No. 726,008. PATENTED APR. 21, 1903.

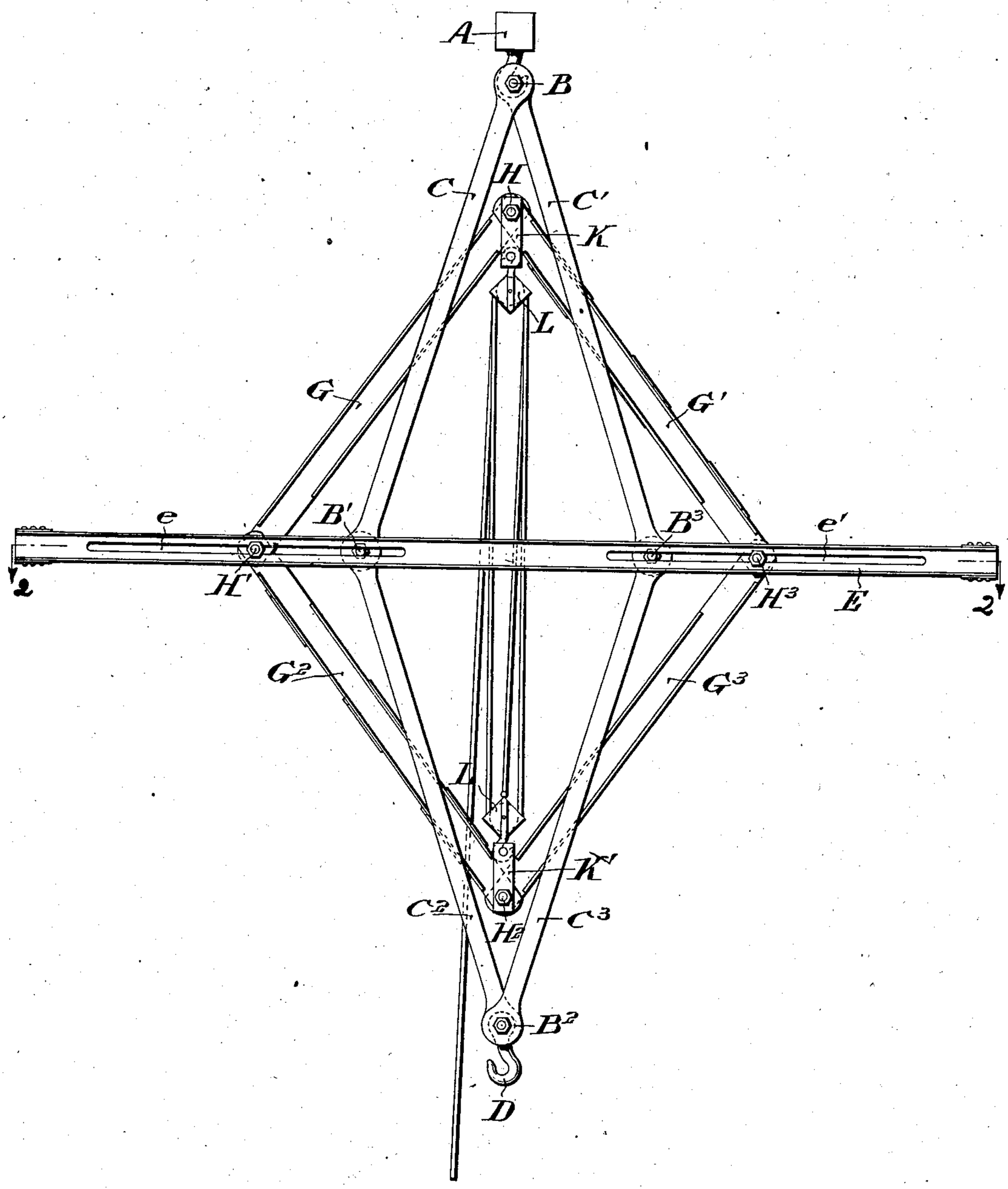
C. J. WENNAS.

MECHANICAL MOVEMENT.

APPLICATION FILED AUG. 4, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

FIG 1.



WITNESSES:

Arthur E. Paige

Bradford Haley

INVENTOR:

Charles J. Wennas

by his Attorneys

Mulvey & Paul

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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 2.

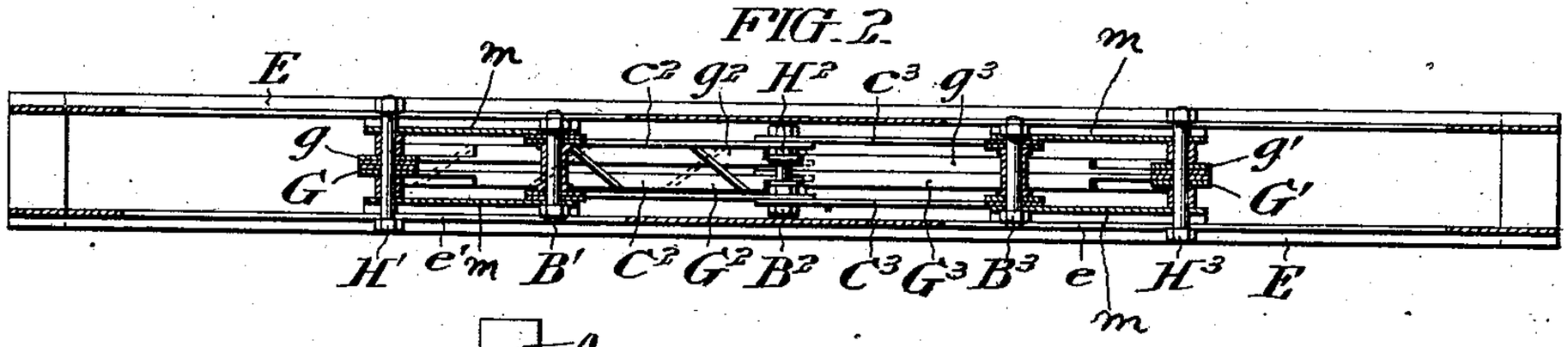


FIG. 3.

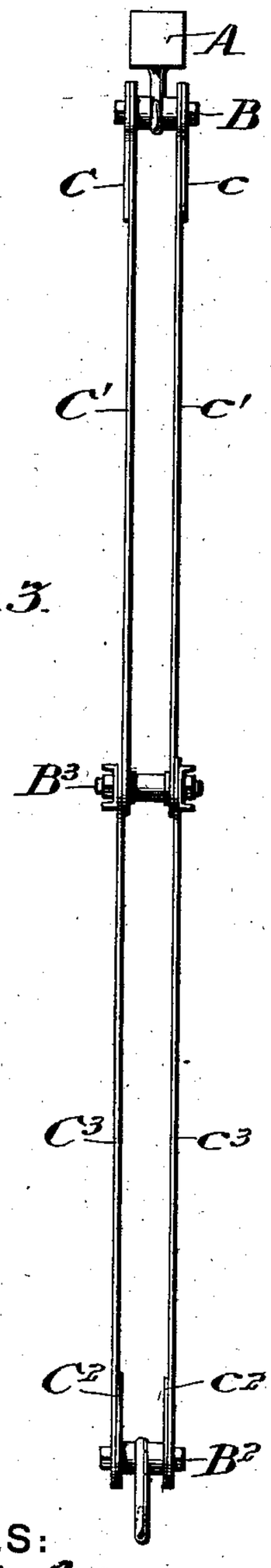
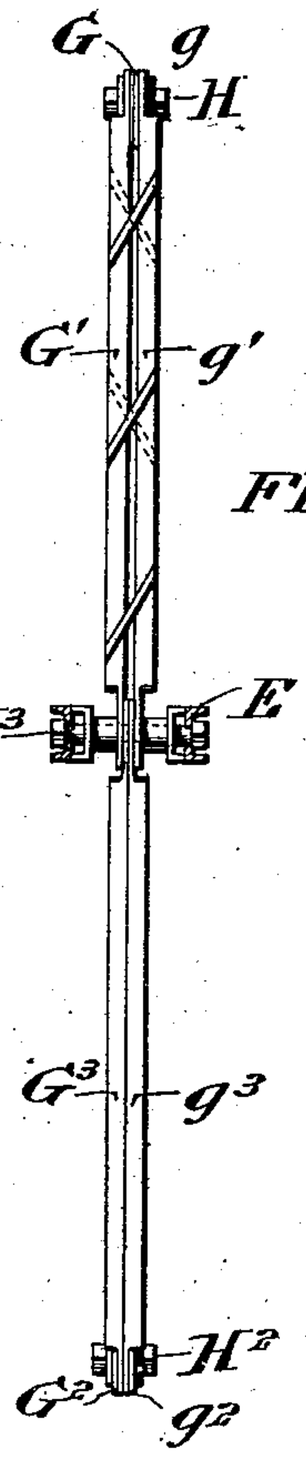


FIG. 4.



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Fraley & Paul

UNITED STATES PATENT OFFICE.

CHARLES J. WENNAS, OF PHILADELPHIA, PENNSYLVANIA.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 726,008, dated April 21, 1903.

Application filed August 4, 1902. Serial No. 118,368. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. WENNAS, a citizen of the United States, residing at No. 136 Pomona terrace, Germantown, in the city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Mechanical Movements for Transmitting and Multiplying Power, of which the following is a specification, reference being had to the accompanying drawings.

My invention consists in a toggle-joint lever operated by a second toggle-joint lever at right angles thereto.

It is characteristic of the toggle-joint lever that the ratio of multiplication of the power instead of being constant is a variable one. By my invention I combine two sets of toggle-joint levers in such a way that the variation of the ratio in one of them is compensated for by the variation of the ratio in the other, whereby nearly constant ratio is obtained. Obviously this principle is capable of application irrespective of whether the toggle-joint levers are single or double; but I have chosen for explanation its application to double toggle-joint levers. Likewise the application of my invention is capable of great variation dependent upon the use to which it is to be put and the mechanism with which it is associated. I have illustrated in the drawings a mechanism in which it is embodied and adapted for the purpose of effecting the movement of heavy masses—as, for instance, in bridge construction, where a truss is to be raised or lowered into position; but it will be understood that this embodiment of my invention which I have illustrated is merely a typical one. For convenience of nomenclature I will call that double toggle-joint which acts directly on the weight the "primary" parallelogram or the "primary" set, and the other double toggle-joint lever, to which the power is applied and transmitted to the primary set, I will call the "secondary" parallelogram or "secondary" set.

In the accompanying drawings, Figure 1 is a plan view of two sets of toggle-joint levers arranged in accordance with my invention. Fig. 2 is a section of the same along the line 2 2, Fig. 1. Fig. 3 is a side elevation of one member of the primary set of toggle-joint levers. Fig. 4 is a similar elevation of one member of the secondary set of toggle-joint levers.

Referring to Fig. 1, the primary set is formed of the four toggle-levers C C′ C^2 C^3. They are pivoted together in the shape of a parallelogram by the pivots B B′ B^2 B^3. For the sake of strength these levers are duplicated, the duplicate set *c c′* c^2 c^3 being joined by the same pivots and placed immediately alongside. The pivot B constitutes the fulcrum, being attached by a hook to an anchorage A. The pivot B^2 carries a hook D, by which movement is transmitted to a chain or cable and thence to the work to be accomplished. The pivots B′ B^3 constitute the knee-joints of the set. These pivots project a short distance upon either side of the toggle-levers and run in slots *e e′*, cut lengthwise in the double-channel beam E, between the members of which both the sets of levers are mounted. The secondary set is formed of the four toggle-levers G G′ G^2 G^3, which are similarly pivoted together to form a parallelogram by the pivots H H′ H^2 H^3. This set is also constructed in duplicate, the duplicate set *g g′* g^2 g^3 having the same pivots and the levers of the secondary set being placed between the duplicate parts of the primary set. The pivots H H^3 constitute the knee-joints of the secondary set and are connected to the similar pivots of the primary set by links *m m m m*. These pivots likewise run in the slots *e e′* cut in the channel-beam E. The extreme pivots H H^2 of the secondary set are the ones between which the force to be applied is exerted. For this purpose they are set in yoke-pieces K K′, to each of which is attached a block L L, through the pulleys of which is rove a rope, to the free end of which power is to be applied, and thus the set of levers which I have described operated.

The operation of my device is as follows: The power is applied by a winch or other means to the rope connecting the blocks L L, drawing them together, and thereby driving the knee-joints of the secondary set farther apart. The links *m* communicate this movement to the knee-joints of the primary set, which are therefore simultaneously forced apart, causing the pivot B^2 to approach the anchorage A, thereby accomplishing the work for which the device is intended. It will be

observed that as the pivots H H^2 approach each other the force with which the knee-joints H′ H^3 are driven apart is multiplied in an increasing ratio; but as the knee-joints B′ B^3 are drawn apart the ratio by which the power is multiplied decreases as B^2 approaches B. These two movements therefore complement each other and cause the combined mechanism to exert an equalized multiplication of the power through its entire range of operation.

For convenience of illustration I have shown a block and tackle as the means for drawing together the extremities of the secondary set of toggle-joint levers; but it is evident that any convenient means for accomplishing the motion of these extremities toward each other may be employed—such, for instance, as a hydraulic cylinder. It is also evident that the operation of the device may be reversed—that is, if pivots H H^2 are thrust apart a multiplied thrust may be obtained at B^2.

Having thus described my invention, I claim—

1. The mechanism for multiplying power which consists of two sets of double toggle-joint levers, the extremities of both sets being in line with each other; the knee-joints of both sets being also in line with each other; and connections between the knee-joints of one set and the corresponding knee-joints of the other set, substantially as described.

2. The mechanism for multiplying power, which consists of two sets of double toggle-joint levers; links connecting the pivots at the knee-joints of both sets; and a slotted beam in which the pivots of the knee-joints of both sets run, substantially as described.

3. In a mechanism for multiplying power, two sets of double toggle-joint levers connected at their knee-joints; one set being formed in duplicate and the other set being interposed between said duplicate parts, substantially as described.

In witness whereof I, CHARLES J. WENNAS, have hereunto signed my name, with two subscribing witnesses, this 30th day of July, A. D. 1902.

CHARLES J. WENNAS.

Witnesses:
C. BRADFORD FRALEY,
E. REESE.