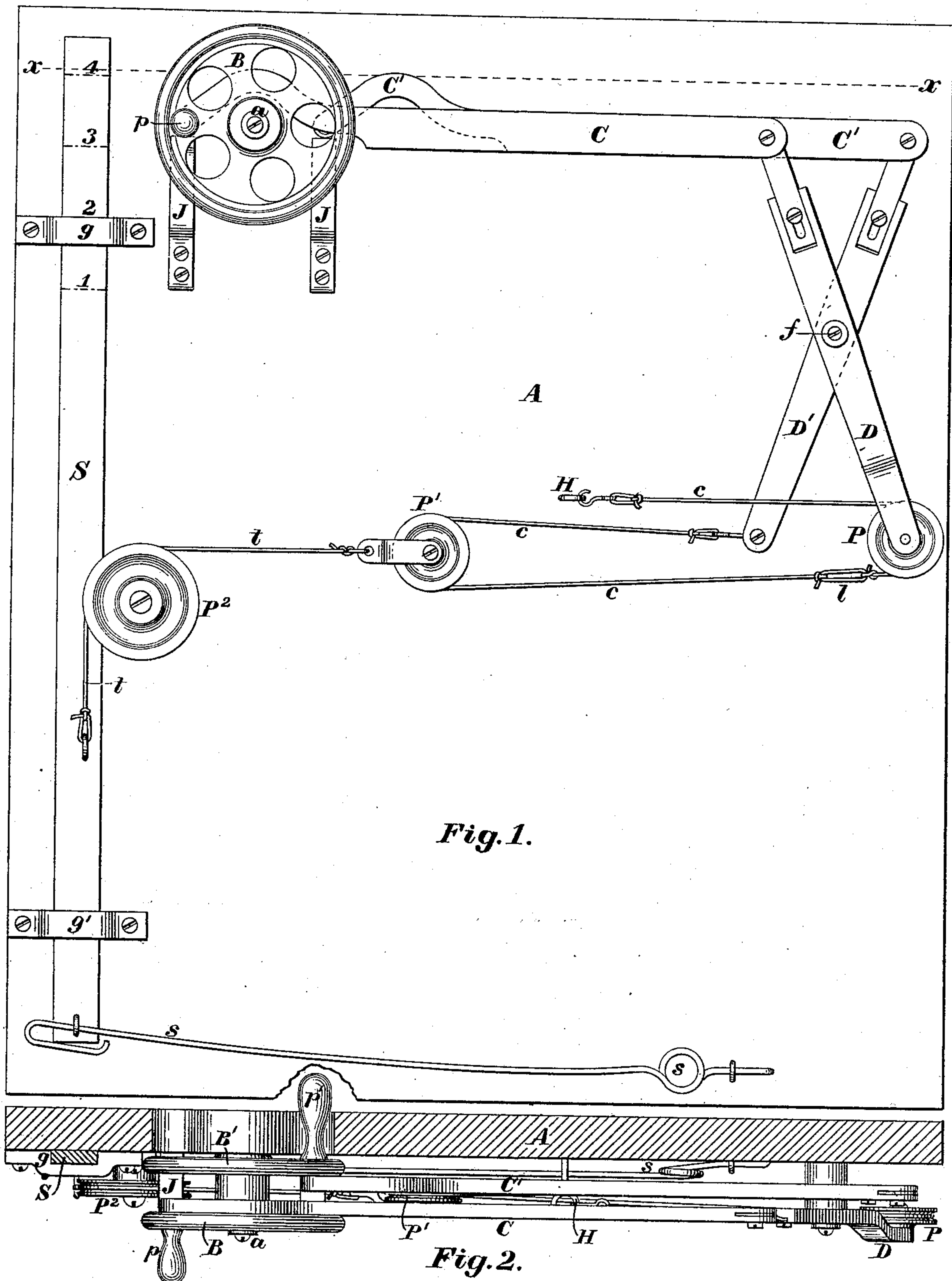


L. J. KNOWLES.
 Mechanism for Operating Drop-Shuttle Boxes for Looms.
 No. 221,239.
 Patented Nov. 4, 1879.



Witnesses:
 W. W. Swan
 H. G. Obmsted

Inventor:
 L. J. Knowles

UNITED STATES PATENT OFFICE.

LUCIUS J. KNOWLES, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN MECHANISMS FOR OPERATING DROP SHUTTLE-BOXES FOR LOOMS.

Specification forming part of Letters Patent No. **221,239**, dated November 4, 1879; application filed May 19, 1879.

To all whom it may concern:

Be it known that I, LUCIUS J. KNOWLES, of Worcester, in the State of Massachusetts, have invented a new and useful Improvement in Mechanism for Operating Drop Shuttle-Boxes of Looms, of which the following is a specification.

The invention is one of a number of modifications which I have made of the mechanism formerly employed by me for raising and lowering drop shuttle-boxes in the well-known looms bearing my name.

These several modifications, being independent each of the others, form the subject-matter of several applications which I am now making for Letters Patent. It is, however, unnecessary for me to here describe the general features of my looms, or of looms to which the present invention is applicable, since these looms are well known to those skilled in the art; and of much of the mechanism employed for raising and lowering the tier of shuttle-boxes in the looms to which the present invention is applied it is sufficient to say that I make use of a pattern-barrel, two vibrating levers, two vibrating gears, two cylinder-gears, all as in my well-known looms, and as shown in patents to me, among others the patent bearing date January 21, 1873.

In the drawings I have, for convenience, represented the vibrating gears as two wheels, having each an independent movement, although upon a common shaft, of about a half a revolution. These wheels and the mechanism operated by them, which embodies my present invention, are shown as mounted on a panel in place of the loom-frame.

Figure 1 is a side elevation of such panel and mechanism attached to it. Fig. 2 is a cross-section on line *x x* of Fig. 1.

The panel is marked A, and will hereinafter be referred to as the loom-frame. B B' are the two wheels taking the place of vibrating gears, which, in the loom as actually constructed, corresponds to the vibrating gears H of my patent No. 134,992, January 21, 1873, and are to be operated by the means there shown, and in the manner there described. As here shown, however, the two wheels B B' turn upon a common fixed axis, *a*, it being unnecessary, for the purpose of illustrating this

invention, that their axes should be independent of each other, and have shifting positions under the control of the pattern-barrel. These wheels B B' will hereinafter, in this specification, receive the name of the gears whose office they fill—viz., vibrating gears. The vibrating gears are here represented as turned by crank-pins *p p'*, but in actual construction they are operated by the cylinder-gears, as described in my said patent.

C C' are two connecting-rods, or, as they are termed by persons using my looms, the "connectors." They are attached at one end to crank-pins in the vibrating gears B B', and near these ends they are bent that they may not interfere with the half revolutions of the vibrating gears. The other ends of these connectors are pivoted, as shown, to two levers, D D', having a common fulcrum, *f*.

P is a fixed pulley, whose shaft has bearings in the lower end of the lever D, as shown, while P' is a running pulley, whose shell is attached to the chain *t*, which is connected with the shuttle-box rod S in the usual manner.

H is a hook supported by the frame. To it is attached one end of a chain, *c*, which, passing over or around pulleys P and P', as shown, is attached at the other end to the lower arm of the lever D'. The two levers D and D' being of equal length, the lever D is bent to make room between them for the fixed pulley P.

J J are two brackets, serving as stops to limit the vibrations of the vibrating gears to about half revolutions, the ends of the connectors resting upon the brackets at the ends of their throws.

The shuttle-box rod is represented as carrying a tier of four shuttle-boxes, and its path is represented as determined by two brackets, *g g'*, the upper surface of the bracket *g* being supposed to be at the level of the race.

In a loom, as actually constructed and operated, the shuttle-box rod with its tier of shuttle-boxes, will fall by its own weight; but in the drawings I have represented that weight by a spring, *s*. The chain *t*, through which the lifting motion is finally imparted to the shuttle-box rod, is shown as passing over one directing-pulley, P², but in the actual construction of looms several pulleys will be required to give proper direction to the lifting power.

As a matter of construction, the levers $D D'$ are of such length and so fulcrumed that a direct pull by either upon the chain t , to the extent allowed by its connector, would raise the shuttle-box rod two boxes; but the pull upon the chain t being by means of the chain c and running pulley P' , and one end of the chain c being made fast to the frame, the effect of a direct pull is lessened by one-half, since the pulley-shell travels a distance equal to half the length of the chain running over the pulley. It follows that a movement of the lever D' in either direction varies the position of the shuttle-box rod and tier of shuttle-boxes one box; and the same result would follow from the movement of the lever D if the chain c were made fast to that lever instead of being carried round the pulley P and made fast to the hook H ; but when the lever D is moved the pulley P becomes a running pulley, and a length of chain, one end being fixed, passes over it equal to twice the distance traveled by the pulley itself or the end of the lever. The pulleys P and P' , therefore, offset each other when the lever D is used, and the result is that a full movement of the lever D varies the position of the shuttle-box rod two boxes.

Accordingly, by the contrivance thus far explained, any one of four shuttle-boxes may be brought opposite the race. For example, the vibrating gears being in the position shown in the drawings, shuttle-box No. 2, counting from the bottom, is at the level of the race. To raise No. 1 to that level, throw the connector C' back upon its vibrating gear B' by turning back that gear; or, resuming the position shown in the drawings, to lower No. 3 to the

level of the race, turn the vibrator-gear B forward and the vibrator-gear B' back, thus, as it is called, discounting. Turning B forward alone would have brought No. 4 box to the level of the race. Moving the vibrating gears in the same direction makes a variation of three boxes—that is, either from No. 1 to No. 4, or from No. 4 to No. 1.

This contrivance may, however, be used for a tier of three boxes, as well as for a tier of four boxes. The chain c is shown with an open link, l , and if one end of the chain c is made fast to the open link instead of the hook H , the chain will no longer run over the pulley P , but will in effect be attached directly to the end of the lever D , and from the explanations already given it follows that when this change is made a movement of either lever in either direction will vary the position of the shuttle-box rod one box, and a movement of both levers in the same direction will vary the position of the shuttle-box rod two boxes.

It is obvious that the mechanism above described may be duplicated for the tier of shuttle-boxes at the opposite end of the race.

I claim—

The connectors $C C'$, and mechanism for operating the same, levers $D D'$, the lever D provided with the pulley P , in combination with cord c , the loom-frame provided with hook H , a tier of shuttle-boxes, and connecting mechanism, as described, for the purposes specified.

LUCIUS J. KNOWLES.

Witnesses:

W. W. SWAN,

H. G. OLMSTED.