No. 772,391. PATENTED OCT. 18, 1904.

H. S. BALDWIN.

VARIABLE STROKE MECHANISM.

APPLICATION FILED JULY 5, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

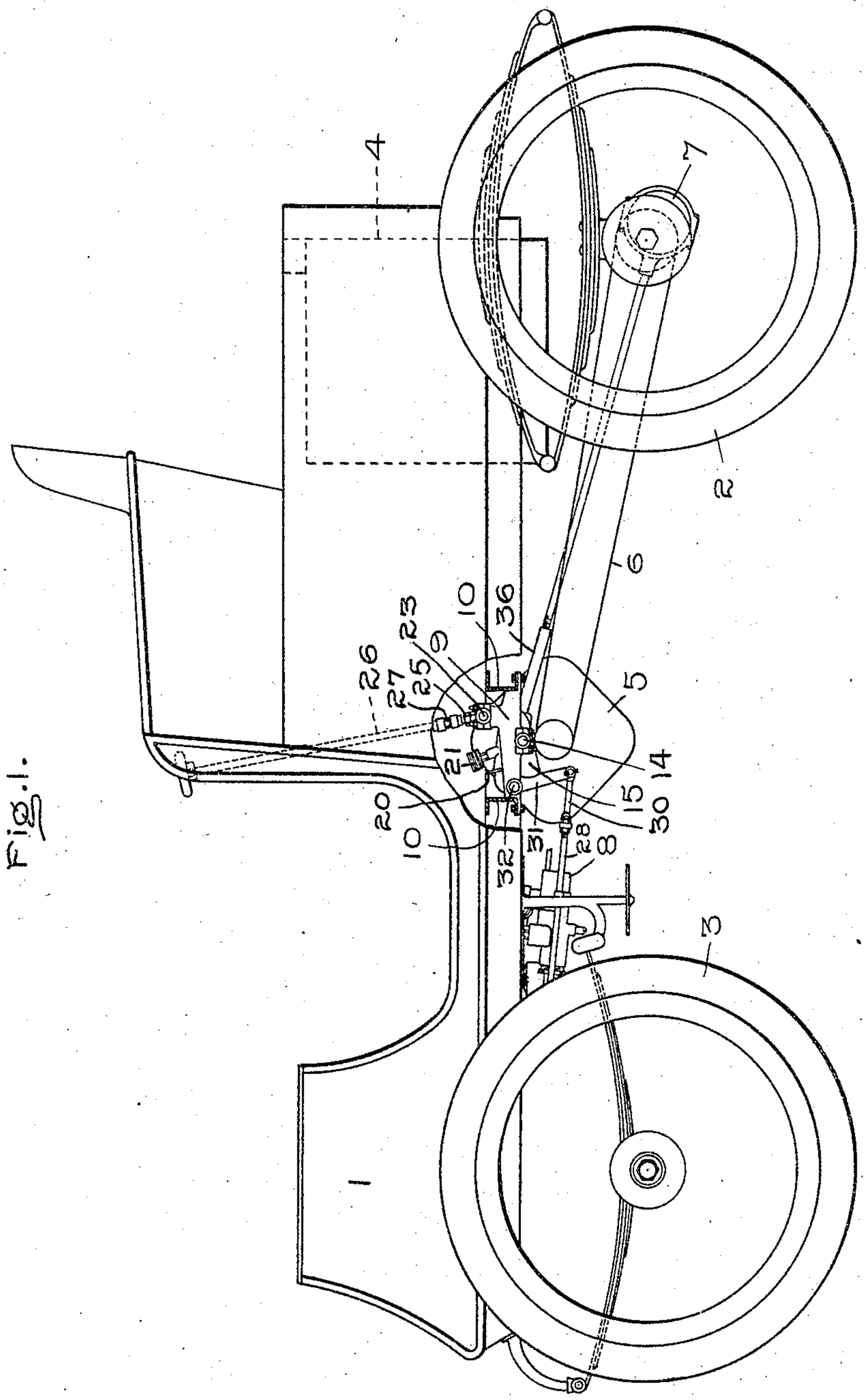

Fig. 1.

Witnesses:

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.

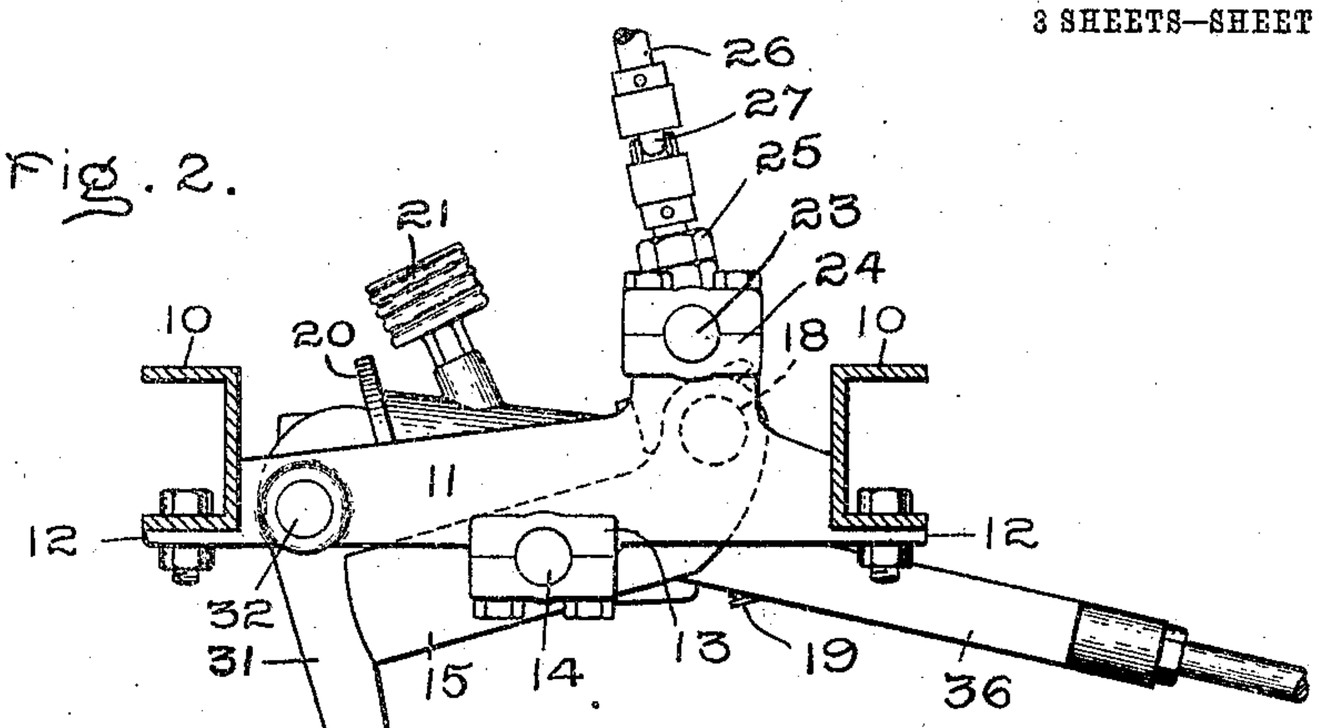

Fig. 3.

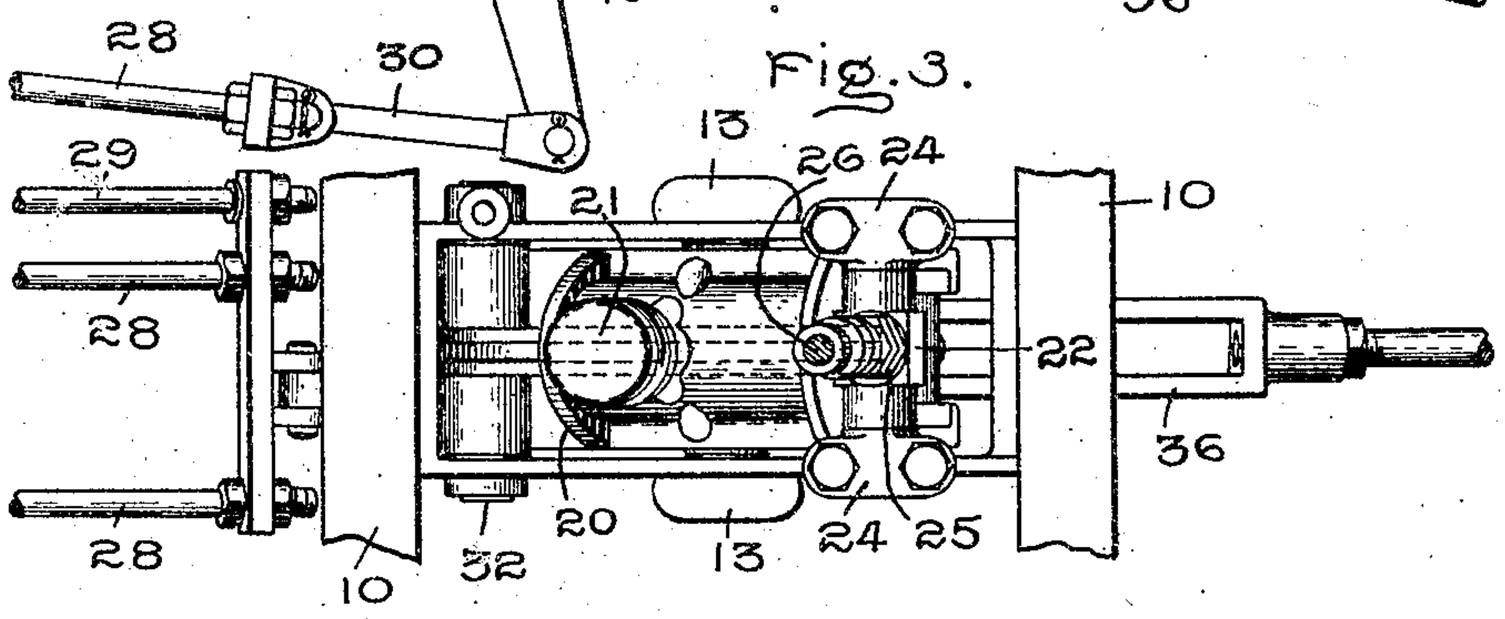

Fig. 4.

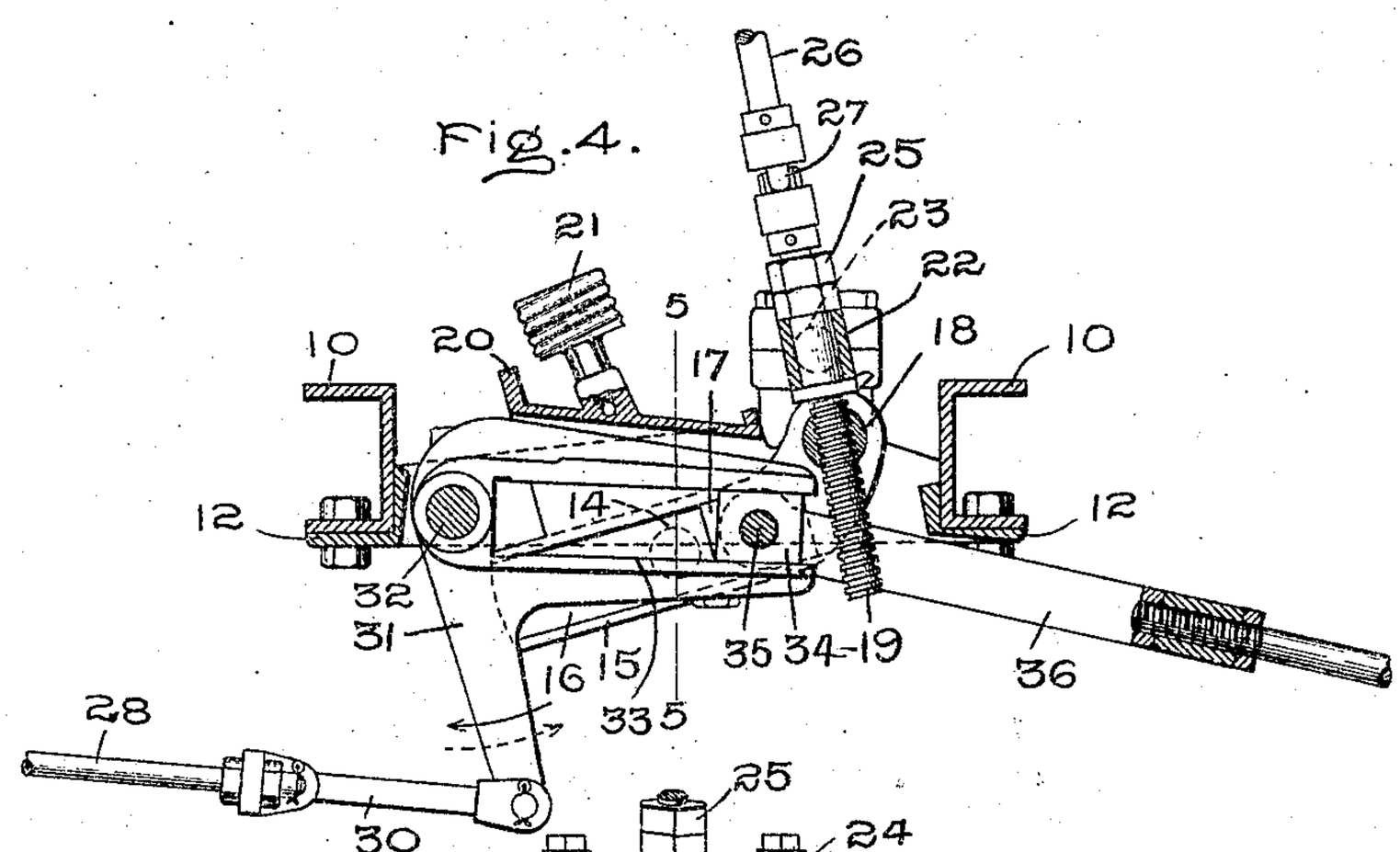

Fig. 5.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 6.

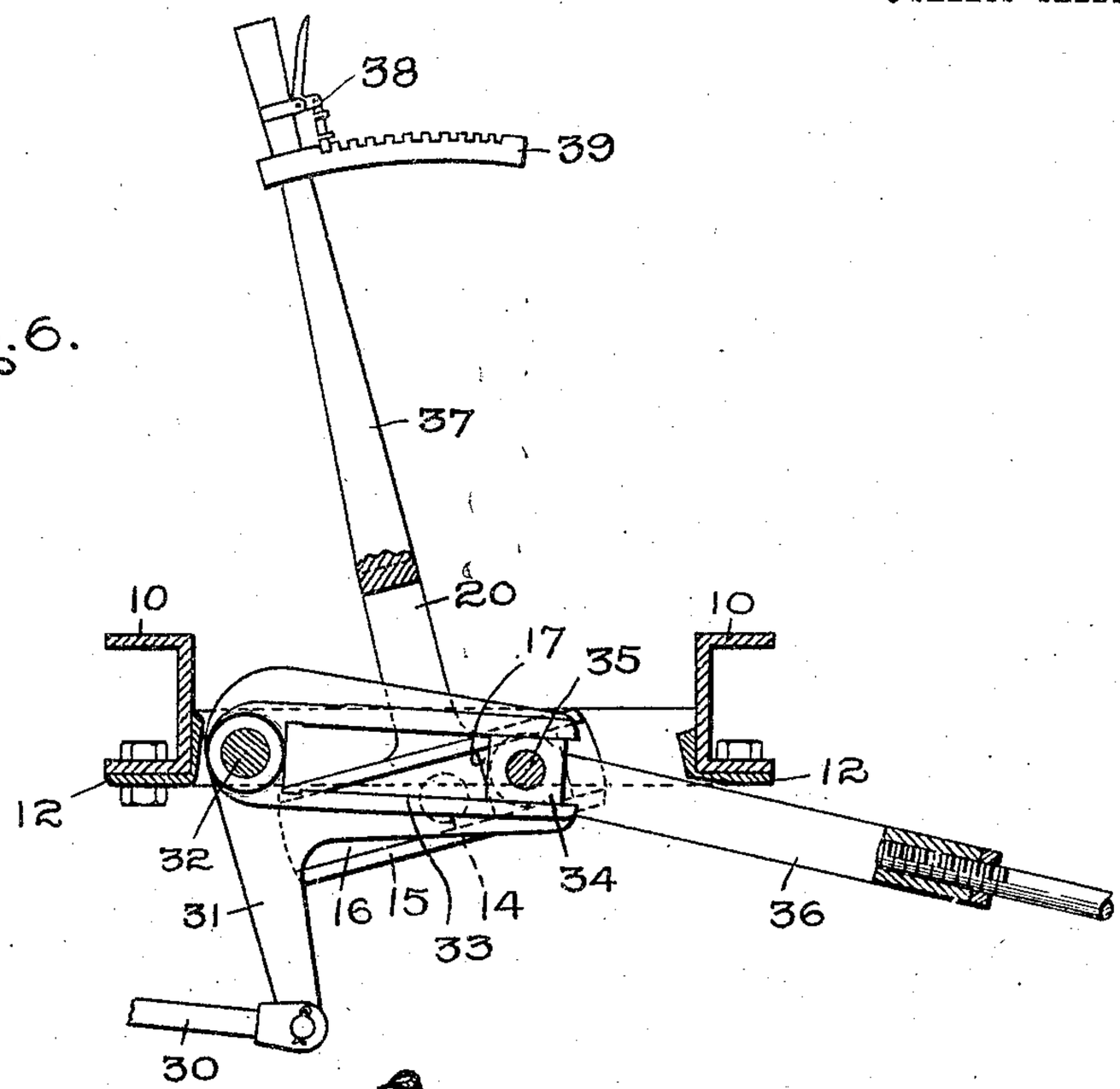
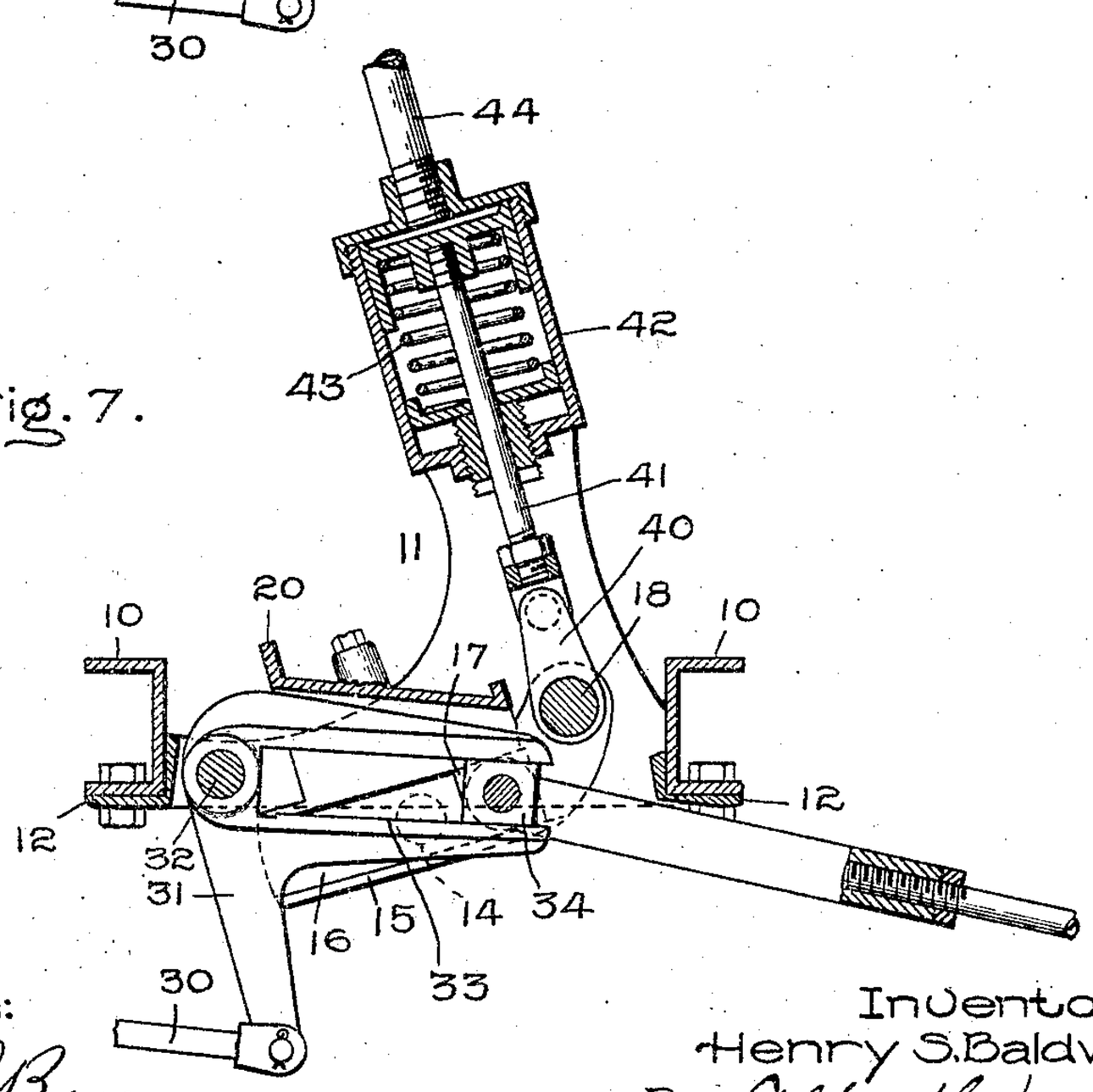


Fig. 7.



Witnesses:
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PHOTO-LITHOGRAPHED BY SACKETT & WILHELMS LITHO. & PTG. CO. NEW YORK.

No. 772,391. Patented October 18, 1904.

UNITED STATES PATENT OFFICE.

HENRY S. BALDWIN, OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

VARIABLE-STROKE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 772,391, dated October 18, 1904.

Application filed July 5, 1902. Serial No. 114,354. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. BALDWIN, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Variable-Stroke Mechanism, of which the following is a specification.

In the operation of flash-boilers and hydrocarbon-burners it is desirable to vary the amounts of water and fuel which are forced into the boiler and burner in accordance with the demand for steam. It is necessary to vary the amount of water delivered to the boiler in accordance with the demand for steam, whereas it is desirable, although not absolutely necessary, to correspondingly vary the fuel-supply. This regulation may be accomplished by hand or automatically, or by a combination of both; and the present invention has for its object to provide a regulator by means of which the capacity of a fluid pump or pumps may be varied from minimum to maximum and this in an efficient manner.

Although the invention is described in connection with fluid-delivering pumps for automobiles, its application is not limited thereto, since it can be used to impart variable strokes or movements to other forms of apparatus.

In the accompanying drawings, which represent an embodiment of my invention, Figure 1 is a side elevation of the vehicle. Fig. 2 is a side elevation of my improved regulator. Fig. 3 is a plan view of the same. Fig. 4 is a side elevation of the regulator, partly in section. Fig. 5 is a transverse section taken on line 5 5 of Fig. 4. Fig. 6 is a side elevation, partly in section, of a slight modification of the means employed to adjust the regulator; and Fig. 7 shows an automatic device for adjusting the regulator, which device is under a fluid-pressure.

1 represents a vehicle-body, which is supported by the driving-wheels 2 and the steering-wheels 3.

4 represents a boiler, which furnishes steam to the engine 5, the latter being coupled by a chain 6 to the rear or driving axle. Mounted on the axle is an eccentric 7, which is employed to actuate the water and fuel pumps 8 through the medium of the adjustable regulator 9. The water-pump is connected to the water-tank which surrounds the boiler and to the boiler by pipes, which pipes have been omitted in order to simplify the illustrations. The fuel-pump is connected by pipes with the fuel-tank and burner in the ordinary manner. The engine is mounted on two transversely-extending frame-bars 10, and these bars may be or may not be employed to carry the regulator, as desired. It is to be noted that the eccentric has a constant stroke, and the relation between it and the engine remains fixed. In other words, as the speed of the engine changes so does the speed of the eccentric.

Inasmuch as there are times when the demand for steam is light and as such times may occur when the vehicle is running at a relatively high speed, it is necessary to provide means whereby the effective discharge of the pump can be varied. This change in the effective discharge is accomplished by varying the stroke of the pump-piston by means of a regulator, comprising certain novel features in construction. The regulator is interposed between the pump-piston and the eccentric in such a manner that the pump may work at full stroke or it may work at any portion of its stroke between zero and maximum. Arrangements are also provided whereby the pump-piston can be held stationary while the eccentric is in service.

The regulator or variable-stroke mechanism comprises, essentially, a pivoted lever or rocker and a pivoted guide or support, one of which is connected to the driving mechanism, while the other is connected to the driven mechanism. Between the lever or rocking device and the guide is an adjustable device, which connects them in such manner that their strokes may be similar or one may be greater than the other, as desired.

Referring more especially to Figs. 2 to 5, inclusive, 10 represents the angle-irons on the vehicle or other supports, to which the regulator is bolted or otherwise secured. The regulator itself comprises a frame 11, which

in the present instance is rectangular in form and has extensions 12, that engage with and are bolted to the angle-irons. On opposite sides of the frame bearings 13 are provided to receive the trunnions 14, which are secured to and carry the adjustable guides or supports 15. The flanged guides or supports are provided with rectangular slots 16, having straight edges, which are arranged to receive the sliding blocks 17, the latter being connected to the driving mechanism. One of the grooves is arranged to receive one block, while the other groove is arranged to receive the block on the opposite side. The adjustable guides or supports 15 are connected together at the right-hand end by the pin 18, which also acts as a nut for the adjusting-screw 19. In order to insure corresponding movements of the levers or supports 15, they are connected by an inverted-U-shaped cover 20, which cover also carries an oil-cup 21, by means of which the parts can be lubricated. In the present instance a two-part guide or support 15 is provided, because the strain on the parts can be better distributed; but it is within the scope of my invention to use only a single guide or support.

In order to vary the effective stroke of the apparatus as a whole, it is necessary to provide means for adjusting the position of the guide or support 15. Such an adjusting device is found in the screw 19, which is mounted in a rocking holder 22. The holder 22 is provided with trunnion-like supports 23, the latter being carried by bearings 24, which are a part of the main frame 11. The holder is held in fixed position on the screw by means of a collar and the nut 25. By rotating the screw in one direction or the other the position of the guides 15 will be changed—that is to say, the guides and the connecting-piece 20 swing around the trunnion 14 as a center. Between the end of the adjusting-screw and the actuating-rod 26 is a universal joint 27 to compensate for differences in alinement between the controlling-handle and the regulator.

The pump-piston or other driven part is connected by the link 30 with the bell-crank lever 31. In the present instance both the water and fuel pumps are driven by the link 30, so that the amounts of water and fuel delivered thereby are correspondingly and proportionately varied. The rods 28 are connected to the water-pump and the rod 29 with the fuel-pump. The rods are connected by a cross-head, and the latter is connected to the link 30, so that as the movement of the lever 31 varies so also do the strokes of the pumps. The lever or rocker 31 is provided with a pivot 32, which enters the bosses formed in the main frame 11 and is supported thereby. The bell-crank lever or rocking device is provided with a pair of jaws or guides 33, which are arranged to receive the sliding block 34. The blocks 17 and the block 34, which is placed between them, are pivotally connected by the same stud or shaft 35. It is to be noted that the pivot 35 in addition to connecting the three blocks also forms the attaching means between the blocks and the fork 36, the latter being connected to the eccentric through suitable means, such as a rod. The arms of the fork are disposed one on each side of the central block 34, and the space between the sides of the fork is somewhat greater than the width of the jaws of the bell-crank lever 31 and also the block 34. By reason of this construction the jaws are free to move between the arms of the fork. The relation of the side and center blocks with respect to the guides and the jaws is best shown in Fig. 5. It is to be observed that the guide 15 and lever 31 are pivoted to the frame 11 in such manner that they extend toward each other and overlap to a certain extent. This overlapping of the guide and lever permits me to reduce their length, to simplify the adjustable connection between them, and also to reduce the size of the regulator as a whole.

The eccentric causes the connecting-rod to move back and forth with a constant stroke. Hence the fork 36 must move likewise. As the fork moves it carries with it the side blocks 17 and the central block 34. When the center block 34 is compelled to move with the fork 36 under the action of the eccentric, it will when moved inward cause the lower arm of the bell-crank lever to move in the direction of the arrow, because as the blocks move to the left the side blocks 17 drop lower and lower, owing to the downward inclination of the guides 15, until the complete movement has been made. The pivoted guide 15 is normally held in fixed relation by the screw 19 when the apparatus is working, and it is only by changing the adjustment of this screw that the stroke of the pump can be varied. As the side blocks 17 and the center block 34 move to the right under the return stroke of the eccentric the lower arm of the bell-crank lever 31 will move in the direction of the dotted arrow. This is due to the fact that the blocks are now traveling up the inclined guides 16 or up the side of a wedge. As the blocks move back and forth this action is repeated. When it becomes necessary for any reason to change the adjustment of the pump or pumps in order to cause it or them to deliver more or less liquid, the screw 19 is adjusted from the seat of the vehicle by means of the hand-wheel. In case it is desirable to decrease the amount of liquid delivered the rod 26 and screw 19 are rotated in a direction to depress the right-hand end of the guide-arms 15. The more nearly parallel the guides 16 and the surface of the jaws 33 become the less will be the stroke of the pump or pumps, because the difference in elevation between one end of the guide 16 and the other becomes less and less until finally when all of the parts are in parallel relation

the blocks are free to move to and fro without imparting any oscillating movement to the bell-crank lever, and hence the pump or pumps will be at a standstill. By reason of the fact that the guides and the jaws in the bell-crank lever can be brought into parallel relation the action of the pump or pumps can be entirely stopped without in any way affecting or retarding the operation of the eccentric. A further advantage of my improved construction resides in the fact that the work done by the eccentric varies with the amount of work done by the pump or pumps—that is to say, when the pump is doing full work so also is the eccentric—but as the effective discharge of the pump or pumps decreases from the maximum to the minimum so also will the work performed by the eccentric be reduced from maximum to a minimum.

Referring now to Fig. 6, I have shown a slight modification of my invention wherein the character of the device for moving the guides 15 is somewhat modified. In the figure referred to a two-part guide is employed as before, and each part is supported by a trunnion 14. Each part of the guide is provided with a slot or groove 16 to receive a side block. The guides are connected by a U-shaped frame 20, which is extended at 37 to form a handle. The handle is provided with a pivoted latch 38, which is arranged to engage with the notches in the fixed rack 39. A bell-crank lever 31 is employed of the same character as the one previously described, and between the jaws of the lever is the central sliding block 34. When the lever 37 is moved forward or back around the trunnion 14 as a center, the stroke of the pump or other apparatus which is connected to the lever 31 is changed. The greater the angularity between the guide 15 and the jaws of the bell-crank lever the greater will be the movement of the pump-piston or other apparatus, and the more nearly parallel these parts become the less will be the stroke or movement of the link 30.

Referring to Fig. 7, I have shown a device whereby the movement of the pump-piston or other apparatus can be automatically adjusted. In the present instance the stud or shaft 18, which connects the guides 15, is connected by a link 40 with a piston-rod 41. The piston is mounted for movement within the cylinder 42, which is supported by an extension of the frame 11. The piston-rod is provided with a suitable packing-gland to prevent the fluid from escaping from the cylinder. Within the cylinder is a spring 43, which opposes the fluid-pressure and tends at all times to give the pump or other apparatus full stroke by maintaining a maximum angularity between the guides 16 and the jaws of the bell-crank lever. The pipe 44 is connected to the boiler or other receptacle containing fluid under pressure. The pressure on the end of the piston is due, of course, to the pressure in the boiler or receptacle, and the medium for actuating the piston may be water or steam or other fluid, as the case may be, the essential feature being that the pressure of the receptacle shall act to regulate the stroke of the pump.

The invention is designed more especially for feeding water to a flash-boiler; but it is not limited to this, since it can be employed to supply water to other types of boilers, such as those having a storage-space, for example. It can also be applied to the fuel service for automobiles or elsewhere, also to apparatus wherein it is desired to vary the stroke of a driven element with respect to that of the driving element.

In accordance with the provisions of the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other and equivalent means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a variable-stroke mechanism, the combination of a pivoted lever and guide which have fixed pivots and extend toward each other from their pivots and overlap, a sliding connection located between the lever and guide for imparting motion from one to the other, and means for adjusting the position of the guide so that the effect of the sliding connection can be varied.

2. In a variable-stroke mechanism, the combination of an overlapping guide and lever, oppositely-disposed stationary pivots therefor, a fixed mounting for the pivots, and a sliding connection for uniting the guide and lever and transmitting motion between them.

3. In a variable-stroke mechanism, the combination of a guide and a lever, each having stationary fulcrums and the arm of the lever being disposed adjacent to and overlapping the guide, a sliding connection uniting the guide and arm of the lever for rocking the lever, and means for moving the connection for varying the angle through which the lever is rocked.

4. In a variable-stroke device, the combination of a pair of overlapping members, stationary pivots therefor, a sliding connection located between them which transmits motion from one to the other, and means for moving the members into parallel or angular relation with respect to each other.

5. In combination, a frame, an oppositely-disposed lever and guide pivotally supported thereby, a driving connection, and an automatic means for adjusting the guide to vary the throw of the lever.

6. In combination, a motive device having a definite length of stroke, a guide and a lever which overlap and are pivoted at opposite ends, a sliding piece which is connected to the

motive device and engages with the guide and the lever, and automatic means for varying the position of the guide whereby the amount of motion imparted by said motive device to the lever can be varied.

7. In combination, a reciprocating driving connection having a constant length of stroke, a lever and pivoted support which overlap, guide-surfaces on the lever and support, a means reciprocating between the guide-surfaces and actuated by the driving connection, and means for moving the guide-surfaces from a parallel to an angular relation so that the lever can be held stationary or given a movement varying from a maximum to minimum.

8. In combination, a driving connection having a predetermined length of stroke, a lever having a variable stroke, a mechanism driven by the lever, an adjustable support, a device comprising a plurality of sliding blocks which unite the lever and support and which is driven by the driving connection, and means for adjusting the lever and support with respect to each other.

9. In a variable-stroke device, the combination of a fixed frame, a guide, oppositely-disposed trunnions thereon which are supported by the frame, means for adjusting the guide, a lever also carried by the frame, a driving means, and a sliding connection which engages with the guide and the lever and transmits motion from the driving means to the lever.

10. In a variable-stroke device, the combination of a frame having bearings therein, a two-part guide, trunnions on the guide which are mounted in the bearings on the frame, a lever mounted on the frame, guides or jaws provided on the lever and situated between the parts of the guide, and a sliding block which moves on the two-part guide and engages the guides or jaws to impart motion to the lever.

11. In a variable-stroke device, the combination of a supporting-frame having side portions provided with bearings, a guide or support mounted in the bearing thereof, an adjusting device for the guide or support, and a pivoted holder for the adjusting device mounted on the supporting-frame.

12. In a variable-stroke device, the combination of a fixed frame, a guide or support mounted thereon, an adjusting-screw, a holder for the screw, and trunnions on the holder which are supported by the frame.

13. In a variable-stroke device, the combination of a frame, a two-part support mounted thereon, a bell-crank lever also mounted on the frame and situated between the parts of the support, guides formed on the support, a sliding block which engages with the guides, and a driving means which is connected to the block.

14. In combination, a lever and a support, guides formed on the lever and the support, a divided block traveling in the guides, and a fork the ends of which are situated between the parts of the block.

15. In combination, a support having oppositely-disposed guides, blocks traveling in said guides, a lever, a guide formed thereon, a block traveling in said guide, and a single means for uniting the blocks.

16. In combination, a guide and lever which overlap and are mounted at opposite ends on stationary pivots and a sliding connection between the guide and lever which is movable between the stationary pivots.

17. In combination, a pair of overlapping levers which are mounted in fixed bearings on a common support and are capable of independent movement, and a sliding device comprising separate pieces pivotally connected and engaging both levers.

18. In combination, a frame, a two-part support, an adjusting means for the support, trunnions thereon which are supported by the frame, a bell-crank lever mounted on the frame, a connection therefrom to the device to be driven, a sliding-block connection between the support and the lever, an eccentric, and a connection between the block and the eccentric.

19. In combination, pivoted members, means guided by one member for imparting motion to the second, and a pressure device for adjusting the relation between said members.

20. In combination, a pair of pivotally-supported members, a pressure device for adjusting the members with respect to each other, a connection between the members, and a means for imparting a stroke of constant length to the connection.

21. In combination, a source of power, two independent devices driven thereby, a mechanical connection for driving both of said devices, and a variable-stroke mechanism between the devices and said source of power for simultaneously and correspondingly varying the effects of said devices, comprising a pair of pivoted members and an adjustable connection between them.

22. In a variable-stroke mechanism, the combination of an adjustable device comprising an inverted-U-shaped member and guides forming symmetrically disposed and spaced flanged portions which are connected by the said member, a pivotal mounting for the adjustable device, a lever having parallel jaws or guides arranged intermediate the flanged portions of the adjustable device, a sliding connection common to the guides and the lever, and an actuating mechanism for imparting motion to the sliding connection.

23. In a variable-stroke mechanism, the combination of a pivotally-mounted guide comprising symmetrically-disposed parallel flanges, a pivotally-mounted lever provided with parallel jaws arranged between the flanges of the guide and adapted to register

therewith, and a movable connection common to the guide and lever, the same comprising sliding blocks pivotally connected and arranged between the parallel flanges and jaws.

24. In a variable-stroke mechanism, the combination of a pivotally mounted and adjustable guide comprising parallel portions each having a pair of parallel flanges presented toward each other, a lever mounted between parallel portions of the guide and having parallel jaws adapted to register with the flanges, and a movable device common to the guide and lever, the same comprising sliding rectangular blocks movable between the flanges and jaws and a shaft connecting the blocks.

In witness whereof I have hereunto set my hand this 2d day of July, 1902.

HENRY S. BALDWIN.

Witnesses:
DUGALD MCK. MCKILLOP,
HENRY O. WESTENDARP.