K. DOUGAN.

GRAIN BLENDER.

APPLICATION FILED JULY 22, 1907.

1,069,771.

Patented Aug. 12, 1913.

2 SHEETS—SHEET 1.

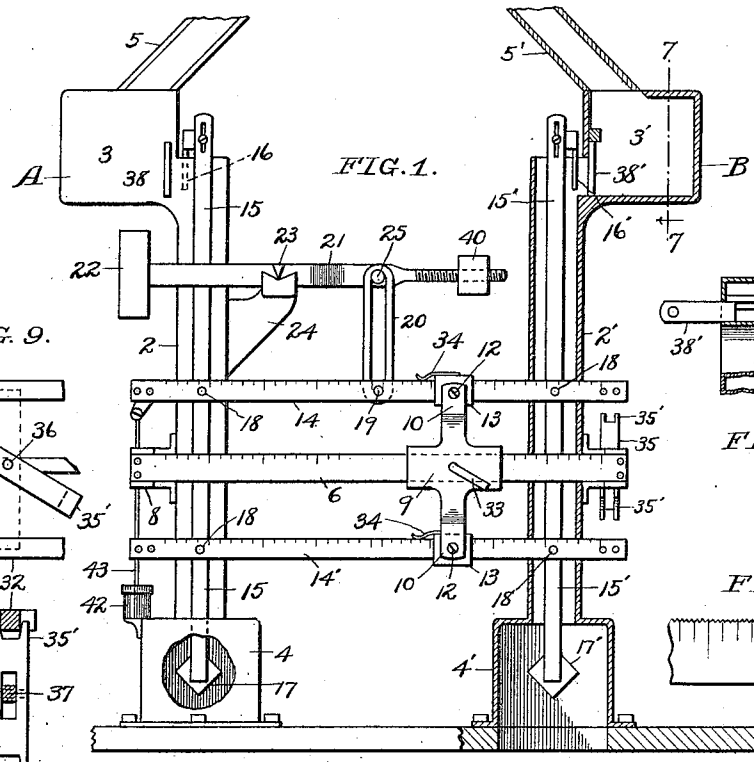

FIG. 1.

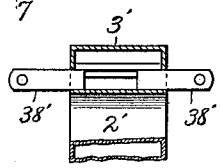

FIG. 7.

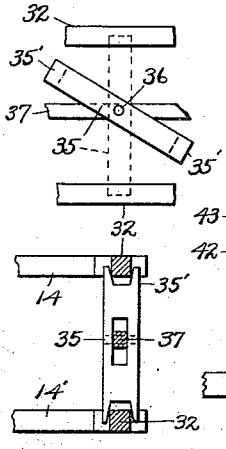

FIG. 9.

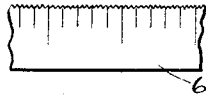

FIG. 8.

FIG. 10.

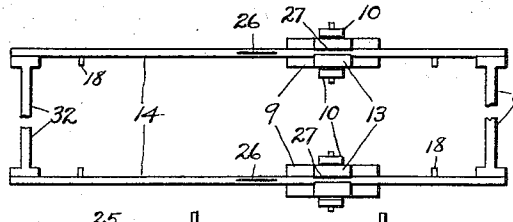

FIG. 3.

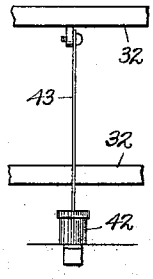

FIG. 11.

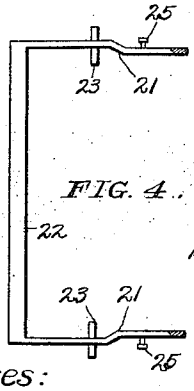

FIG. 4.

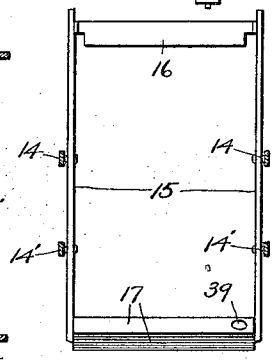

FIG. 2.

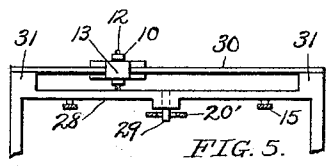

FIG. 5.

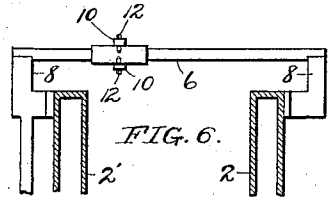

FIG. 6.

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GRAIN BLENDER.

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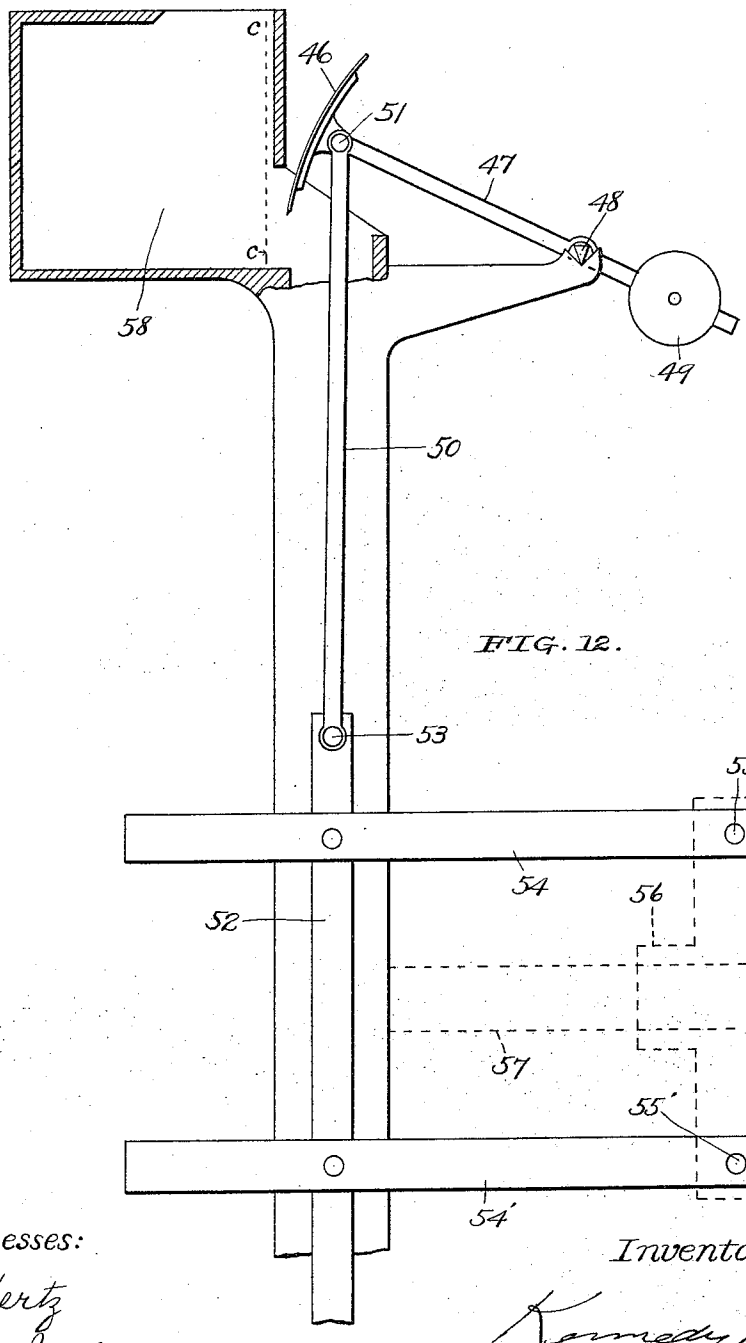

FIG. 12.

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GRAIN-BLENDER.

1,069,771. Specification of Letters Patent. Patented Aug. 12, 1913.

Application filed July 22, 1907. Serial No. 384,909.

To all whom it may concern:

Be it known that I, KENNEDY DOUGAN, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and useful Improvement in Grain-Blenders, of which the following is a specification.

This invention relates to a machine for blending fluids such as water, or wheat or other grain but especially adapted for blending different varieties of wheat in flour mills.

The object of this invention is to provide means for automatically blending fluids in any desired proportion, means for automatically shutting off or stopping the flow of all the other fluid streams should a certain one of the streams stop, and means for decreasing or increasing the volume of all the fluid streams in proportion to the increase or decrease in the volume of the larger or controlling stream.

Briefly described, the blender is constructed as follows: A lever having a receiver at either end is provided with a movable fulcrum and the materials to be blended are directed against and impinge on these receivers. The proportion of materials depends upon the position of said fulcrum. Connected to the ends of the lever are two regulating gates under which the respective streams of material must pass, and the amount of material fed to one hopper of the blender will determine the proportion of material allowed to pass through the other hopper.

Reference is made to the accompanying drawings, in which—

Figure 1 is a partly diagrammatic elevation of a blender constructed according to the invention, one of the two conduits being shown in section; Fig. 2 is a reduced-scale elevation of one of the two regulating couples; Fig. 3 is a plan view of two companion transmission levers at opposite ends of the machine, with their connecting bars; Fig. 4 is a plan view of the suspension counterweight and its levers; Fig. 5 is a reduced-scale plan view of one of the transmission levers as preferably constructed. Fig. 6 is a similar plan view of one of the fulcrum guides showing its mounting on the frame; Fig. 7 is a reduced-scale section on line 7—7 of Fig. 1; Fig. 8 is a fragmentary detail of one of the transmission levers; Figs. 9 and 10 are detail views of a locking device; Fig. 11 is a side elevation of the dash-pot and connections; Fig. 12 represents a modification.

This blender comprises feed governors of the type illustrated in my copending application, filed July 19th, 1907, Serial Number 384,588, said governors being arranged in opposition to each other and interconnected by transmission levers. Each feed governor comprises what may be termed a couple, consisting of a valve or gate by which the stream to be mixed must pass, and a receiver, upon which said stream falls; the couple being pivotally supported so that the varying impact of the stream upon the receiver causes movement thereof and corresponding movement of the valve or gate.

In Fig. 1 of the drawings, A and B designate, as units, the two respective feed governors. Each comprises a vertically disposed conduit 2 or 2′ having at its upper end a receiving chamber 3 or 3′, and at its lower end an enlarged part 4 or 4′. Spouts 5 and 5′ conduct the grain from separate bins (not shown) to the respective receiving chambers. The two governors are set a suitable distance apart and their frames are rigidly connected together by a beam 6, hereinafter called the fulcrum-guide, supported by brackets 8. (See Fig. 6.) Mounted slidably on said fulcrum-guide 6 is a fulcrum-shifter block 9, provided with upwardly and downwardly extending jaws 10. Each jaw 10 holds a pair of pivots 12, arranged trunnion-wise, and mounted upon said pivots are fulcrum-clips 13, 13. Said clips engage slidably but snugly the respective transmission levers 14, 14′, by which the vertical members 15 15′ of the governing couples 16, 17, and 16′—17′ are supported; said members and levers 15, 15′ being pivotally connected at points 18. (See also Fig. 2.)

The entire system of movable elements thus far described is suspended at 19, by means of a link 20, from a stud 25 on a pivoted arm 21 having a counter-weight 22. Said arm 21 is fulcrumed and supported by a pivot stud 23 on a bracket 24. In the link connection shown in Figs. 1 and 3 the lever 14 is slotted at 26 to receive the link, and the fulcrum clip 13 is slotted at 27 in order to pass said link when moved across the lever. A construction in some respects better than this is shown in Fig. 5. Here the transmission lever 28, is provided with a pivot stud 29 which rests in the bottom of

the link 20. A separate beam, 30, is spaced outward from lever 28, its ends being secured to lugs 31 thereon.

The face of the machine seen in Fig. 1 will be considered as one of its ends, as distinguished from its right and left sides. At the opposite end of the machine, the guide 6, the shifter 9, the levers 14 14′, link 20, arm 21, and vertical members 15 15′ are duplicated. The duplicate transmission levers 14 14′ are pivoted to said members 15 15′ at 18′, and their ends are rigidly secured to the ends of the levers 14 14′ by longitudinal equalizing-bars 32 (shown broken out in Fig. 3).

The weight 22 is elongated and connects the two opposite or companion arms 21 21, as shown in Fig. 4. It will be understood that these arms 21 constitute practically one lever, and the same of the levers 14 and 14, 14′ and 14′. The weight 22 is sufficiently heavy to balance the arms 21. This balancing means permits of an accuracy of force transmission from A to B or from B to A that would be impossible were no balancing means employed. The reason is that, without such means, the shifting of the fulcra 12 would inevitably change the ratio between the weights of the opposite arms of the levers 14 and 14′: for example, the arms of lever 14 opposite the pivots 12 thereof.

Each fulcrum-shifter block 9 is provided with a lever set-screw 33 for holding same tightly on the guide 6 in any position. Said guide is graduated, and is made sufficiently long to permit the fulcra 12 to be brought very close to the pivots 18. Where the extra beam 30 (Fig. 5) is employed it is possible for the operator to set the shifter 9 so that the fulcra 12 will be in exact vertical alinement with pivots 18. The transmission levers may also be graduated, and are preferably serrated upon one edge (see Fig. 8). The fulcrum clips 13 13′ are provided with springs 34 bearing on said transmission levers, as shown, to prevent accidental slipping of said clips along the levers. When shifting said clips there is a tendency for the clips to carry the levers 14 14′ endwise with the shifter 9. To prevent this; and insure that the motion of the clips upon said levers shall always be equal to that of the shifter 9 upon the guide 6, any suitable device may be employed. Figs. 9 and 10 illustrate a device adapted for the purpose. A jam-lever 35 is provided with bifurcated ends 35′ adapted to engage the two adjacent equalizing bars 32 at either side of the machine. Said lever 35 is pivoted at 36 upon a rigid bar 37, made integral with the bracket 8 shown to the left in Fig. 6. Normally the jam-lever 35 is in the position shown in full lines in Fig. 9. Before moving a shifter 9, the operator simply turns lever 35 to the position shown in dotted lines in Fig. 9 its ends grip the bars 32, and thereby prevent lengthwise movement of the transmission levers, while the shifter is being moved. The lever 35 is then restored to normal.

Further describing the feed governor A, of which B is a duplicate: The gate 16 is mounted on the upper ends of the opposite vertical member 15, and preferably for relative adjustment vertically thereon. This gate controls in a measure the flow of grain from the chamber 3 into the throat below. Said flow is further controlled, but manually, by means of slides 38, arranged to vary the width of the opening which is controlled vertically by the gate. (See Fig. 7.) The members 15 are held in vertical positions by the levers 14 which are in turn supported by the fulcra 12. The receiver 17 consists preferably of a horizontally disposed, hollow body, presenting two opposed, outwardly and downwardly inclined faces to a falling stream. The upper plates 17 only are essential, but the tubular form (including the lower plates 17) is preferred because the receiver is thus adapted to hold a quantity of shot (not shown) by which the two governing couples may be put in balance. To receive the shot an opening 39 is provided into the receiver. Normally said opening is closed with a plug, not shown. The grain after striking the receiver rebounds and falls through the opening into a receptacle that receives the two streams from the two governors. Each of the weight arms 21 is provided with a relatively small adjustable weight 40 the function of which is to enable the operator to accurately balance the weight 22 against the parts suspended by links 20, whatever be the position of the fulcra of the transmission levers. The effect of momentum upon the couples and transmission levers is lessened by means of a dash-pot 42, the rod 43 of which is pivotally connected to one of the equalizer bars 32. The purpose of lower transmission levers 14′ is to insure the same leverage regardless of the point where the grain may strike the receivers.

Before the machine is ready for use, the following adjustments are made at the factory: The fulcrum clips 13 13′ are removed from levers 14 14′ to permit of balancing the couple 16—17 of A with the couple 16′—17′ of B. Possibly these couples will balance upon 19 as a pivot, while the receivers 17 17′ are empty; if not, shots are dropped into the lighter receiver until the two couples are in equilibrium with both gates 16 16′ the same height. Weights 40 are then adjusted until the arms 21 are approximately horizontal. The fulcrum clips are then connected with their holding jaws 10 by setting in the pivots 12 which may be in the form of screws. The two couples will now remain in balance in any position to which the shifters 9 may be moved, until

some downward force is exerted upon one of said couples, or an excess of such force upon one over the other.

The operation of the blender is as follows:—One of the two streams fed to the blender must be gaged to about the amount required of that particular grain. For example, suppose it is required to make a mixture of 25% soft wheat and 75% hard wheat. One of the streams say through governor A is adjusted to about ¾ the entire rate at which it is intended to mix, which rate, let it be supposed, is 80 bushels per hour. This may be done by pushing in one or both of the slides 38 of the governor A which is intended to pass the 75%. The slides 38′ of the other governor B are left wide open. The supply of wheat from both bins will in practice be ample to keep the spouts 5 5′ and chambers 3 3′ filled with wheat. The regulation just described need not necessarily be done at the blender, as it may be done at a distant point by means of the usual slides located in the feed spouts. The next step is to adjust the shifters 9 along their guides 6 to bring the fulcrum pivots at the proper points on the levers 14, 14′ to cause the 20 bushel stream to balance the 60 bushel stream. The 60 bushel stream being fed by governor A, the shifter will obviously be moved toward A, that being the larger stream. The graduations on beams 30 and guides 9 indicate the positions of the fulcra for all proportions of mixtures. The locking of the levers 14, 14′ preparatory to adjusting the fulcra has been hereinbefore described. The spouts 5, 5′ are now opened, and the two streams flow into the respective conduits, impinging on and falling from the respective receivers 17 and 17′. The gate 16′ of B, the governor of the smaller stream, will regulate the volume of said stream to one third that of the larger and controlling stream. Regardless of how much the larger stream may vary in volume the other stream will be varied in the same proportion. When the controlling stream stops the other stream will stop, due to the cessation of pressure upon the receiver of A, its upward movement, and the consequent downward movement of the gate of B, closing communication between the chambers 3′ and throat 2′. When the A stream starts, the reverse operation occurs and the B stream is started. Suppose the A stream now increases: its receiver in governor A will be further depressed, and through the medium of levers 14, 14′ the gate of B will be raised by the proper degree to pass a proportionately larger stream. Suppose the fulcra 12 to be in the position shown in Fig. 1, in which case the stream through B is the larger and the controlling stream; and that said stream increases. The couple of B descends; the movement imparted to the transmission levers 14, 14′ is not affected in the least by the presence of the link 20, arm 21 and weight 22; that is to say, said movement is neither assisted nor resisted by said link, arm and weight. This is due to the fact that the A and B couples have previously been placed in balance upon the main fulcrum 19, and remain in normal balance regardless of the positions of the fulcra 12. It should further be noted that the suspension of the system at 19 eliminates an error which would destroy the accuracy of the control of A by B or vice versa. Said error is due to the fact that the levers 14, 14′ necessarily have weight. Therefore, except when blending exactly equal streams, the arms at one side of the fulcra 12 are longer and hence heavier than those at the opposite side.

Any number of streams may be blended, by the use of a number of these machines; the first machine blending two streams into one stream which is passed into one side of a second machine, the other side of which receives a third stream and so on.

Various modifications within the scope of this invention will occur to one skilled in the art, and I do not limit the invention to the structures shown and described herein.

Fig. 12 illustrates a modified construction of the gate and its connection with the transmitting levers. As here shown the gate, 46, is mounted on a yoke 47, pivoted at 48 and having a counterweight 49. The gate 46 is curved to the segment of a cylinder whose center is the axis of movement passing through the points of the pivots 48. A rod 50 is pivotally connected to the gate at 51 and to the vertically movable member 52, corresponding to member 15 in Fig. 1, at 53. 54 and 54′ are the transmission levers, fulcrumed at 55 55′; 56 the shifter, and 57 its guide.

It will be understood that the gate 46 moves in the arc of a circle, and as the friction of the grain is negligible owing to the motion thereof, the pressure of the grain against plate 46 will not detract from the sensitiveness of the machine.

I claim as my invention:

1. In a blender, the horizontally disposed floating lever, feeding mechanism connected with each end thereof, a suspending means engaging said lever between the ends thereof, and counterweighted means for supporting said suspending means.

2. In a blender, a pair of opposed feed governing devices, a lever, balanced upon a floating pivot, for transmitting movement from one of said devices to the other, and means for counterbalancing the entire weight of said lever.

3. In a blender, a pair of opposed feed

governing devices, a lever for transmitting movement from one of said devices to the other, a movable fulcrum for said lever, and means for balancing said lever to eliminate error due to the weight of said lever.

4. A blender comprising two feed governors connected to receive the streams to be blended, operative connections between said governors, said connections comprising a horizontally disposed lever, and means for balancing said lever.

5. A blender comprising two opposed feed governing mechanisms, two transmission levers connecting said mechanisms, and means for shifting the fulcra of said levers.

6. A blender comprising two opposed feed governing mechanisms, transmission levers connecting said mechanisms, a shifter-guide disposed parallel to said levers, a fulcrum shifter mounted upon said guide, and a fulcra carried by said shifter and engaging said levers respectively.

7. In a blender, two feeding mechanisms, a horizontally disposed lever, each end of which is connected to one of the aforesaid feeding mechanisms, a movable fulcrum for said lever, a pivoted suspension member engaging said lever between the ends thereof, and counterweighted means for supporting said suspension means.

8. A blender comprising two opposed hoppers, two opposed valves, a system of movable parts, and means for suspending the entire system in balance, said suspending means comprising a horizontally disposed pivoted lever, a vertically movable element supported by said lever and forming a fulcrum for said system, and a counterweight acting upon said lever.

9. A blender comprising two opposed hoppers, adapted to receive and discharge the material to be blended, two opposed valves adapted to control the flow of material from said hoppers, a receiver below each of said valves and in uninterrupted communication therewith, a connection between each valve and its receiver, a normally horizontal translation lever connecting said connections, a link for suspending said described movable parts in balance, said link being vertically movable, and a movable fulcrum for said lever.

10. A blender comprising two opposed feed governing devices, a translation lever connecting said devices, a fulcrum shifter mounted for movement parallel with said lever, a fulcrum pivot carried by said shifter, and a clip slidably mounted upon said lever and engaged by said pivot, the latter constituting a fulcrum for said lever.

11. A blender comprising two opposed feed governing mechanisms, transmission levers connecting said mechanisms, means for shifting the fulcra of said levers lengthwise and relative to said levers simultaneously and means for locking said levers against longitudinal movement during said shifting of said fulcra.

12. In a blender, two feed governors of duplicate construction, each comprising a hopper, a chute, a gate, a receiver, and members connecting said gate and receiver, and a lever connecting a movable member of one feed governor to a corresponding member of the other feed governor.

13. A blender comprising two opposed feed governors, each comprising a hopper, a chute, a gate, a receiver, and members connecting said gate and receiver, and means connected with said members and actuated by variation of the flow into either of said governors for varying the flow through the other governor in predetermined proportion.

14. A blender comprising two opposed feed governing mechanisms, each comprising a hopper, a chute, a gate, a receiver, and members connecting said gate and receiver, a lever so connecting said mechanisms that the upward or downward movement of the receiver of one mechanism will cause a respective closing or opening movement of the gate of the other mechanism, and means for shifting the fulcrum of said lever lengthwise of and relatively to said lever.

15. A blender comprising two opposed suspended feed governing mechanisms, each comprising a hopper, a chute, a gate, a receiver, and members connecting said gate and receiver, and means whereby the upward or downward movement of the receiver of either mechanism will cause a respective closing or opening movement of the gate of the other mechanism.

16. A blender comprising two opposed feed governing mechanisms, each comprising a hopper, a gate, a receiver, and members connecting said gate and receiver, a suspended lever so connecting said mechanisms that the upward or downward movement of the receiver of one mechanism will cause a respective closing or opening movement of the gate of the other couple, and means for shifting the fulcrum of said lever lengthwise of and relatively to said lever.

17. In a blender, a pair of opposed feed governing devices, a lever pivotally connected to respective valve-controlling members of said devices, and a shifting fulcrum for said lever, said fulcrum being movable lengthwise on said lever to any point between the connections of said lever to said movable members.

18. In a blender, a pair of opposed feed governors, each comprising a hopper, a gate, a pair of vertically movable connecting rods; two sets of transmission levers connecting one rod of each pair with one rod of the other pair respectively; fulcra for said levers, and means for shifting said fulcra lengthwise and relatively of said levers.

19. In a blender, a pair of opposed feed governors, each comprising a hopper, a gate, a pair of vertically movable connecting rods; two sets of transmission levers connecting one rod of each pair with one rod of the other pair respectively; fulcra for said levers; means for shifting said fulcra lengthwise and relatively of said levers, and means for locking said equalizing bars before shifting said fulcra.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."