

(No Model.)

3 Sheets—Sheet 1.

F. H. RICHARDS.
WEIGHING MACHINE.

No. 548,848.

Patented Oct. 29, 1895.

Fig. 3.

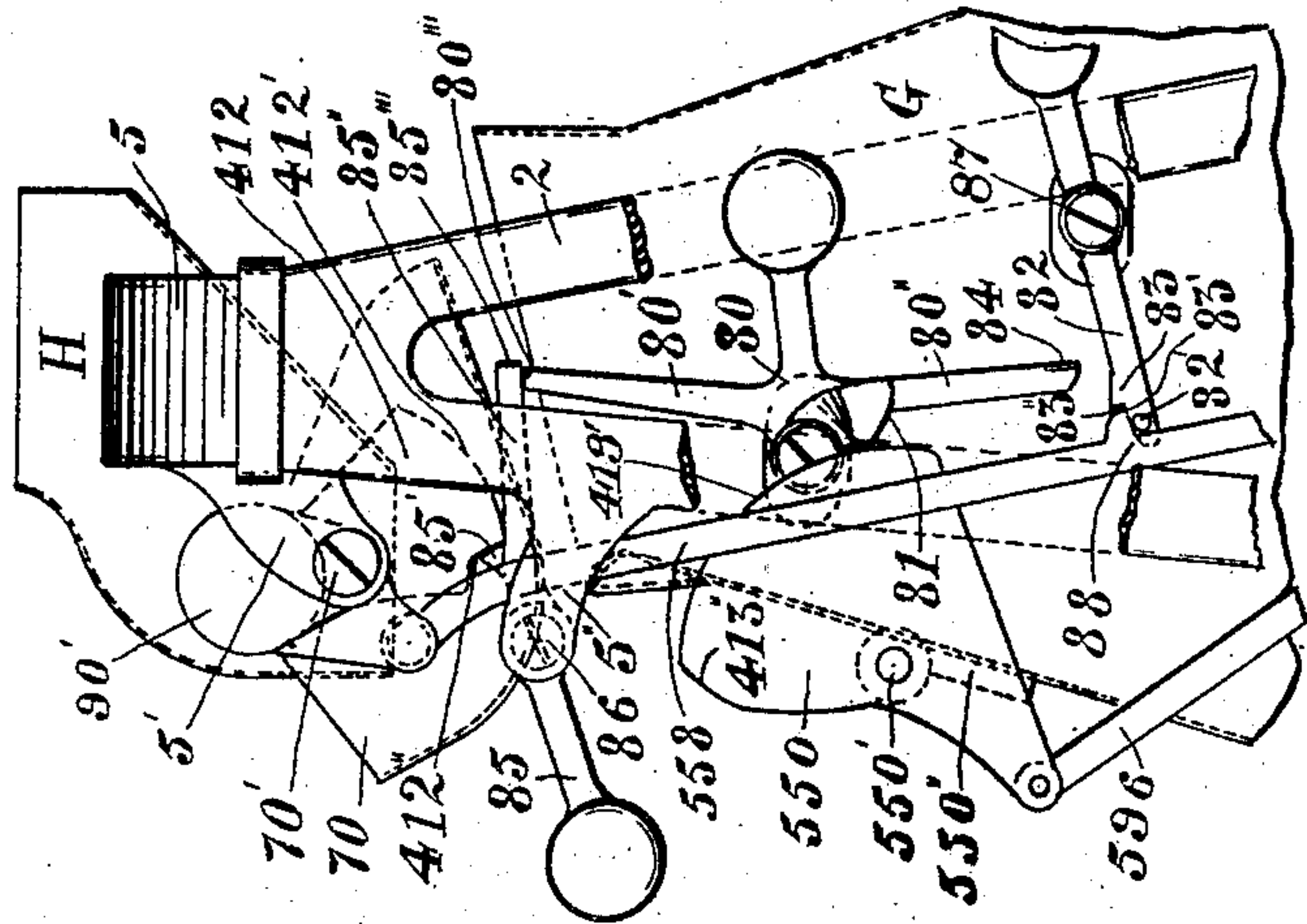


Fig. 2.

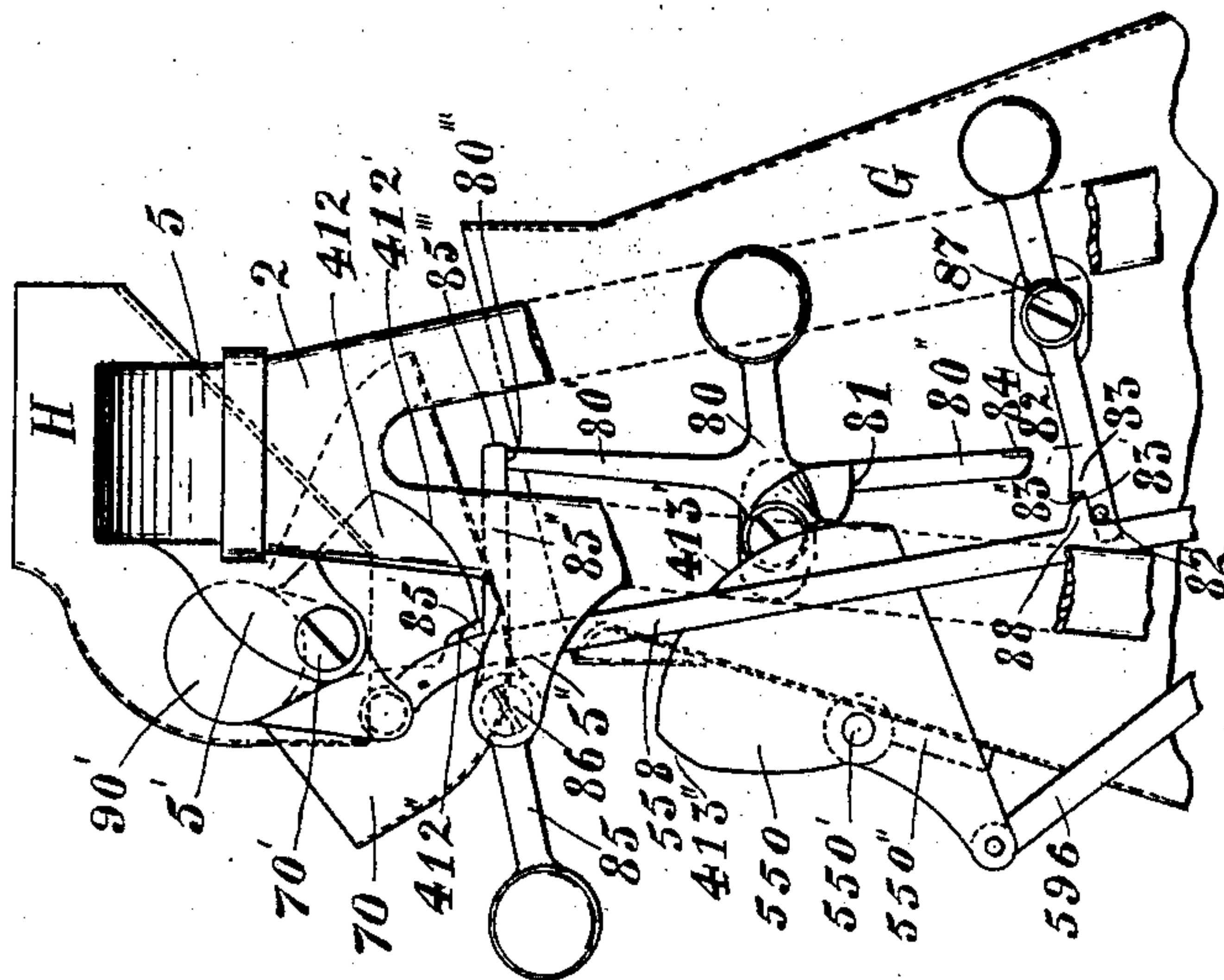
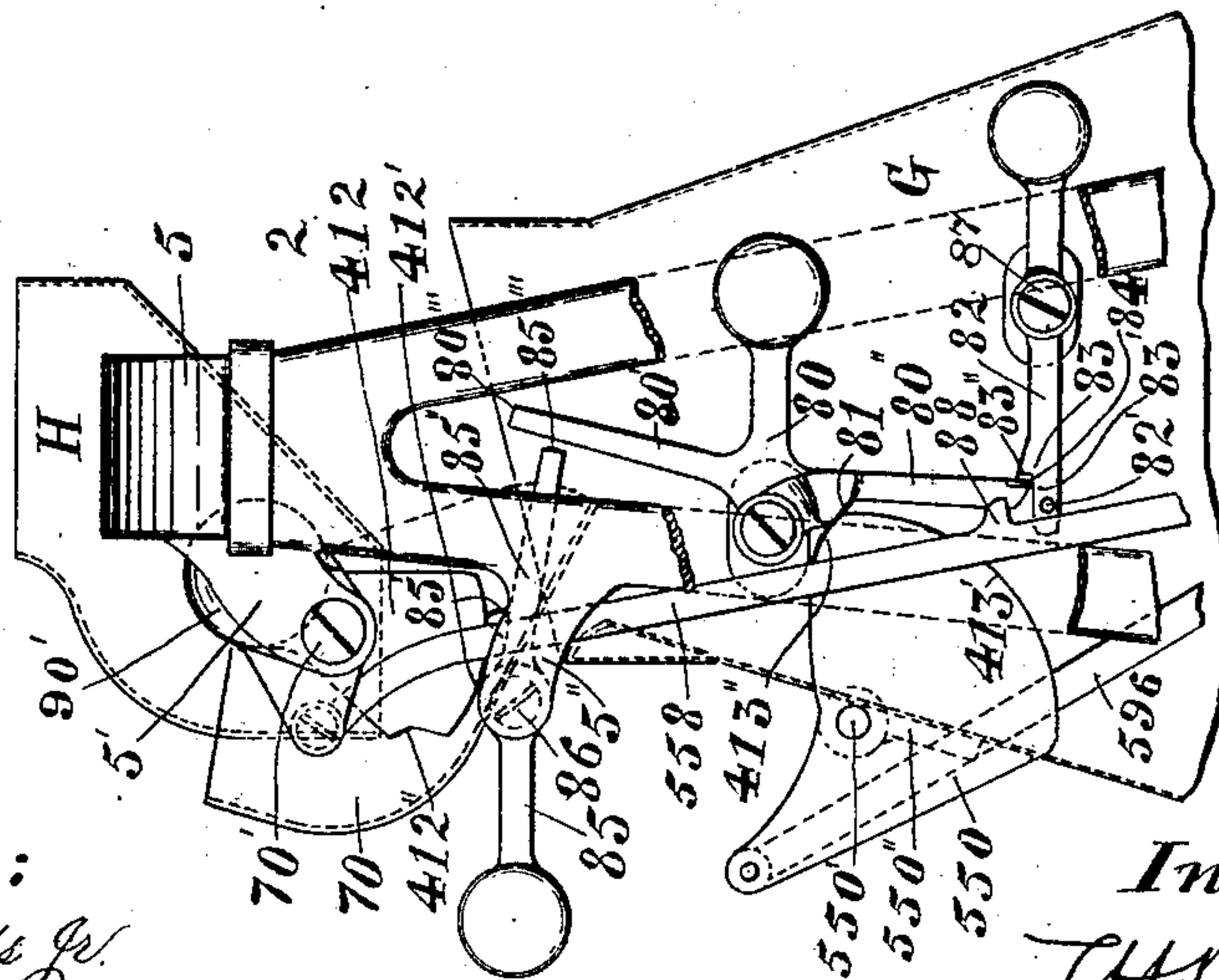


Fig. 1.



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Fig. 4.

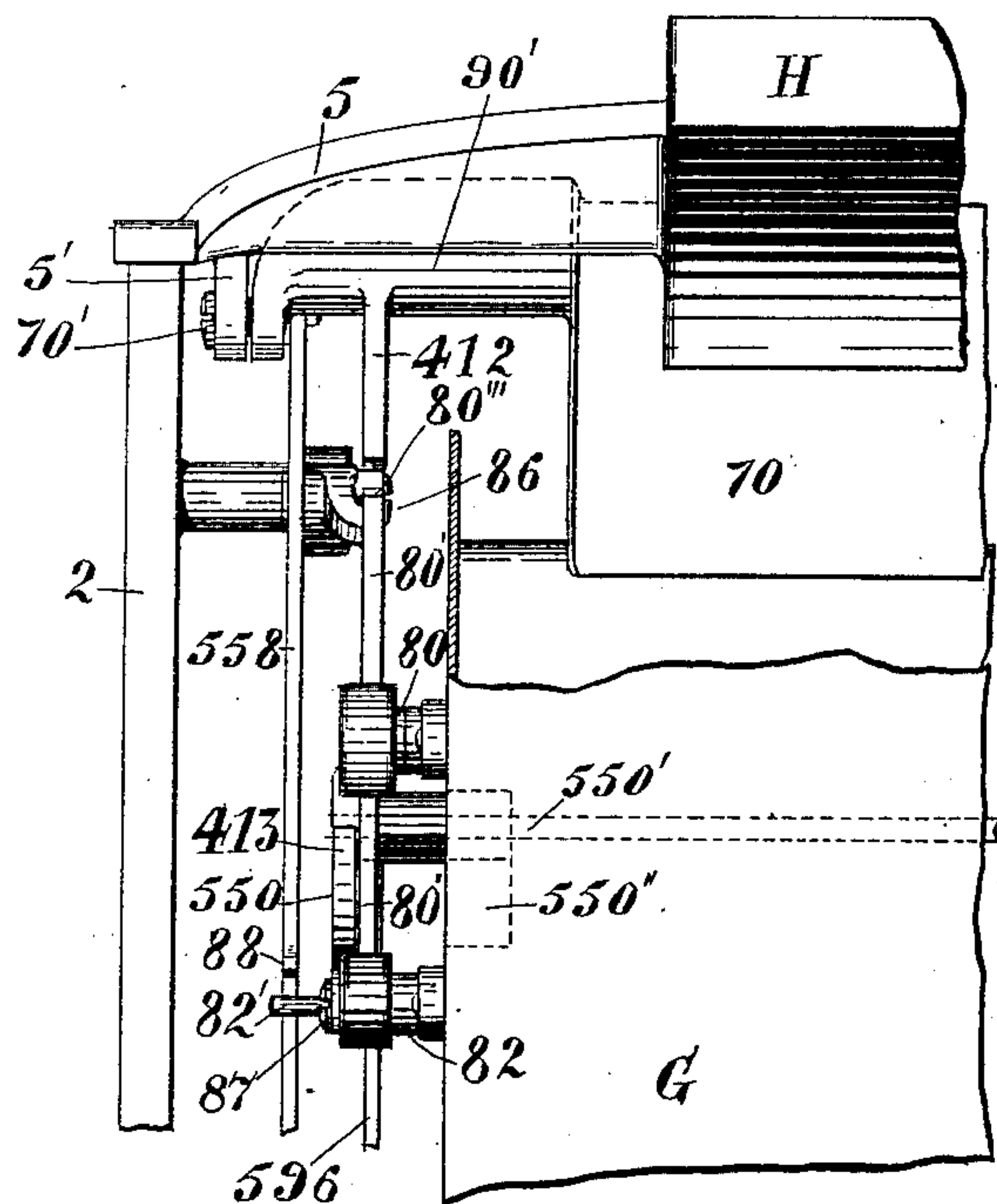
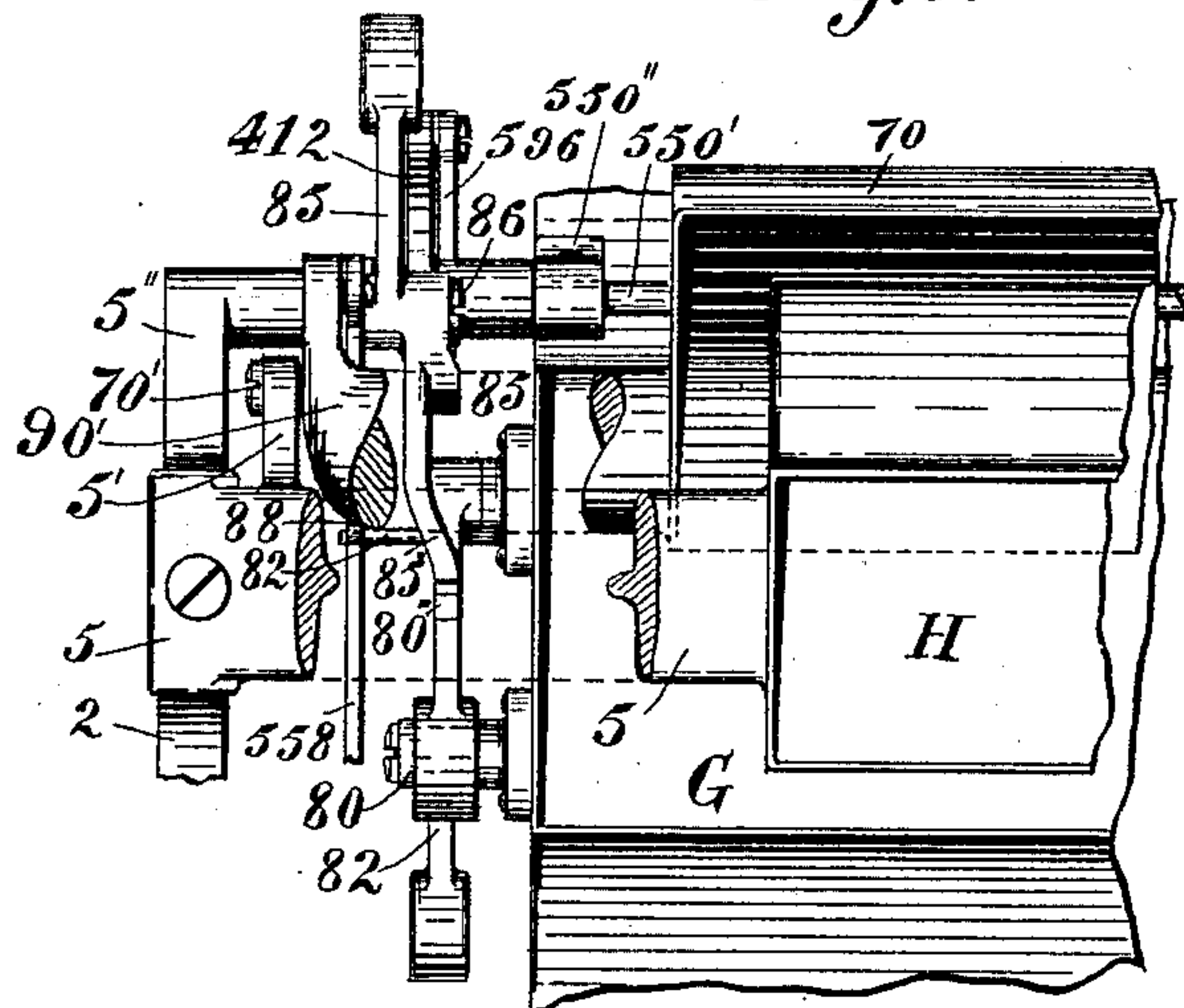


Fig. 5.



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Fig. 7.

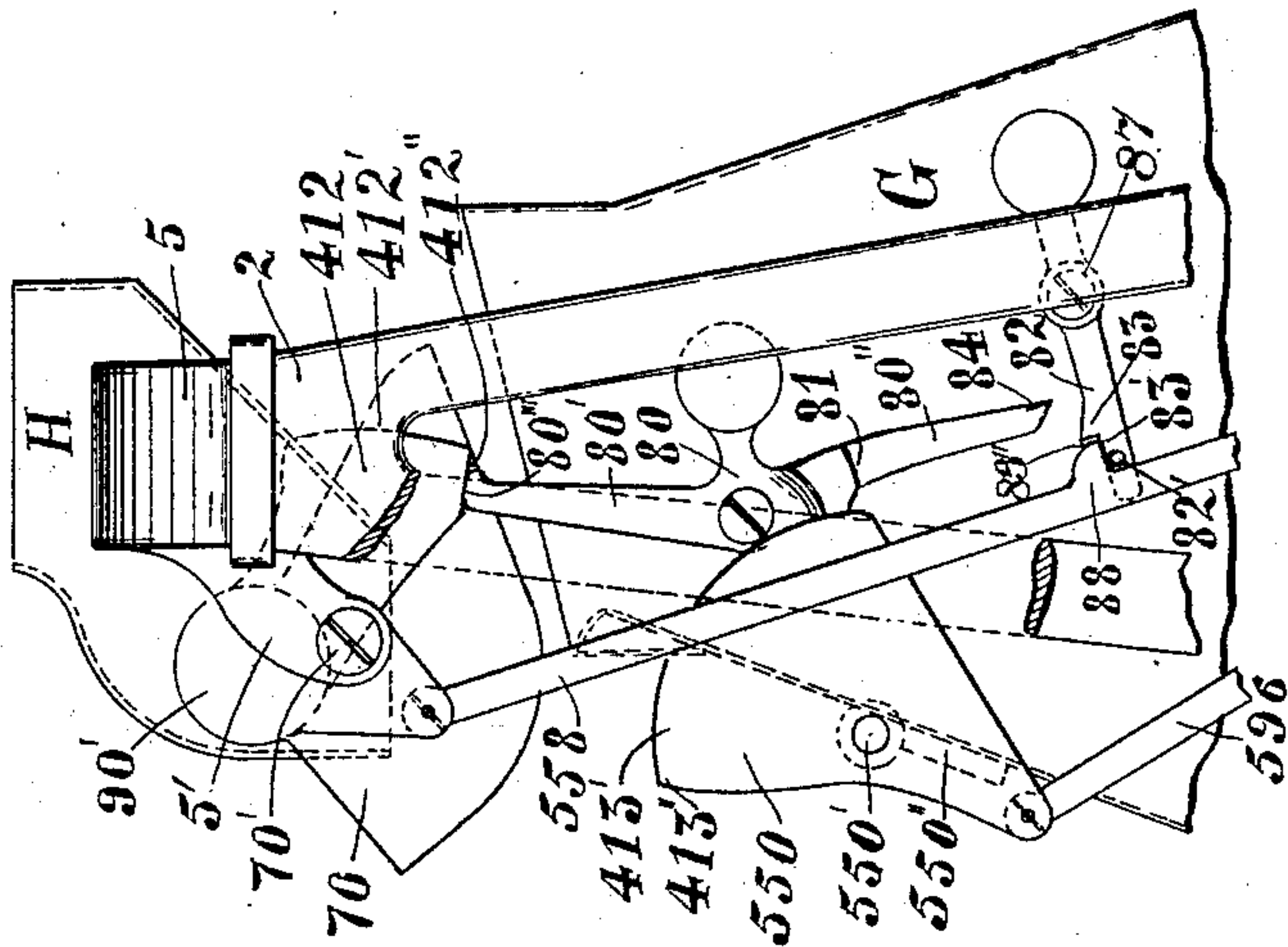
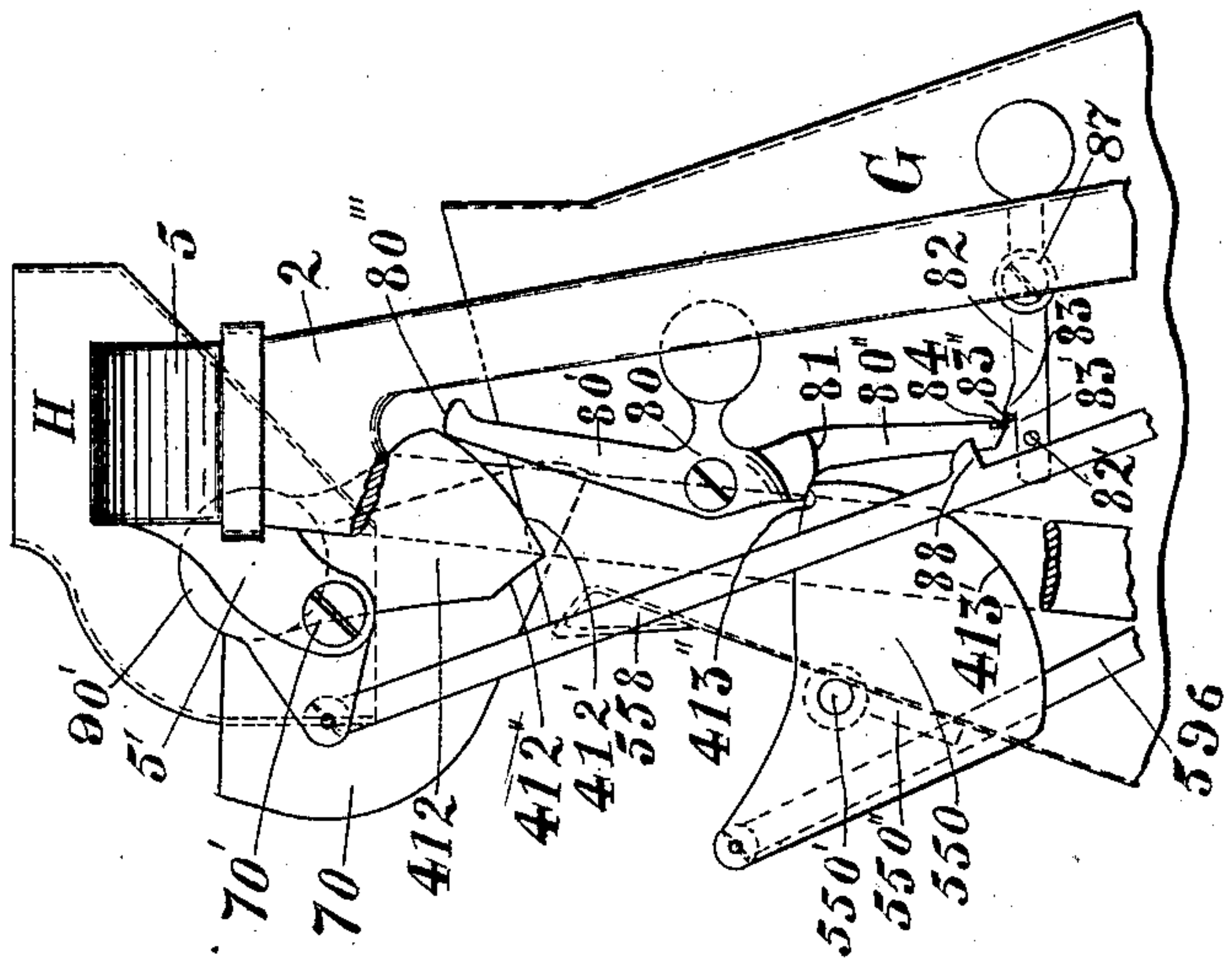


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

WEIGHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,848, dated October 29, 1895.

Application filed May 24, 1895. Serial No. 550,537. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Weighing-Machines, of which the following is a specification.

This invention relates to weighing-machines, the object being to provide an improved organization of stop devices coacting with the valve and the bucket and positioned each relatively to the other for limiting and reducing the thrust and strain from all directions on the valve and bucket during the operation of the machine, whereby the present improvements are especially adaptable to machines for securing true and accurate measurements in relatively-large loads or quantities of material.

The present invention is in the nature of an improvement on the weighing-machine described and claimed in my application, Serial No. 546,612, filed April 22, 1895.

In the drawings accompanying and forming part of this specification, Figure 1 is a right-hand end elevation of a weighing-machine embodying my present improvements, the bucket being illustrated as empty and the valve open for permitting a flow of the supply-stream to the bucket. Fig. 2 is a similar view illustrating the bucket as discharging a load. Fig. 3 is a view similar to Figs. 1 and 2, illustrating the bucket as having discharged its load and as having risen, the valve still being shown locked. Fig. 4 is a front elevation, and Fig. 5 is a plan view. Fig. 6 is a right-hand end elevation of the weighing-machine and illustrates one modified form of the invention and shows the parts in the positions in which they are shown in Fig. 1, and Fig. 7 is a similar view showing the parts in the positions which they are shown as occupying in Fig. 3.

Similar characters designate like parts in all the figures of the drawings.

The framework for carrying the operative parts of the machine may be of any suitable construction, being shown comprising side frames connected by a top plate or beam 5. There is shown in the drawings but one of the side frames, and it is designated therein as 2.

The top plate or beam 5 is illustrated as having suitably secured thereto the hopper H.

The bucket (designated by G) is of the "single-chambered" type or class and is supported under the hopper H to receive material therefrom.

As a means for controlling and regulating the stream from the supply-chute any suitable valve may be employed. There is illustrated in the drawings at 70 a valve substantially similar to that described and claimed in my Letters Patent No. 535,727, granted March 12, 1895. The valve 70 is shown pivoted within arms or brackets 5', depending from the top plate 5 of the machine, the pivot or axis of movement of the valve being designated by 70'. The valve 70 is illustrated as located substantially beneath the mouth of the supply-chute in position for supporting the descending column or mass when the valve is closed. The valve is also preferably balanced, so as to have, normally, no tendency to either open or close, the balance-weight being shown herein as a shaft 90' extending from opposite ends of the valve-pan.

A portion of the means employed for supporting the bucket-closer (not shown) is illustrated in the drawings as comprising an inverted toggle connection. This toggle connection consists of some suitable rocker—such, for instance, as 550—which is illustrated as secured to a rock-shaft 550', journaled in bearings 550'', one on each side of the upper rear portion of the bucket G. The rocker is shown as having pivoted thereto a connecting-rod 596, the opposite end of this connecting-rod being pivotally connected to the closer. (Not shown.)

In connection with a valve and a bucket mechanism and with a pair of main stops, one operative with the valve as a valve-stop and the other constituting a bucket-discharge stop, I employ a pair of locking-stops intermediate of the valve-stop and the bucket-discharge stop and each in position and adapted for limiting the operation of the other locking-stop and also in position and adapted for respectively limiting the operation of the valve and bucket-discharge stops.

In connection with a valve and bucket mechanism and with a pair of main stops, one

of which is operative with the valve as a valve-stop and the other of which constitutes a bucket-discharge stop, I also employ an oscillatory locking-stop, which has a stop-face 5 relatively adjacent to the center of movement of said locking-stop and also has said stop-face normally in locked engagement with one of the main stops, this locking-stop being provided with an arm having a working 10 ing face relatively remote from the center of movement of said locking-stop and having said working face in position and adapted for limiting the movement of the other main stop.

15 The rocker 550 is shown as serving as a bucket-discharge stop and as having a curved stop-face 413', which is illustrated as defined by an arc drawn from the rock-shaft 550' or pivot of said rocker as a center. The rocker 20 is also shown as provided with a relatively-short substantially-straight face or portion, intended for serving as a cam-face, and is disposed between the center of movement of said shaft and the other stop-face, and which is designated by 413''. The peculiar functions of 25 the curved face 413' and the straight stop or cam-face 413'' will be hereinafter made apparent.

The valve 70 is shown provided with a stop 30 412, also termed a "main stop," and is illustrated as having a curved stop-face 412', defined by an arc drawn from the pivot or center of movement of said stop 412 as a center. The valve-stop 412 is also shown provided with a relatively-short stop or cam- 35 face 412'', illustrated as forming a continuation of the curved face 412' and located between the first-mentioned stop-face and the center of movement of said stop 412.

40 Means coacting with the valve-stop and with the bucket-discharge stop are employed for reciprocally limiting and regulating the movements of said stops, and through them the valve and closer. The means employed 45 comprise two intermediate shiftable locking members or stops in the form of levers, each adapted for limiting and regulating the operation of the other, for minimizing lateral and direct strain on the valve and closer and their 50 stops, and for securing quick, close, and responsive action of the main stops at all times, whereby it is possible to secure accurate and positive operation of the machine during the process of weighing. These intermediate 55 shiftable locking members or stops compensate for and take up lost motion between the valve-stop and the bucket-discharge stop, and each intermediate member serves as a positive lock for the other and for its respective 60 main stop. The upper of the two members or stops serves during one period of the operation of the machine as an effective valve lock or limiter and the other or lower of the two intermediate members serves as 65 effectively as a closer lock or limiter by regulating the movements or operation of the valve-stop and the bucket-discharge

stop, which control, respectively, the valve and the closer, the latter not being shown. Said locking-stops are, therefore, alternately 70 shiftable relatively to the main stops. The lower one of the intermediate shiftable stop members is illustrated as comprising a lever 80 and as pivotally carried by the bucket for permitting an oscillatory movement of said 75 lever. This intermediate stop member 80 is illustrated as provided with two oppositely-disposed arms or levers 80' and 80'', constituting, respectively, stop-arms and locking-arms. The locking member 80 co-operates 80 with the bucket-discharge stop, and it is shown provided with a stop or holding face 81, which when the bucket-closer is in the position indicated in Fig. 1, illustrating the valve as open and the closer, (not shown,) to which 85 the bucket-discharge stop 550 is operatively connected, as closed, engages the stop-face or cam portion 413'' of the said bucket-discharge stop for locking said bucket-discharge stop. The intermediate stop member 80 is illus- 90 trated as having a counterweight for maintaining the locked engagement of the bucket-discharge stop and the locking-lever stops.

The stop or holding face 81 of the intermediate stop member 80 is illustrated as being 95 relatively adjacent to the center of movement of said intermediate member 80 and the line of engagement of the bucket-discharge stop, and this locking-lever stop is, preferably, about coincident with the angle of repose of 100 the metals constituting the engaging parts of the same, so that it will require but a minimum expenditure of power to effect their disengagement.

The stop-arm 80' of the lower intermediate 105 locking member 80 is shown with its stop or working face 80''' relatively remote from the stop-face 81 of said locking member.

Heretofore it has been customary for the shiftable member 82 to receive the thrust di- 110 rectly from the bucket-discharge stop. By my present improvement the locking member or stop 80, which is illustrated as interposed between the bucket-discharge stop 550 and the shiftable member 82, serves as a thrust- 115 receiving member for receiving the thrust from the bucket-discharge stop. This thrust is in turn taken up or received by the shiftable member or latch 82, which is substantially parallel to the line of thrust of the 120 bucket-discharge stop, but is materially reduced by reason of the interposition of the locking member or stop 80 between the bucket-discharge stop 550 and the latch or shiftable member 82. The thrust exerted by the 125 bucket-discharge stop 550 against the locking member or stop 80 is substantially in a perpendicular direction, as is the thrust exerted against the latch or shiftable member 82 by the locking member or stop 80, the latch 130 82 serving as a fixed abutment until tripped for discharging the bucket-load.

It is obvious that by the interposition of the locking member or stop 80 between the

bucket-discharge stop 550 and the latch or shiftable member the thrust exerted by the bucket-discharge stop on the latch is so materially reduced as to render the organization of stop devices just described peculiarly efficient for accurately weighing relatively large quantities or loads of material.

The upper of the intermediate shiftable locking stops or members is illustrated at 85 as an oscillatory lever pivoted at 86 to an arm 5'', extending from the side frame 2, and is shown provided with a stop or holding face 85', disposed relatively adjacent to its pivotal point 86, which when the valve is closed is in engagement with the stop-face 412'' of the valve-stop 412. The locking member or stop 85 is shown provided with a counterweight, which tends normally to exert an upward pressure of the said stop member 85 against the curved face of the valve-stop, and when the two stop-faces 85' and 412'' are opposite the stop or holding face 85' will be projected into the stop-face 412' by means of the counterweight of the locking member or stop 85 for thereby locking the valve closed. The line of engagement of the stop-faces 85' and 412'' should, preferably, be about coincident with the angle of repose of the metals composing these stop-faces, so that but a minimum expenditure of power will be necessary to disengage or unlock the same. The intermediate stop member or lever 85 is illustrated as provided with a forwardly-extending lever 85'', which has a working or stop face 85''', illustrated as relatively remote from said locking member.

The stop or working faces 85''' and 80''' of the arms 80' and 85'' should, preferably, be at about the angle of repose of the metals comprising these parts, so that the frictional resistance offered the one by the other during the operation of the machine may be reduced materially.

The valve 70 is shown in the drawings as having a connecting rod or arm pivotally secured to the upper rear portion thereof. The lower end of this rod is in operative connection with some suitable valve-opening actuator. (Not shown.)

The closer-latch 82 is illustrated as provided with a stop-arm 82', disposed in the path of a latch-actuator—such, for instance, as 88—shown as formed on the connecting-rod 558. When the stop-arm 82' of the latch or shiftable member 82 is engaged by the latch-actuator, the latch or shiftable member 82 will be tripped for permitting a discharge of the bucket through the operative connection of the closer (not shown) with the bucket-discharge stop or rocker 550, as will be hereinafter described.

For securing the rocker or bucket-discharge stop in a position for maintaining the closer closed the latch or shiftable member 82 is shown as counterweighted and at the end thereof opposite to that having the counterweight as provided with a stop-face or detent

83, co-operating with a corresponding stop-face or detent 84, illustrated as forming a part of the lower intermediate locking member 80. The stop-face 83 in turn is composed of two stop-faces 83' and 83'', one of which 83' is parallel to the line of thrust of the bucket-discharge stop and serves for preventing upward movement of the latch. The other stop-face 83'' is disposed perpendicularly to the stop-face 83' and is for receiving the thrust of the stop member 80. On the closing of the valve by a valve-closing actuator (not shown) the said valve turns on its pivot and carries with it the connecting-rod 558, having the latch-actuator 88, which engages the stop-arm 82' on the closer-latch 82. This operation disengages the stop-faces or detents of the latch or shiftable member 82 and the locking member or lever 80 and, in a manner hereinafter described, permits the disengagement of the locking stop-faces 413'' and 81 of the bucket-discharge stop and the lower intermediate member 80.

In the modification shown in Figs. 6 and 7 I employ but one locking-stop. The operation of this modified form of the invention is substantially similar to that form illustrated by the other views. This locking-stop is shown pivoted to the bucket G and is shown provided with a stop-face or cam-face 81 relatively adjacent to the center of movement or pivot of the locking-stop. When this locking-stop is in the position in which it is shown in Fig. 6, it being there illustrated as in locked engagement with the bucket-discharge stop, held in this locked position by means of the stop or cam face 81 engaging the corresponding stop or cam face 413'' of the bucket-discharge stop 550, the closer (not shown) is closed and the valve is open, permitting the full stream to enter the bucket. As the bucket descends, the valve simultaneously therewith gradually closes. The valve in closing carries with it the valve-stop, the cam-face 412' of which rides over the working face 80''' of the locking-stop. When the stop-face 412'' of the valve-stop 412 is approximately opposite the working or stop face 80''' of the locking-stop, the shiftable member or latch 82 is in a position to have its stop-arm 82' engaged by the actuator 88. When thus engaged, the shiftable member or latch 82 is disengaged from the locking-arm 80'' of the locking-stop, which operation disengages these two parts. When the shiftable member or latch 82 and the locking-arm 80'' are disengaged, the bucket-discharge stop, by reason of its superior power relatively to the locking-stop 80, tends to carry or oscillate said locking-stop on its pivot, so that the stop-face 80''' of the locking-stop 80 and the stop-face 412'' will engage each other. The counterweight of the locking-stop 80 then tends to project the stop-face 80''' into the stop-face 412'' of the valve-stop 412. In this latter position the parts are shown in Fig 7. In this view the locking-stop 80 is shown as being entirely out

of locked engagement with the bucket-discharge stop and in position where it may limit the movement of the valve-stop.

The operation of the improved machine herein described is as follows: Taking the parts as shown in Fig. 1, where the valve 70 is shown in position for permitting the stream to flow into the bucket, it will be assumed that the stream is entering the bucket. It will be observed that the stop 81 of the lower of the intermediate locking members or levers is shown in engagement with the co-operating locking-stop face or cam portion 413'' of the bucket-discharge stop and that the stop-face 85' of the upper of the intermediate locking members or levers is disposed relatively remote from the stop-face 412'' of the valve-stop 412. The arm or lever 85'' is shown disposed in a plane below the upper edge or engaging-face of the lower intermediate lever or member 80. As the valve closes, the curved face 412' of the stop 412 thereof rides over the stop-face 85' of the intermediate member 85 until the two stop-faces 412'' and 85' are opposite each other, when the stop-face 85' of the intermediate stop member is projected into the curved stop-face 412'' by reason of its counterweight. The valve is shown in Fig. 2 in a locked position and it is assumed that the bucket is just discharging a load of material. It will be observed that the stop-faces 85' and 412'' are in engagement. Simultaneously with the projection of the stop-face 85' into the stop-face 412'' the forward edge of the interlocking stop or member 85 is carried upward past the engaging-face of the lever or arm 80'' of the lower locking member or stop 80. As the valve closes it causes the connecting-rod 558, which has the latch-actuator 88, to descend, and at the proper time said latch-actuator engages the stop-arm 82' of the closer-latch 82, carrying said closer-latch downward and disengaging the stop-face or detent 83 of the closer-latch 80 and the stop-face or detent 84, which forms a part of the locking-lever for the bucket-discharge stop. On the disengagement of these stop-faces or two detents the stop portion 413'' of the rocker acts as a cam and by its greater power carries the upper arm 80' of the lower intermediate locking member under the forwardly-extending arm 85'' of the upper intermediate locking member 85. The position then assumed by the parts is shown by Fig. 2. In Fig. 2, where the valve is shown locked in its closed position, it will be observed that the upper arm 80'' of the lower intermediate locking member or stop 80 is under and engaged by the forwardly-extending arm 85'' of the upper intermediate locking member 85. It will be obvious, then, that the lower intermediate locking member serves the additional function when in this position of assisting the upper intermediate locking member to lock the valve closed. As soon as the valve is securely locked the bucket discharges its load. On the discharge of a load the bucket of

course ascends, and in ascending the rocker or bucket-discharge stop 550 turns on its pivot 550', and the curved face 413' thereof rides over the stop-face 81 of the lower intermediate locking member until the stop-face 81 is opposite the stop-face 413'' of the bucket-discharge stop, the said stops 81 and 413'' riding over each other and each serving as a cam relatively to the other, the stop-face 413'' acting on the stop-face or cam portion 81, permitting the arm 80'' of the member 80 to move, gradually, from under the arm 85 of the upper member. When the two stop-faces 81 and 413'' are fully engaged, the detents 84 and 83, respectively, of the arm 80' of the lower intermediate locking member or stop and of the closer-latch will also be engaged. When the latter operation has taken place, the upper arm 80' of the locking member 80 is entirely out of the path of the arm 85'' of the locking member 85, so that the valve 70 can be opened.

On reference to Fig. 3, where the bucket is represented as just having discharged a load, it will be noticed that the upper intermediate locking member or stop 85 serves as a limiter for the lower member 80—that is, by reason of the greater weight on the upper member, this in turn tends to maintain the lower locking member or stop in a position where the curved face 413' may freely ride over the stop-face 81 of the lower locking member or stop 80 until the stop-face 81 of the lower member 80 is opposite the stop-face 413'' of the bucket-discharge stop 550, when, by reason of the peculiar cam formation of the stop-faces 81 and 413'' relatively to each other and through the agency of the lower counter-weighted member 80, these stop-faces are brought into operative relation. As the curved face 413' rides over the stop-face 81 the arm 80' of the lower locking member 80 is carried out of the path of the arm 85'' of the upper locking member 85 and simultaneously therewith the stop-faces 412'' of the valve-stop and arm 85' of the upper locking member 85 are disengaged for permitting the opening of the valve.

Each of the stop members 80 and 85 is so disposed relatively to the other that the stream cannot enter the bucket until the bucket-closer is closed, and when the mass of material is flowing into the bucket said closer is so locked that the mass cannot be discharged from the bucket until at the proper time the bucket-discharge stop is released for discharging the load.

Having thus described my invention, what I claim is—

1. In a weighing-machine, the combination with a valve and a bucket mechanism; of a pair of main-stops, one operative with the valve as a valve-stop, and the other constituting a bucket-discharge stop; and a pair of locking-stops intermediate of the valve and the bucket-discharge stops, and each in position and adapted for limiting the operation of the

other locking-stop, and also for respectively limiting the operation of the valve-stop and the bucket-discharge stop, substantially as specified.

5 2. In a weighing-machine, the combination with a valve and a bucket mechanism; of a stop for the valve; a bucket-discharge stop; a locking-stop normally in locked engagement with the bucket-discharge stop, and adapted
10 also for limiting the movement of the valve-stop; and means for releasing the locking-stop from locked engagement with the bucket-discharge stop, whereby said locking-stop will be free to be projected into engagement with
15 the valve-stop, to thereby limit the movement of the valve-stop, substantially as specified.

3. In a weighing-machine, the combination with a valve and a bucket mechanism; of a stop for the valve; a bucket-discharge stop;
20 a locking-stop normally in locked engagement with the bucket-discharge stop, and adapted also for limiting the movement of the valve-stop; a latch in position and adapted for holding the locking-stop in engagement with the
25 bucket-discharge stop; and an actuator in position and adapted for releasing said latch from engagement with the locking-stop, whereby said locking-stop will be free to be projected into engagement with the valve-stop, to thereby limit the movement of the
30 valve-stop, substantially as specified.

4. In a weighing-machine, the combination with a valve and a bucket mechanism; of a pair of main-stops, one operative with the
35 valve as a valve-stop, and the other constituting a bucket-discharge stop; and intermediate locking-stops in position and adapted, respectively, for locked engagement with the main-stops, and each of said intermediate
40 locking-stops having a stop-arm provided with a working-face, remotely disposed relatively to the point at which the locking-stop is in locked engagement with the main-stop, and having each of said working-faces in position
45 and adapted for engaging the other working-face, to thereby limit the movement of the respective intermediate locking-stops, substantially as specified.

5. In a weighing-machine, the combination
50 with a bucket having a bucket-discharge stop; of a locking-stop normally in locked engagement with the bucket-discharge stop; and a shiftable member in position and adapted for normally holding the locking-stop in locked
55 engagement with the bucket-discharge stop, substantially as specified.

6. In a weighing-machine, the combination with a bucket having a bucket-discharge stop;
60 of a locking-stop normally in locked engagement with the bucket-discharge stop, and constituting a thrust-receiving member for receiving the thrust of the bucket-discharge stop; and a latch disposed parallel to the line of thrust of the bucket-discharge stop, for
65 holding the locking-stop in locked engagement with the bucket-discharge stop, substantially as specified.

7. In a weighing-machine, the combination with a bucket having a bucket-discharge stop; of a counterweighted locking-stop normally
70 in locked engagement with the bucket-discharge stop, and constituting a thrust-receiving member for receiving the thrust of the bucket-discharge stop; and a counterweighted-latch disposed substantially parallel to the
75 line of thrust of the bucket-discharge stop, for holding the locking-stop in locked engagement with the bucket-discharge stop, substantially as specified.

8. In a weighing-machine, the combination
80 with a bucket having a bucket-discharge stop; of a locking-stop normally in locked engagement with the bucket-discharge stop, and constituting a thrust-receiving member for receiving the thrust of the bucket-discharge stop; a
85 latch disposed substantially parallel to the line of thrust of the bucket-discharge stop, and having a pair of stop-faces normally in engagement with the locking-stop, and disposed, the one substantially parallel to the line
90 of thrust of the bucket-discharge stop, and the other substantially perpendicular to the line of thrust of said bucket-discharge stop, whereby, the former of said stop-faces serves to limit the movement of said latch, and the
95 latter of said stop-faces serves to receive the thrust of the bucket-discharge stop, substantially as specified.

9. In a weighing-machine, the combination with a bucket having a bucket-discharge stop;
100 of an oscillatory locking-stop having a stop-face relatively adjacent to the center of movement of said locking-stop and normally in locked engagement with the bucket-discharge stop, and having an arm provided with a stop-
105 face relatively remote from the center of movement of said oscillatory locking-stop; and a latch having a stop-face normally in engagement with said stop-face of said arm, substantially as specified.
110

10. In a weighing-machine, the combination with a bucket having an oscillatory bucket-discharge stop provided with two stop-faces, one of which is defined by an arc struck from the center of movement of said stop, and the
115 other of which forms a continuation of said first-mentioned stop-face, and is disposed between said first-mentioned stop-face and the center of movement of the stop, and constitutes a cam-face; of an oscillatory locking-
120 stop having a stop-face relatively adjacent to the center of movement of said locking-stop, and having said stop-face normally in locked-engagement with said cam-face of the bucket-discharge stop, and also having an arm pro-
125 vided with a working-face relatively remote from the center of movement of said oscillatory locking-stop; and a latch having a stop-face normally in engagement with said stop-face on the arm of the locking-stop, substan-
130 tially as specified.

11. In a weighing-machine, the combination with a bucket having a bucket-discharge stop; of a locking-stop normally in locked engage-

ment with the bucket-discharge stop; a latch adapted for normally holding the locking-stop in locked engagement with the bucket-discharge stop; and an actuator in position and adapted for releasing the shiftable member from engagement with the locking-stop, and thereby disengaging the locking-stop and the bucket-discharge stop, substantially as specified.

12. In a weighing-machine, the combination with a valve mechanism, and with a bucket; of a bucket-discharge stop; a locking-stop normally in locked engagement with the bucket-discharge stop; a latch for holding the locking-stop in locked engagement with the bucket-discharge stop; and an actuator carried by the valve and in position and adapted for releasing the latch from engagement with the locking-stop, and thereby disengaging the locking-stop and the bucket-discharge stop, substantially as specified.

13. In a weighing-machine, the combination with a valve having a valve-stop, and a bucket having a bucket-discharge stop, each of said stops constituting a main-stop; of a pair of shiftable locking-stops, one normally in locked engagement with the valve-stop, and the other normally in locked engagement with the bucket-discharge stop, and having said locking-stops alternately shiftable out of locked engagement with their respective main-stops, substantially as specified.

14. In a weighing-machine, the combination with a valve and a bucket mechanism; of a pair of oscillatory main-stops, each having two stop-faces, one of which is defined by an arc struck from the center of movement of said stop, and the other of which forms a continuation of the first-mentioned stop-face and is disposed between said first-mentioned stop-face and the center of movement of the stop, and constitutes a cam-face; a pair of shiftable counterweighted locking-stops in position and adapted for reciprocally limiting the movements of each other, and each of said locking-stops having a stop-face relatively adjacent to the center of movement thereof, and adapted for engagement with the cam-face of the corresponding main-stop, substantially as specified.

15. In a weighing-machine, the combination with a valve and a bucket mechanism; of a pair of stops, constituting, respectively, a valve-stop and a bucket-discharge stop; and an oscillatory locking-stop having a stop-face relatively adjacent to the center of movement of said locking-stop, and having said stop-face normally in locked engagement with one of said pair of stops, and said locking-stop also having an arm provided with a working-face relatively remote from the center of movement of said locking-stop, and having said working-face in position and adapted to limit the movement of the other of said pair of stops, substantially as specified.

16. In a weighing-machine, the combination with a valve and a bucket mechanism; of a stop for the valve, and a bucket-discharge

stop; an oscillatory locking-stop having a stop-face relatively adjacent to the center of movement of said locking-stop, and having said stop-face normally in locked engagement with the bucket-discharge stop; and having a stop-arm provided with a working-face relatively remote from the center of movement of said locking-stop, and having said working-face in position and adapted for limiting the operation of the valve-stop, and said locking-stop also having a locking-arm; a latch in position and adapted for engaging said locking-arm; and an actuator carried by the valve, and adapted for releasing said latch from engagement with said locking-arm, to thereby disengage the stop-face from the bucket-discharge stop, substantially as specified.

17. In a weighing-machine, the combination with a valve and a bucket mechanism; of a stop for the valve; a bucket-discharge stop; an oscillatory locking-stop having a stop-face relatively adjacent to the center of movement of said locking-stop, and having said stop-face normally in locked engagement with the valve-stop, and said locking-stop also having an arm provided with a working-face relatively remote from the center of movement of said locking-stop, and having said working-face in position and adapted for limiting the operation of the bucket-discharge stop; a latch for maintaining said locking-stop normally in engagement with the valve-stop; and an actuator for releasing said latch from engagement with the locking-arm, to thereby disengage the locking-stop and the valve-stop, substantially as described.

18. In a weighing-machine, the combination with a valve mechanism and a bucket mechanism; of a pair of stops, one operative with the valve as a valve-stop, and the other constituting a bucket-discharge stop; a pair of locking-stops intermediate of the valve-stop and the bucket-discharge stop, and each in position and adapted for limiting the operation of the other locking-stop, and also for respectively limiting the operation of the valve-stop and the bucket-discharge stop, and having one of said locking-stops normally in locked engagement with the bucket-discharge stop; and a latch in position and adapted for normally holding said locking-stop in locked engagement with the bucket-discharge stop; and an actuator in position and adapted for releasing the shiftable member from engagement with the locking-stop, and thereby disengaging the locking-stop and the bucket-discharge stop, substantially as specified.

19. In a weighing-machine, the combination with a valve mechanism and a bucket mechanism; of a pair of stops, one operative with the valve as a valve-stop, and the other carried by the bucket and constituting a bucket-discharge stop; a pair of locking-stops, one carried by the bucket, and having said locking-stops intermediate of the valve-stop and the bucket-discharge stop, and each in position and adapted for limiting the operation

of the other locking-stop, and also for respectively limiting the operation of the valve-stop and the bucket-discharge stop, and having one of said locking-stops normally in locked engagement with the bucket-discharge stop; and a shiftable member in position and adapted for normally holding said locking-stop in locked engagement with the bucket-discharge stop, substantially as specified.

20. In a weighing-machine, the combination with a valve mechanism and a bucket mechanism; of a pair of stops, one operative with the valve as a valve-stop, and the other carried by the bucket and constituting a bucket-discharge stop; a pair of locking-stops, one carried by the bucket, and having said locking-stops intermediate of the valve-stop and the bucket-discharge stop, and each in position and adapted for limiting the operation of the other locking-stop, and also for respectively limiting the operation of the valve-stop and bucket-discharge stop, and having one of said locking-stops normally in locked engagement with the bucket-discharge stop; a latch in position and adapted for normally holding the said locking-stop in locked engagement with the bucket-discharge stop; and an actuator in position and adapted for releasing said latch from engagement with said locking-stop, and thereby disengaging said lock-stop and the bucket-discharge stop, substantially as specified.

21. In a weighing-machine, the combination with a valve mechanism and a bucket mechanism; of a pair of main-stops, one operative with the valve as a valve-stop, and the other constituting a bucket-discharge stop; a pair of oscillatory counterweighted locking-stops having holding-faces adjacent to the center of movement of said locking-stop and adapted for alternate engagement with the main-stops, and having also arms in position and adapted for reciprocally engaging each other at points relatively remote from the center of movement of said locking-stops; a latch in position

and adapted for holding one of said locking-stops in locked engagement with the bucket-discharge stop; and an actuator in position and adapted for releasing the latch from engagement with said locking stop-lever, to thereby disengage said locking-lever and the bucket-discharge stop, substantially as specified.

22. In a weighing-machine, the combination with a valve mechanism and with a bucket mechanism; of a pair of oscillatory main-stops, one operative with the valve as a valve-stop, and the other carried by the bucket and constituting a bucket-discharge stop, and each of said stops having two stop-faces, one of which is defined by an arc drawn from the center of movement of said stop, and the other of which forms a continuation of said first-mentioned stop-face, and is disposed between said first-mentioned stop-face and the center of movement of the stop and constitutes a cam-face; a pair of oscillatory, shiftable locking-stops, one carried by the bucket, and each having a holding-face relatively adjacent to the center of movement of said locking-stop, and having said holding-face adapted for engagement with the corresponding cam-face of its main-stop, and each of said locking-stops having an arm provided with a working-face located at the end thereof, and adapted for limiting the movement of the other stop-arm, and one of said locking-stops also having a locking-arm; a latch on the bucket normally in locked engagement with said locking-arm; and an actuator carried by the valve and in position and adapted for releasing the latch from engagement with said locking-arm of the locking-stop, to thereby disengage said locking-stop and the bucket-discharge stop, substantially as specified.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,
R. W. PITTMAN.