocking-tooth 26, has a contacting-surface adapted to bear against the adjacent end of one of the gear-segments of the gear 24, when the tooth is in its projected position. The said tooth is formed with a sloping outer surface so that when the tooth is in the retracted position, the rocking tooth will be wholly out of the range of movement of the gear-segment 25. The contacting-surface of each rocking tooth 26, with the adjacent end of a gear-segment of gear 24, affords a firm backing for the rocking tooth when the enlarged first tooth (see Fig. 1) of the segment-gear 25, comes around in the rotation of the latter and engages with such rocking tooth. As will be understood, when the cam-piece is moved in the proper direction to cause a rocking tooth to become projected into the path of the said enlarged first tooth, the gear 24 and connected parts will be impelled, by the engagement of said first tooth with the said rocking tooth so as to bring the teeth of the following segment of gear 24, around into position to be engaged by the teeth of segment-gear 25, where-

upon gear 24 and the connected parts, including the crank 40, will be rotated through one hundred and eighty degrees, thereby shifting the shuttle-boxes, after which the segment-gear will run out of mesh with the teeth of gear 24, at a blank space on the



latter, the rocking tooth in such space being retracted. The gear 24, and connected parts then will remain without movement of rotation, holding the shuttle-boxes in the position which was given them by the described movement of the parts until the cam-piece is moved in the opposite direction lengthwise by the action of the described devices, so as to project the other previously-retracted rocking tooth into the range of the segment-gear 25.

At the free ends of arms of the cam piece 31, the cam-slots are open-ended for convenience in assembling and separating the parts, this construction enabling the cam-piece conveniently to be slipped into place or removed after the rocking teeth have been mounted in the gear 24. (*Crompton and Knowles Loom Works.*)

SHUTTLE-BOX MOTION FOR PLAIN LOOMS.

This motion is adapted for weaving textile fabrics, etc., in which the shuttle boxes are arranged two by one, or four by one.

The box-operating mechanism is preferably arranged at the lower part of the loom, at the rear right or left hand end thereof.

Referring to the drawings:—Fig. A, is a side view of this box motion, looking in the direction of arrow *a*, Fig. C. Fig. B, corresponds to Fig. A, but shows the parts of the mechanism in the opposite position, and Fig. C, is an edge view of the parts shown in Fig. A, looking in the direction of arrow *b*, same figure.

1, is a frame or stand, adapted to be bolted to the lower side of the loom, at the rear right hand end thereof, and near the bottom shaft. 2, is the bottom shaft, journaled in bearings (not shown) and 3, is a two-leaf cam fast on the bottom shaft. 4, is an indicator lever hung on a stud 5, fast in the frame 1,

and 6, is a connector attached at one end to said indicator lever 4, and connected at its other end with the box pattern chain indicator (not shown).

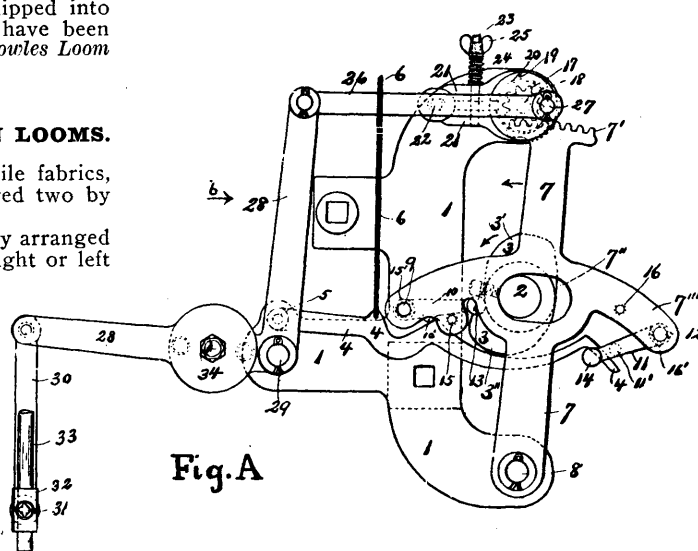
A cam arm 7, is pivoted at its lower end on a stud 8, fast in the frame 1, and is provided at its upper end with gear teeth 7'. The cam arm 7, has an opening 7'' therein, through which the bottom, or driver shaft 2, extends, and is also provided with two oppositely extending arm 7''''. On a pin 9, fast in the outer end of one arm 7''', is pivoted a cam finger 10, provided with an outwardly extending pin 10', adapted to be engaged by the indicator lever 4.

A second cam finger 11, is pivoted on a pin 12, fast in the outer end of the other arm 7''', of the cam arm 7, and is provided with an outwardly extending pin 11', which is adapted to be engaged by the outer end of the indicator lever 4.

The cam finger 10, is provided at its free end with a boss or roll 13, adapted to be engaged by the leaf 3', of the two-leaf cam 3, and the free end of the cam finger 11, is provided with a boss or roll 14, adapted to be engaged by the leaf 3'', of said cam 3.

A pin 15, on the arm 7''', of the cam arm 7, limits the downward motion of the cam finger 10, and a pin 15', limits the upward motion of said finger. A pin 16, on the other arm 7''', of the cam lever 7, limits the upward motion of the cam finger 11, and a pin 16', limits the downward motion of said finger.

The gear teeth 7', on the upper end of the cam arm 7, mesh with and drive a pinion 17, loose on a stud 18, fast in the upper part of the frame 1. Fast to or made integral with the pinion 17, is a crank disk 19, and upon the opposite side of said pinion is—in this instance, a disk 20, provided with a friction device consisting of two arms 21, pivoted at one end on a pin 22, on the frame, and provided with curved portions at their other ends, which encircle the disk 20, and are pressed thereon to produce friction by a bolt 23, extending through holes in said arms 21, and provided with a spring 24, intermediate the upper side of the upper arm 21, and the nut 25, on said bolt. By screwing up or down the nut 25, the friction of the arm 21, on the disk 20, may be adjusted as desired. Said friction prevents the disk 20, returning to its starting point, if the loom should start before said disk completes its motion.



A connector 26, is pivoted at one end on a crank pin 27, on the crank disk 19, and at its other end is

pivoted to the upper end of the angle lever 28, which lever is hung on a pin 29, in the frame 1. To the other end of the angle lever 28, is pivoted a connector 30, the lower end of which is adjustably secured by a bolt 31, in the head 32, of the box lifter rod 33.

The angle lifter lever 28, may be provided with a give way, or safety device 34, which will yield and

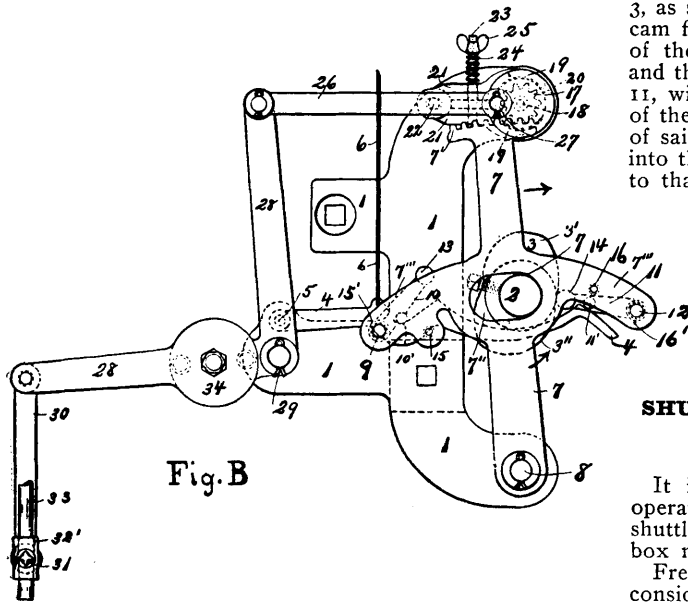


Fig. B

Fig. B, and thus the top cell of the shuttle box will be lowered. The shuttle box will stay in this position until the indicator lever 4 is lifted, through the connector 6, by a pattern-chain-indicator, and when said lever is so lifted, the cam finger 10, through the engagement of the pin 10', thereon with said indicator lever 4, will be lifted out of engagement with the cam 3, as shown in Fig. B, and at the same time the other cam finger 11, will be lifted, through the engagement of the pin 11', thereon, with the indicator lever 4, and the boss or roll 14, on the end of said cam finger 11, will be in position to be engaged by the leaf 3', of the cam 3, as shown in Fig. B, and the revolution of said cam will cause the cam arm 7, to swing over into the opposite position from that shown in Fig. B, to that shown in Fig. A, thus raising the lifter rod, and also the lower cell of the shuttle box, and returning it to its first position shown in Fig. A.

This motion can be used for looms running at high speed, the motion being sure to give a positive and quick change for the shuttle boxes. (Crompton and Knowles Loom Works.)

SHUTTLE-BOX MECHANISM FOR CROMPTON LOOMS.

It is a well-known fact to any fixer that in the operation of a modern loom the time in which the shuttle-boxes must be shifted is very short, and the box mechanism must act quickly and with precision.

Frequently the boxes and their connections are of considerable weight, and the shafts, wheels, and other parts required to move the same must necessarily be heavy and strong, so heavy, in fact, that difficulty is found in operating them at the speed and with the accuracy desired.

The present invention has for its object to provide an improved and novel box mechanism wherein the number and speed of operation of the several parts are reduced to a minimum.

The box operating or shifting member in the new mechanism is actuated by a cam, as heretofore, said cam, however, being rotated by a wheel provided with a plurality of slots or notches to enable it to be intermittently rotated by a driving-wheel provided with a plurality of projections adapted to enter said slots or notches.

The slotted or notched wheel is of considerable diameter and provided with a large number of slots in order that each step-by-step or rotative movement of the wheel may be as slight as possible.

By means of the new device a continuously-rotating wheel is made to engage the notched wheel for nearly one-half of each rotation of the former, yet act through only about one-quarter of each rotation to actually move the said notched or slotted wheel and its cam, so that a quick intermitting cam movement may be obtained from a continuously and relatively slow rotating driving wheel.

The accompanying illustration shows in end elevation, a sufficient portion of a loom to enable anybody to understand at once the new mechanism.

A, indicates the frame of the loom; b, the crank-shaft, connected with and to vibrate the lay B; c, the lay-swords; d, the shuttle-box; e, its lift-rod; e', the swinging bracket or frame connected with and vibrated with the lay and in which the lift-rod e', slides; d, the main or driving shaft geared to and operating the crank-shaft.

The shuttle-box lift-rod e', is connected by a link e, with one arm of the bell-crank lever or shifting member e', fulcrumed at e'', on the frame and having

allow the lever to give at this point, so as to prevent the breaking of the parts of the box lifter mechanism.

In Fig. A, the box lifter rod 33, is shown in its upper position, and therefore the bottom cell of the shuttle box (not shown), is ready to receive or discharge the shuttle.

To lower the lifting rod, so that the top cell of the box will assume the position occupied by the bottom cell, the operation is as follows: The leaf 3', of the cam 3, fast on the bottom shaft 2, revolves in the direction of the arrow, Fig. A, toward the cam finger 10, and said finger having been lowered by the indicator lever 4, through the connector 6, into the position shown in Fig. A, will be in the path of said leaf 3', of the cam 3, which will come in contact with the boss or roll 10', on the end of said cam finger, and cause the cam arm 7, through said cam finger, to move in the same direction that the cam 3 moves, as indicated by the arrow in Fig. A, and the teeth 7', on said arm 7, engaging the teeth of the pinion 17, will cause said pinion to revolve and also the crank disk 19, carrying the pin 27, and through the connector 26, attached to said crank pin, the angle lifter lever 28, will be moved, to lower the lifter rod 33, through connector 30, into the position shown in

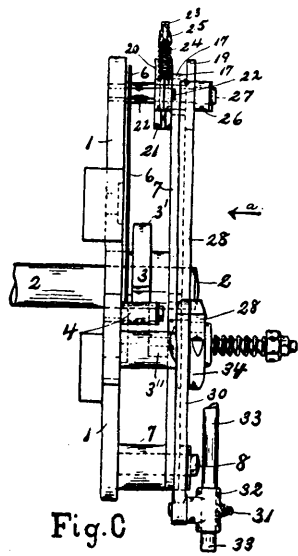
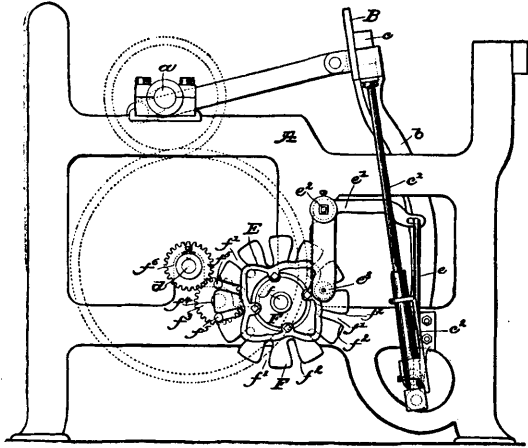


Fig. C

Fig. C, into the position shown in

its other arm provided with a suitable roller-stud e^s , held in operative contact with the cam E, by the weight of the shuttle-box on its lift-rod.

The cam E, is provided with a plurality of projections or tappets, of the same, or of different heights, to impart the desired movement to the shuttle-box,



ranging from its highest to its lowest position, and these tappets or projections are formed so as to reduce as far as possible all unnecessary movement of the cam, and also to most quickly shift the box when the cam is changed.

For instance, the depression between two tappet projections is of a size nearly or quite fitting the roller e^s , so that the initial movement of the cam will act to move the roller and partially lift the shuttle-box, and the highest portion of the projection is made as pointed as is practicable in order that no unnecessary movement of the cam shall take place when the roller has reached the highest point on any projection.

The cam E, is secured to the face of a wheel F, loosely mounted upon a stud f . This wheel F, is provided with a large number of radial slots or notches f^s , the entrances to which are made slightly flaring, as at f^s , said wheel being driven by the driving wheel f^s , fast on a shaft, or it may be loosely mounted upon a stud f^s , on the frame and provided with two projections or pins f^s , adapted to enter the slots f^s , in the wheel F, to drive the latter.

The driving-wheel f^s , is geared to and driven by a mating wheel f^s , fast on the main or driving shaft d , of the frame.

The shaft d , rotates once for each two picks of the loom, and a corresponding rotation is imparted to the driving-wheel f^s , as the two wheels are of substantially the same diameter. At each rotation of the driving-wheel f^s , one of its pins f^s , enters a notch or slot f^s , in the slotted wheel F, and turns the latter a distance represented by the distance between two slots on the wheel.

In the illustration one of the pins is shown as just entering a slot, and the other pin as just leaving another slot, and starting from this position of the driving-wheel the uppermost pin f^s , will rotate for nearly one-eighth of a rotation of the driving-wheel before it will begin to move the slotted wheel F. It will then move the wheel through substantially one-quarter of its rotation and will then permit the said slotted wheel to stand at rest for another one-eighth of a rotation before its pin leaves the slot in the wheel, and, therefore, since the slotted wheel is held against movement during an eighth of a rotation before a pin

leaves a slot, and after a pin leaves a slot for another one-eighth of a rotation, while the other pin is entering a new slot, the wheel is held against movement for one-quarter of a rotation of the driving-wheel f^s , is then moved for a distance represented by one-quarter of the rotation of the said driving-wheel, and again rested for another one-quarter of a rotation of said wheel, and so on.

The slotted wheel F, therefore, is given an intermitting rotary movement by and from a continuously-rotating driving-wheel, the slotted wheel having two movements and two periods of rest, all of substantially the same duration, during each rotation of the driving-wheel.

The driving-shaft d , and driving-wheel f^s , rotate at a relatively slow speed, and the slotted wheel F, being of relatively large diameter with a large number of slots f^s , receives only a comparatively short movement for each shifting of the shuttle-box, so that the wear and tear of the parts is reduced to a minimum, and the high speed heretofore necessary in operating the parts of the box mechanism is entirely overcome.

Furthermore, the pins working in the slots start the slotted wheel easily and without shock, thereby differing from pawl-and-ratchet or other mechanism for imparting a relative intermitting motion to the cam-wheel.

The mechanism embodying the invention, *i. e.*, the axis of the driving-wheel f^s , lies inside of the peripheral line of the driving-wheel F. Hence, one of the pins f^s , enters its slot at the top of the driving-wheel before the other pin leaves its slot at the bottom of said wheel, so that the driving-wheel F, is always under the direct control of at least one of the pins f^s , whereas if the axis of the said driving-wheel was outside the peripheral line of the driving-wheel one of the pins must necessarily leave its slot before the other pin can fully enter its slot, thereby leaving the driving-wheel for at least two periods in each rotation of the driving-wheel without any means of holding it in position, except some means independent of the pins be provided to retain it positively in position during the periods when it is not engaged by one or the other of the pins.

As readily seen by explanations thus given, the object of the new mechanism is to get a motion that will work well on high speed looms running on plain work, *i. e.*, no pattern-chain to be used.

In the illustration a 3 box cam connection is shown, however, by changing the cam, 2 or 4 boxes could be used, but as this is a continuous motion worked from the bottom shaft, no rest of boxes can be had for more than one pick.

The new mechanism gives a quick motion to the cam and at the same time a slow motion to all the parts operating said cams, resulting in a quick and positive box motion with very little wear on the parts constituting said motion. (*Crompton and Knowles Loom Works.*)

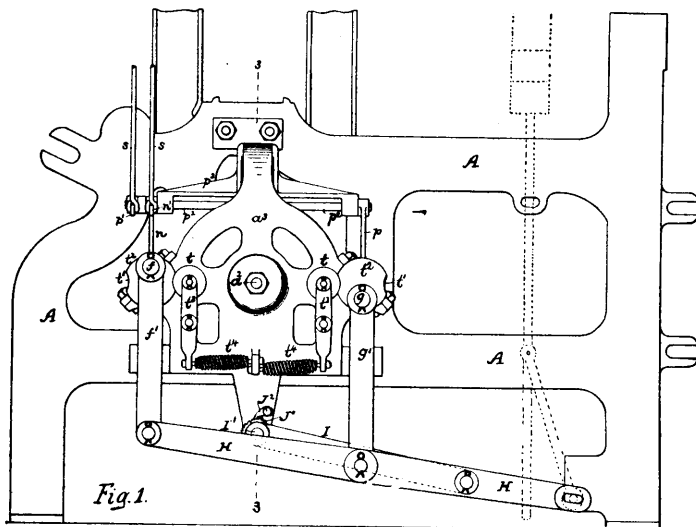
INGRAHAM'S DROP-BOX MECHANISM.

The object of this device is to construct a simple, positive, and efficient drop-box motion for looms, that the boxes, when adjusted, being effectually locked against vertical displacement in either direction.

To explain this mechanism, the accompanying three illustrations are given and of which Fig. 1 is a side view of sufficient of a loom to illustrate this improved drop-box motion. Fig. 2 is a similar view with some of the outer parts removed and some in sections in order to show internal construction. Fig. 3 is a transverse section on the lines 3-3, Fig. 1.

A, represents one of the side frames of the loom, having a bearing for the shaft B, which has a spur-pinion a , meshing with a spur-wheel a' , which is free to turn on a stud a^2 , secured to a hood or casing a^3 , attached to the side frame A. On said stud a^2 , also

Connected to the drop-box lever H, is an arm I, which is hung to a stud I' on a depending portion of the hood a^3 , said arm I, being connected to one end of a spring J, tending to lift it, and the tension of the spring being regulated by the adjustment of a ratchet-wheel J', to which the other end of said spring is attached, back movement of the ratchet-wheel being prevented by a pawl J². This spring-actuated arm serves to counterbalance the weight of the drop-boxes, and thus permits the easy elevation of the same and prevents uneven strain upon the operating mechanism for the drop-box lever.



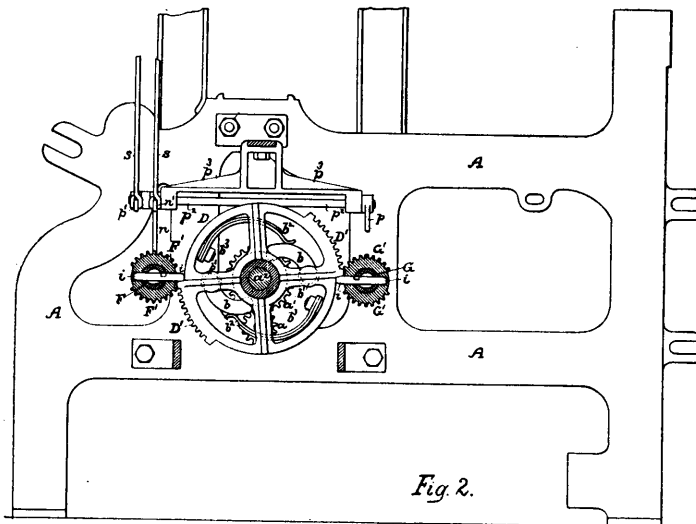
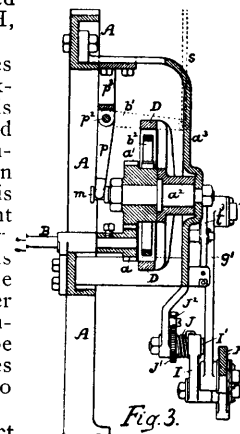
The throw of each of the crank-pins f and g , is equal to the height of one of the boxes. Hence the construction shown is adapted for application to a four-box loom. When the parts are in the position shown in Fig. 1, the boxes will be fully depressed, the top box will be in line with the shuttle-race, the crank-pin f , being at the top limit of and the crank-pin g , at the bottom limit of its throw.

If it is desired to raise the boxes to the extent of one box, a half turn is imparted to the shaft F, so as to carry its crank-pin to the lowest limit of its throw, and thereby operate the lever H, so as to raise the boxes to the desired extent, the lever H,

turns a drum D, between which and the hub of the spur-wheel a' there is a frictional clutch connection consisting of fingers b , hung to studs b' , on the drum and engaging at their free ends with notches in the hub of the spur-wheel a' , the fingers being retained in engagement with said notches by means of springs b^2 , bearing upon the fingers and secured to studs b^3 , on the drum. On the periphery of the drum D, are formed two toothed segments D', being diametrically opposite each other, and on each side of the drum is suitably mounted a hollow shaft, that on one side of the drum being represented at F, and that on the opposite side at G. At the outer end of the shaft F, is a crank-pin f , which is connected by a link f' , to one arm of a lever H, the latter being fulcrumed midway of its length to the lower end of a link g' , depending from the crank-pin g of the shaft G, the forward

fulcruming upon the link g' .

If it is desired to raise the boxes from the lowest position to the extent of two boxes, the shaft F is permitted to remain stationary and the shaft G, has a half turn imparted to it. This imparts motion to the link g' , and as the latter is connected to the lever H, at a point midway of the length of the lever and the inner end of the latter is fulcrumed upon the lower end of the link f' , the movement of the outer end of the lever H, which is connected to the drop-box rod, will be doubled. Consequently the boxes will be lifted to the extent of two boxes.



If it is desired to effect a three-box lift, both shafts F and G, are given a half turn from the positions shown in Fig. 1, the operation of the shaft G, resulting in a lift of two boxes and the operation of the shaft F, resulting in a further lift of one box.

The boxes can be lowered in like manner to the extent of one, two, or three boxes, by the operation of either or both of the shafts F and G. In fact it will be readily understood that as the operation of the shaft F provides for a movement of the boxes in either direction to the extent of one box, and the operation of the shaft G provides for a movement of the boxes in either direction to the extent of two boxes, any desired operation of the boxes can be effected by moving either or both shafts. When both shafts are operated, the movement due to the operation of the shaft F, is added to or subtracted from the movement due to the operation of the shaft G. (Fairmount Machine Company, Phila.)

end of the lever H, being constructed for connection to the drop-box rod.