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ARCHIBALD NIMMO, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF, THOMAS MORAN, AND VALENTINE STAUSSE, OF SAME PLACE.

Letters Patent No. 113,687, dated April 11, 1871.

IMPROVEMENT IN MECHANICAL MOVEMENTS.

The Schedule referred to in these Letters Patent and making part of the same.

I, ARCHIBALD NIMMO, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented a new Mechanical Movement, of which the following is a specification

Nature and Object of the Invention.

My invention consists of a system of graduated cams, or their equivalents, arranged to be operated and to operate in the manner too fully described hereafter to need preliminary explanation.

The object of my invention is to obtain, by the operation of a few prime movers, and through the medium of the said cams, or their equivalents, the means of effecting a great variety of changes, the whole forming a new mechanical movement applicable among other things to the operating of the drop-boxes of looms.

Description of the Accompanying Drawing.

Figure 1 is a view of a series of graduated cams and levers arranged to illustrate my mechanical movement; and

Figures 2 and 3 are views of a series of graduated slotted cams and of a series of graduated wedges, through the medium of either of which my invention can be carried into effect.

General Description.

In carrying out my invention many modifications and varieties of devices may be adopted, all, however, being based on the same general principles, the character of the detailed mechanism being in a great measure dependent upon its application.

The device illustrated in fig. 1 will serve to refer to in explaining my new movement, the prime movers consisting of three levers, A A A, and the pointer B and graduated quadrant D serving to indicate the multifarious changes which can be produced by operating these three levers through the medium of the new mechanical movement, which in the present instance is dependent on three levers, E, F, and G, and three cams, H, I, and J, the whole being inclosed in a box, K.

The cam J is hung to a fixed pin, *a*, and is arranged to operate the lever E, which is also hung to a fixed pin, and which carries the cam I, the latter being arranged to operate the lever F, which is jointed to the outer end of the lever E and carries a cam, H, arranged to operate the lever G, the latter being jointed to the outer end of the lever F, and the last lever, G, is connected to the pointer B by a rod, M.

Each of the cams is connected to one of the operating levers A.

It will be observed that there are eight marks or

graduations on the quadrant D, and that when the cams H and I are elevated and the cam J depressed the pointer will be directed to the graduation 7. On raising the latter cam J, however, the pointer will at once reach the graduation 8, but will at once move to the lowest graduation, 1, on depressing the whole of the cams; but on raising the cam J only while the others are depressed the pointer will be moved from the mark 1 to the mark 2. In like manner, by the simple manipulation of these three cams the pointer may be directed not only from graduation to graduation so as to make eight successive changes of position, but can be directed from any one graduation to any other graduation without hesitating at intermediate graduations; and thus the pointer can have hundreds of different movements imparted to it; and this is owing to the fact that while the position of the highest lever G is dependent on its own cam H, it is also dependent upon the positions of the cams below; in other words, each of the cams has an independent action of its own as regards the effecting of some movements of the pointer, while it is dependent upon one or both of the other cams for effecting other movements. For instance, if it is desired to move the pointer from the graduation 1 to 8, all the cams must be elevated simultaneously; but if the movement of the pointer from 1 to 7 only is desired, the cam J remains depressed and the cams I and H should be elevated simultaneously.

It should be here understood, however, that this effect could not be produced if each of the three cams of itself imparted the same extent of movement to the pointer. In that case the utmost limit of the pointer would be the graduation 4, and the number of changes would be very much restricted.

It will be observed, however, that the cams are graduated. For instance, the operation of the cam H, the other cams being depressed, will move the pointer from the mark 1 to the mark 5, while the operation of the cam I alone will move the pointer from 1 to 3, and the operation of the lowest cam will move the pointer to the extent of one graduation only, the operation of the whole of the cams moving the pointer to the full extent of the quadrant.

It is essential, therefore, in carrying out my invention, either that the cams should be graduated or that the levers on which the cams operate should be graduated, or that the positions of the cams in respect to the fulcrums of the levers should be graduated to bring about the desired result.

A prominent application of my invention is that to the drop-boxes of looms; in fact it was for this that the movement was originally designed.

Take away the pointer and quadrant, which have

been simply introduced here to illustrate the capacity of the invention in effecting different movements, and attach the rod M directly to the sliding drop-box of a loom in which are eight compartments for as many shuttles, each shuttle having a thread of a color differing from that of the threads of all the other shuttles. By the simple operation of these three cams the drop-box can be so changed that any one of these colored threads can be made to succeed any other of the eight colors which may have been woven into the fabric, a result the importance of which will be readily understood by those familiar with the art of weaving.

But my invention can be carried into effect without the aid of the levers E, F, and G, shown in fig. 1. In the modification fig. 2, for instance, the same variety of movements may be imparted to the guided rod *m* by the slotted cams H, I, and J, a pin, *x*, on the said rod *m* passing through the curved slot of the cam G, which is arranged to vibrate on a pin, *a*, passing through the curved slot of the cam I, the latter being hung to a pin, *b*, passing through the curved slot of the third cam J, which is hung to a fixed pin, *d*; these pins *x*, *a*, and *b* being guided by a vertical slot in a vertical frame, K.

While the rod M can be operated to a limited extent by the movement of the cam G only, the altitude of that cam is dependent upon the position of the cams I and J; hence the same multifarious changes in the movement of the rod M can be produced by these three cams as were effected by the cams and levers in fig. 1; in fact the slotted cams in fig. 2 are the equivalents of the cams and levers in fig. 1.

It will be remarked, however, that in the above modification there is the same essential feature of my invention, namely, the graduation of the cams.

In the modification illustrated in fig. 3 wedges H I J, arranged to be reciprocated, are substituted for the cams in fig. 2 and for the cams and levers in fig.

1, the inclination of these wedges being graduated for effecting the same result as that described in reference to the graduated cams in fig. 1.

The operation of these wedges will be readily understood if it be borne in mind that the journals of the lower roller *a*, supporting the lowest wedge, turn in fixed bearings in the frame A, that the journals of the intermediate yielding rollers *a*¹ and *a*² are adapted to vertical slots in the frame A, and that the upper yielding roller *a*³ is attached to the sliding rod *m*.

Other devices involving the same general principles will readily suggest themselves to those experienced in the mechanic arts.

Although I have illustrated and described three graduated cams, or their equivalents, the number of graduated cams may be increased, thereby increasing the capacity of the mechanical movement for effecting changes. For instance, if we add to fig. 1 a fourth cam and lever, a quadrant with sixteen graduations on it would be required to illustrate the capacity of the movement, and a quadrant with thirty-two graduations on it would be required to illustrate the capacity of the movement if a fifth cam and lever were added.

Claim.

The system of graduated cams, or their equivalents, arranged to be operated and to impart the within-described movements, substantially in the manner described.

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

ARCHIBALD NIMMO.

Witnesses:

WM. A. STEEL,
F. B. RICHARDS.