

Feb. 6, 1951

L. D. BOYCE
ENGINE STARTING DEVICE

2,540,607

Filed June 15, 1945

3 Sheets-Sheet 1

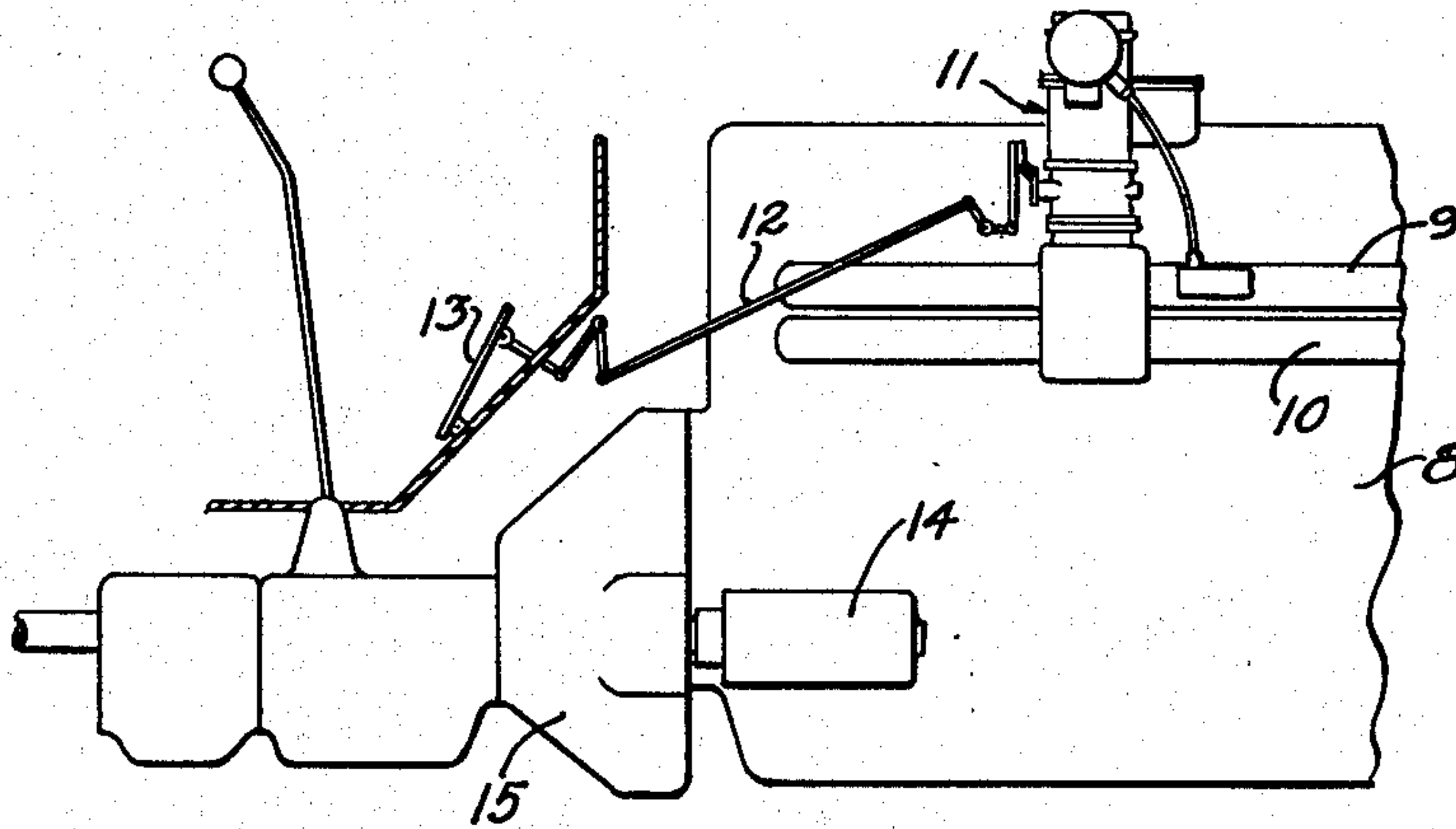


FIG. 1.

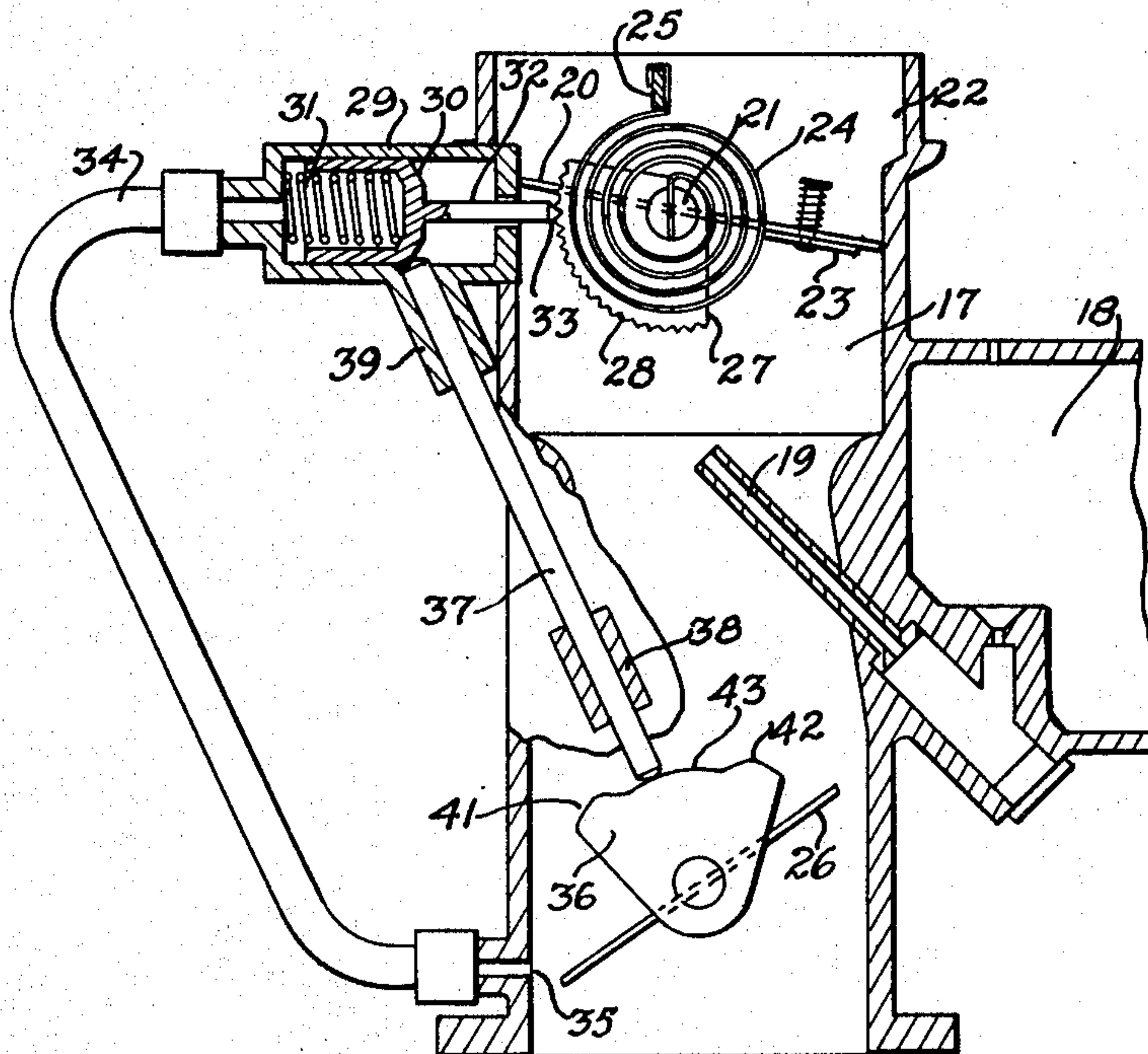


FIG. 2.

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3 Sheets-Sheet 2

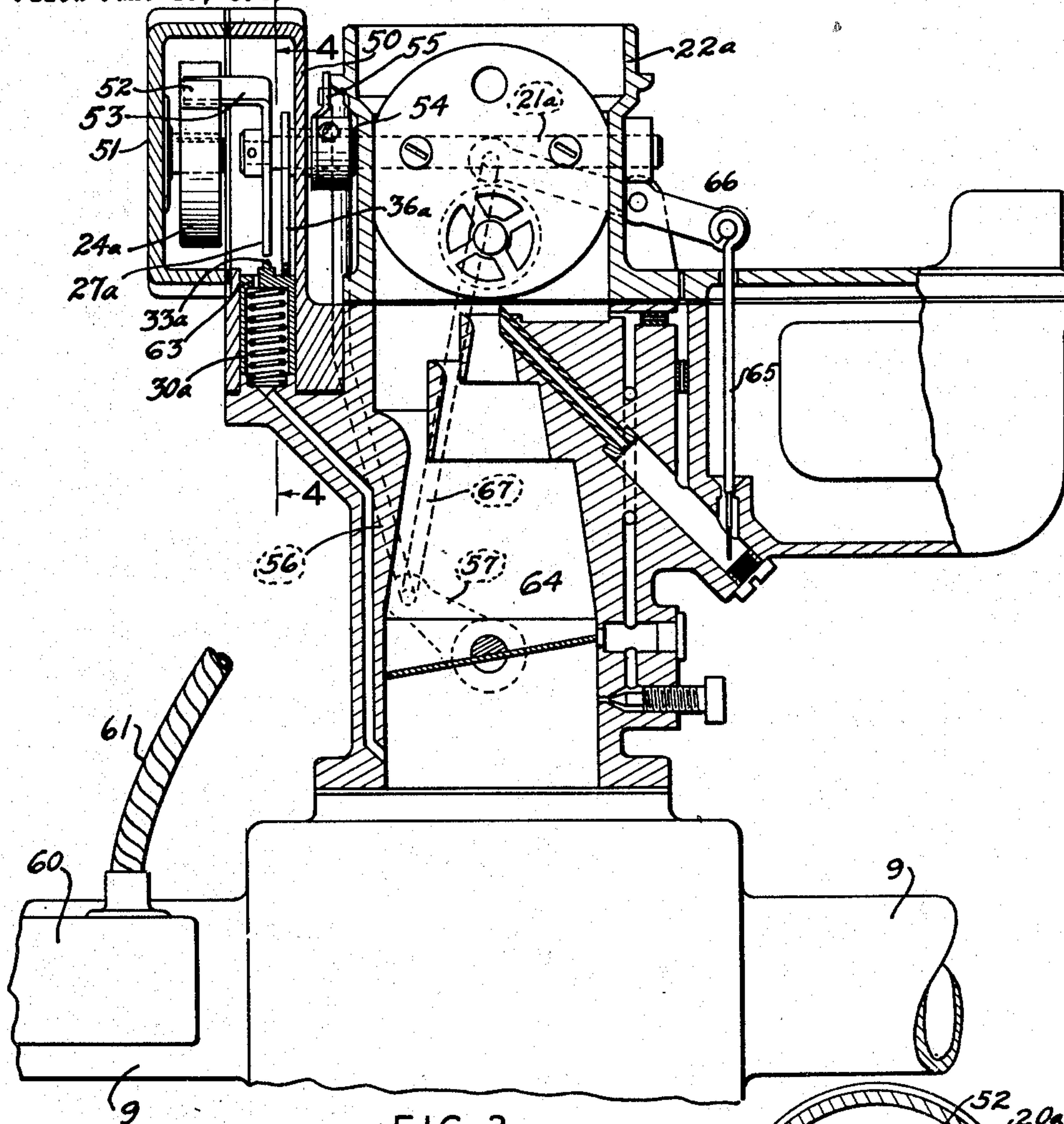


FIG. 3.

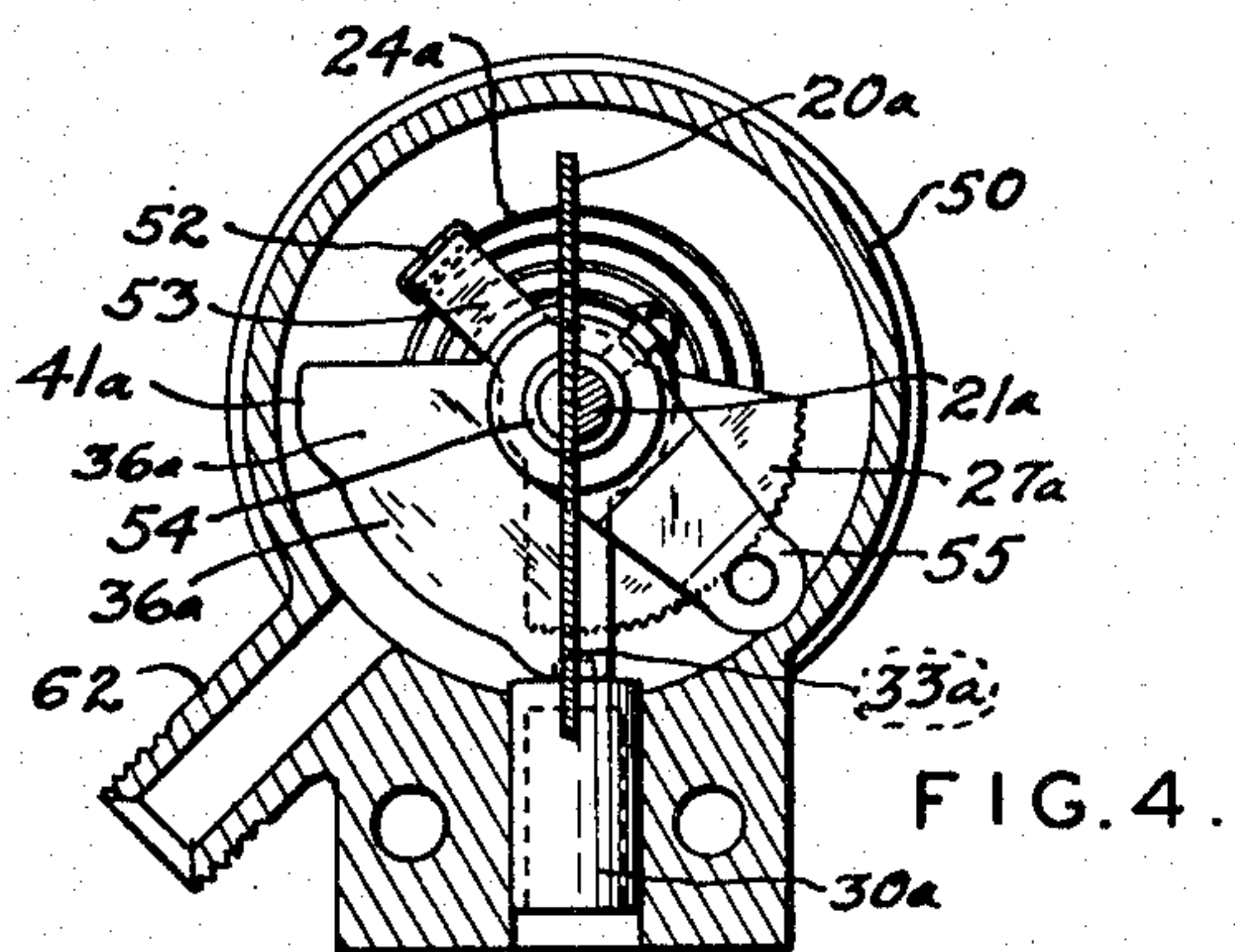


FIG. 4.

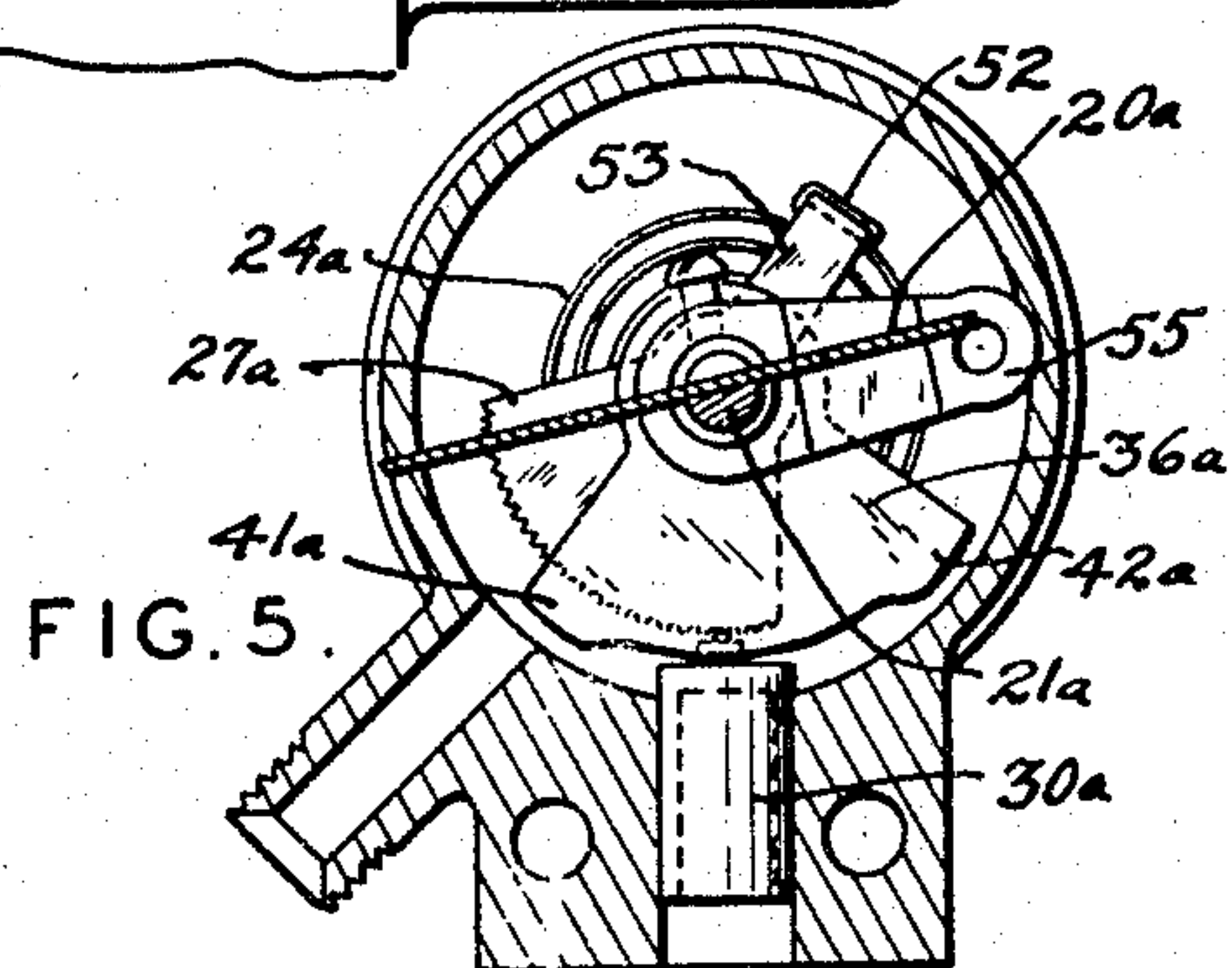


FIG. 5.

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3 Sheets-Sheet 3

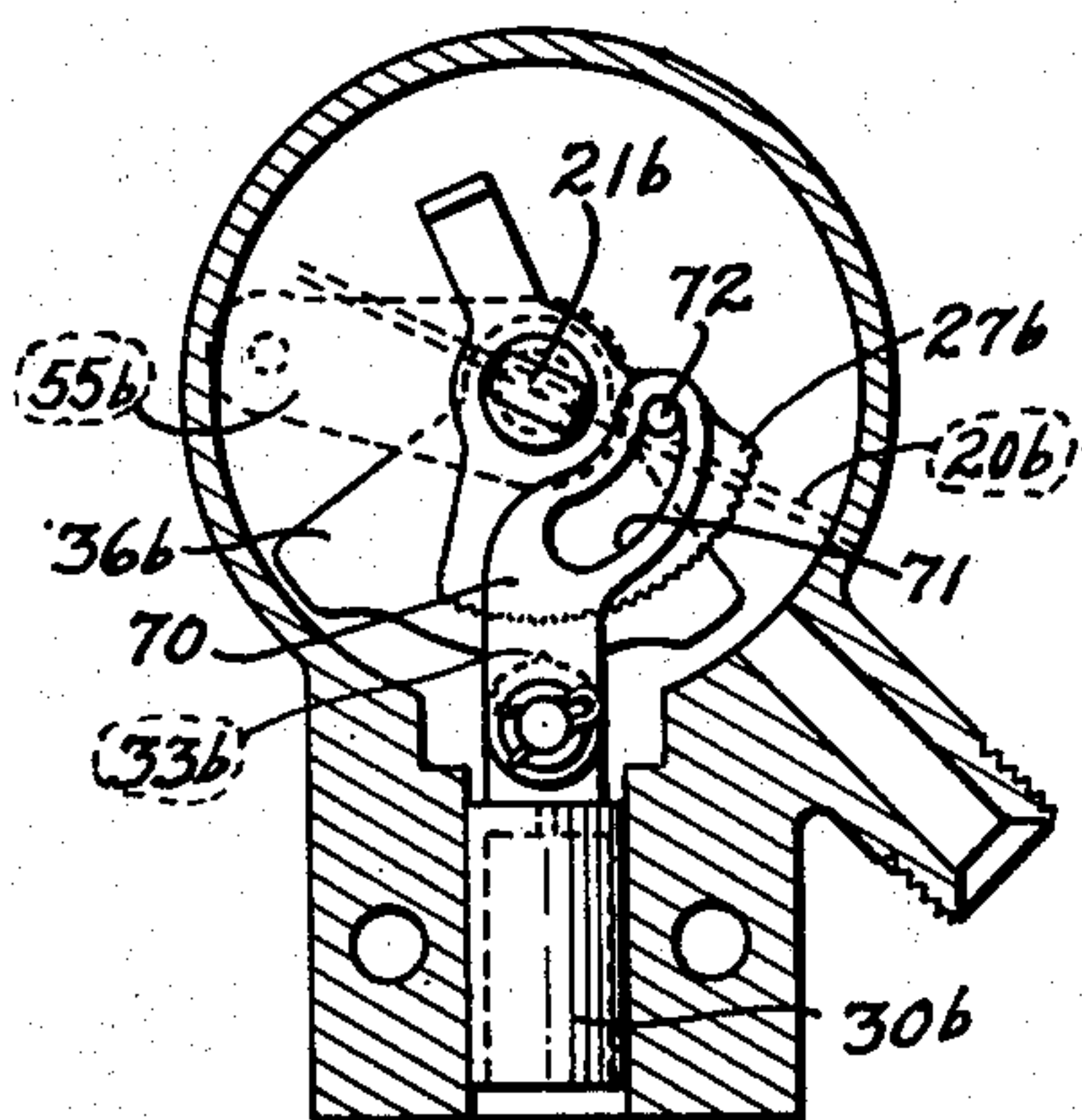


FIG. 7.

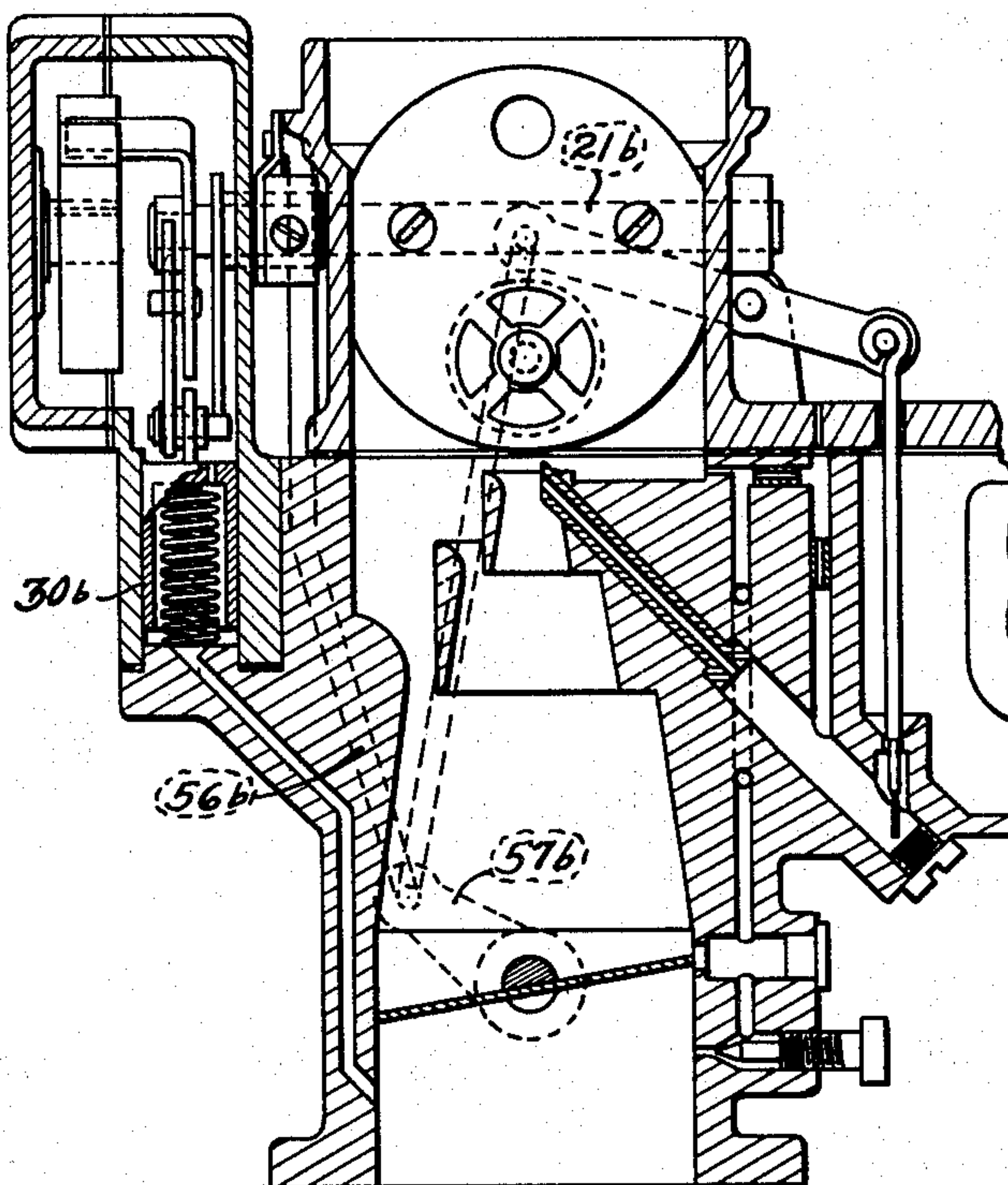


FIG. 6.

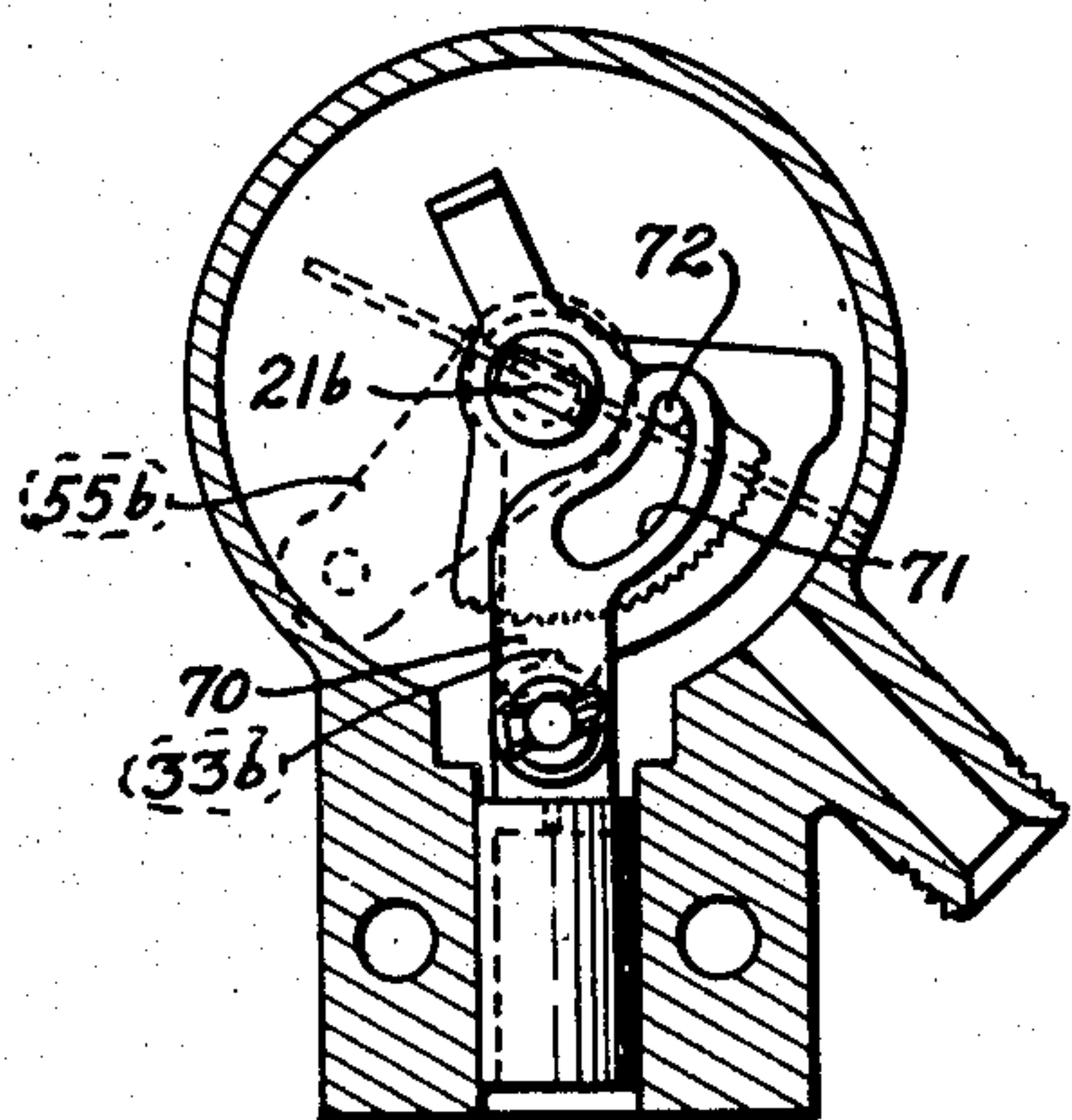


FIG. 8.

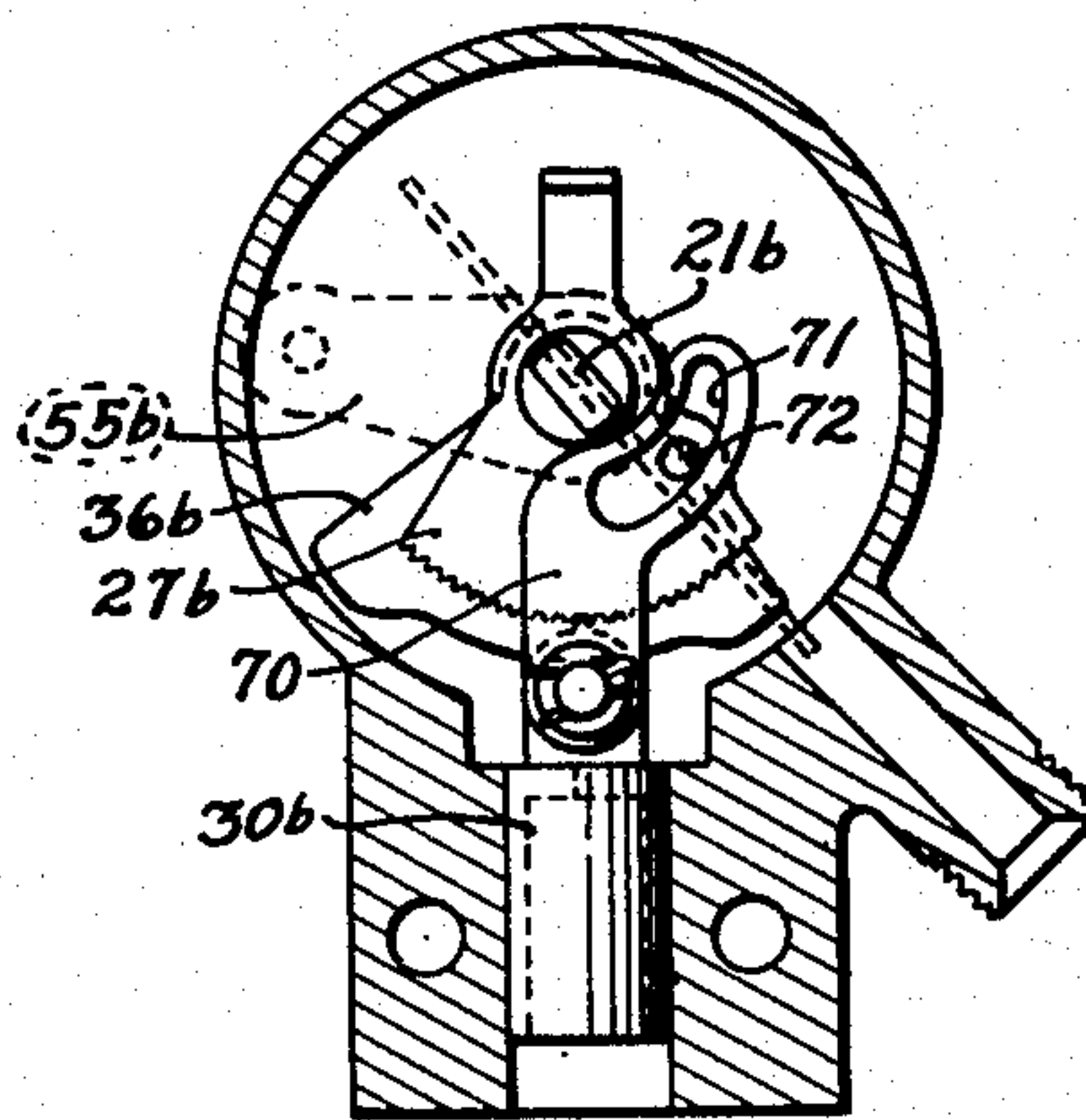


FIG. 9.

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2,540,607

ENGINE STARTING DEVICE

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Application June 15, 1945, Serial No. 599,658

12 Claims. (Cl. 261—39)

1

This invention relates to starting devices for internal combustion engines and consists, particularly, in novel means for controlling a mixture enriching valve so as to insure starting.

There have been a number of devices developed for controlling the carburetor choke valve to facilitate starting of the engine. In most of these, the choke valve is urged towards closed position when the temperature is low by a thermostat. In one example, a relatively strong thermostat is used and its force is counteracted by a suction responsive element, when the engine starts to run under its own power, to admit proper air supply. Such a device is illustrated in Coffey Patent No. 2,085,351. In others, the choke is locked in full closed position before the engine starts to run and, afterwards, the lock is broken to release the choke for control by the thermostat. In some cases, it is desirable that a thermostatic choke valve be locked in its assumed position according to temperature during cranking. However, it is also desirable that the valve be free to close at all times under the influence of the cooling thermostat.

Accordingly, it is an object of the present invention to provide a novel choke control device which can be locked in substantially any position during cranking according to temperature, but which is free to respond to the thermostat when the engine is not running.

Another object is to provide a choke locking device which is normally urged towards its locking position, but which is withdrawn therefrom when the engine starts to operate under its own power and is also withdrawn therefrom whenever the throttle valve is moved to closed or full open positions.

Another object is to provide a choke controlling device adapted to lock the choke in its assumed position for starting and also incorporating an "unloader" for causing partial opening of the choke when the throttle is fully opened.

These objects and other detailed objects hereafter appearing are attained substantially by the device illustrated in the accompanying drawings in which

Fig. 1 is a view of an internal combustion engine and carburetor having the invention applied thereto.

Fig. 2 is a somewhat diagrammatic sectional view illustrating a form of the invention.

Fig. 3 is a view similar to Fig. 2, but showing a different form of the invention.

Fig. 4 is a detail section taken substantially on 4—4 of Fig. 3.

2

Fig. 5 is a section similar to Fig. 4, but showing the choke valve in closed position and locked.

Fig. 6 is a view of the carburetor similar to Fig. 3 but showing another modification.

Fig. 7 is a detail section similar to Fig. 4 but showing the structure of Fig. 6 with the choke opened slightly by engine suction.

Fig. 8 is a view similar to Fig. 7, but with the parts in the "unloading" position.

Fig. 9 is a similar view showing the choke locked in a partially open position for starting.

Fig. 1 shows an internal combustion engine 8 of the automotive type having an exhaust manifold 9 and an intake manifold 10 to which is attached a carburetor generally indicated at 11. The carburetor throttle is operated in the usual manner by linkage 12 extending to throttle pedal 13 located conveniently for the driver. A starting motor 14 is located in position for cooperating with the fly-wheel located in the housing 15 in starting the engine.

Fig. 2 shows a carburetor with a somewhat simplified form of the starting device for clear illustration of the principles. The carburetor has a downdraft mixture barrel 17 and the usual constant level chamber 18 from which fuel is supplied to the barrel through main nozzle 19. Entry of air into the upper part of the barrel is controlled by an unbalanced, butterfly choke valve 20 on a shaft 21 journaled in the wall of the upper or air horn portion 22 of the barrel. Choke valve 20 carries a yielding mounted poppet valve 23 which may be opened by engine suction, as described hereafter. A coiled, bi-metal thermostat 24 has one end hooked around a fixed stop 25 on the air horn and the other end anchored in an extremity of choker shaft 21. The thermostat is mounted so as to urge the choker valve closed at low temperatures. A throttle 26 controls the discharge of mixture from the lower end of the barrel.

A quadrant 27, carried rigidly by the choker shaft, has a series of peripheral teeth 28. Mounted on the air horn and projecting laterally therefrom is a cylinder 29 in which works a piston 30 constantly urged to the right by a coiled spring 31. A locking finger 32 projects rightwardly from piston 30 and has a point 33 for cooperating with the adjacent teeth 28 to lock quadrant 26 and the choke valve. A tube 34 connects the left hand end of cylinder 27 to a port 35 opening into the mixture barrel posterior to throttle 26. Cylinder 28, thus, communicates with engine suction through port 35.

A cam segment 36 is rigidly carried by the

3

throttle shaft and cooperates with a follower rod 37 slidable in guides 38 and 39. The upper extremity of rod 37 extends within cylinder 29 so as to limit the rightward movement of piston 30. When throttle 26 is moved to its fully closed position, a high point 41 on cam 36 engages rod 37 so as to push the rod upwardly and shift piston 30 and pointed pin or detent 33 to the left or away from locking quadrant 27 so as to release the choke valve. Likewise, when the throttle is in substantially wide open position, another high point 42 on cam 36 insures retraction of detent 33. The cam has a low portion 43 between the extreme high points.

This device operates as follows:

Assuming the engine is to be started at a low temperature and that the throttle valve is in its normal, closed position, thermostat 24 will have urged choker valve 20 fully closed, as shown in Fig. 2. Throttle valve 26 is then slightly opened, as is desirable for starting, to bring intermediate low portion 43 of the cam in line with rod 37, permitting this rod to drop. Thereupon, locking pin 31 is urged rightwardly by spring 30 into locking position with quadrant 26. The starter motor is then operated to crank the engine. The cranking suction, however, do not effect either choker 20 or poppet 23. When the engine fires and starts to run under its own power, the sharply increased suction forces open poppet 23 to supply necessary additional air. Almost simultaneously, piston 30 is drawn to the left so as to unlock toothed quadrant 27. Thereafter, the choke valve is under the control of the thermostat and the direct action of suction thereon. After the engine has reached normal temperature, choke 20 will be fully open and will remain in that position irrespective of suction, until the engine again cools below its normal temperature.

When the engine is allowed to stand idle after a run, the return of the throttle to its normal, close position will release the toothed quadrant so that the choke valve may freely close under the influence of the thermostat.

Figs. 3, 4, and 5 shows a structurally different form of the invention in which the various choke control parts are mounted in a cylindrical housing 50 as in Fig. 1, adjacent the carburetor air horn 22a. Thermostat 24a is anchored at the center to cover 51 of the casing and has a hook 52 at its outer extremity receiving an L-shaped arm 53 which is rigidly attached to choker shaft 21a. Toothed quadrant 27a is also rigid with this shaft and positioned to be engaged by a pointed extension or detent 33a on suction piston 30a. As shown, quadrant 27a forms an extension of L-shaped lever 53.

A sleeve 54 is loosely received on choke shaft 21a, between the air horn and casing 50 and carries a cam 36a within housing 50. Also rigid with the sleeve between the housing and the air horn is a lever 55 which is connected by a link 56 to an arm 57 rigid with the throttle shaft. Upon closing of the throttle, high point 41a of cam quadrant 36a engages the top of piston 30a to force it and locking point 33a downwardly and clear of toothed segment 27a. Point 33a is also released by suction, as in the previous form, when the engine starts to run under its own power. When the choke valve is fully opened, as in Fig. 4, a second high point 42a on the cam engages the top of piston 30a and again releases locking segment 27a. In any intermediate positions of the throttle, segment 27a and the choke

4

valve will be locked by pointed element 33a whenever the engine is stopped. Thus, necessarily, the choke will be held firmly during cranking, in whatever position it has assumed under the influence of the thermostat provided the throttle is between fully open and fully closed position.

The form in Figs. 3, 4, and 5 also shows a stove 60 mounted on exhaust manifold 9 and connected by a tube 61 to a boss 62 on housing 50. A small vent 63 in the top of piston 30a bypasses a small portion of engine suction to the interior of the housing for drawing heated air through the stove and into the vicinity of the thermostat. This form also shows the idling system, generally indicated at 64 and a metering pin 65 connected to the throttle by lever 66 and link 67.

The operation of the form in Figs. 3, 4, and 5 is the same as that in Fig. 2, corresponding parts being given the same reference numerals with the letter "a" added.

The form in Figs. 7-9, inclusive, incorporates the features of the previous two forms, with the addition of "unloader" mechanism. Suction piston 30b has pinned thereto, at one side of locking point 33b, an angular arm 70 having a curved slot 71. Toothed segment 27b, rigid with choke shaft 21b, has a laterally projecting pin 72 received in slot 71. As in the previous form, an arm 55b, movable with cam 36b, is rotatable on the choke shaft and is connected by a link 56b to throttle arm 57b.

This form operates the same as the previous form except for the "unloader" connection by means of which cam 36b is rotated to the position in Fig. 8, when the throttle valve is substantially fully opened, to depress piston 30b. At the same time, the upper edge of slot 71 engages pin 72 to move the toothed segment and the choke valve slightly in the clockwise direction so as to open the valve. In this position, continued cranking of the engine will draw air through the carburetor and manifold to sweep out excess fuel therein. The "unloader" elements do not affect the other operations of the mechanism, as previously described.

In all of the forms, means is provided to insure locking of the choke valve, in whatever position it has assumed in accordance with the temperature, as soon as the throttle is opened to the starting position to release detent carrying piston 30, 30a, or 30b. In case the choker valve is locked tightly closed in starting, the poppet valve therein will open as soon as the engine fires to supply necessary additional air. A fixed air hole may also be provided in the choke valve, as shown in the last two forms. This form of choke control has been found to start more satisfactorily with certain engines than other types at present known.

The invention may be modified as will occur to those skilled in the art and the exclusive use of all such modifications as come within the scope of the appended claims is contemplated.

I claim:

1. A starting device for an internal combustion engine having a mixture conduit comprising a choke valve, a thermostat for moving said choke valve towards closed position when the temperature is low, a member movable rigidly with said choke valve, an element for engaging said member in substantially any position of said choke valve to lock the same, means constantly urging said element into locking relationship with said

5

member, and means actuated by engine suction when the engine is operating under its own power for withdrawing said locking element from said member to release said choke valve.

2. A starting device for an internal combustion engine having a fuel supply conduit and a throttle therein comprising a valve in said conduit for enriching the mixture, a thermostat for moving said valve toward mixture enriching position when the temperature is low, an element capable of locking said valve in substantially any position thereof, means normally urging said element into locking position with relation to said valve, and suction responsive means for withdrawing said element from said locking position.

3. A starting device for an internal combustion engine having a supply conduit for fuel and air mixture and a throttle therein comprising a choke valve in said conduit for enriching the mixture, a thermostat for moving said valve toward mixture enriching position when the temperature is low, cooperating elements for locking said valve one of which is movable rigidly with said choke valve, means normally urging said other locking element into locking relationship with said first element, and means responsive to engine suction produced when the engine starts to run under its own power for withdrawing said other element from said locking relationship.

4. A starting device for an internal combustion engine having a supply conduit for fuel and air mixture and a throttle therein comprising a choke valve in said conduit for enriching the mixture, a thermostat for moving said valve toward mixture enriching position when the temperature is low, cooperating elements, including a first element rigidly movable with said choke valve capable of locking said valve in substantially any position thereof, means normally urging the other of said elements into locking relationship with said first element, and means responsive to engine suction for withdrawing said other element from said locking relationship, said valve being constructed and arranged to move to and remain in its lean position during normal temperature operation.

5. A starting device for an internal combustion engine having a supply conduit for fuel and air mixture and a throttle therein comprising a choke valve in said conduit for enriching the mixture, a thermostat for moving said valve toward mixture enriching position when the temperature is low, cooperating elements, including a first element rigidly movable with said choke valve for locking said valve, means normally urging the other of said elements into locking relationship with said first element, suction responsive means for withdrawing said other element from said locking position, and means associated with said throttle for withdrawing said other element from said locking relationship when the throttle is closed.

6. A starting device for an internal combustion engine having a supply conduit for fuel and air mixture and a throttle therein comprising a valve in said conduit for enriching the mixture, a thermostat for moving said valve toward mixture enriching position when the temperature is low, cooperating elements capable of locking said valve in any intermediately open position thereof including a first element movable with said valve, means normally urging the second of said elements into locking relationship with said first element, suction responsive means for withdrawing said second element from said locking position, and means associated with said throttle for withdrawing one of said elements from said locking

6

relationship when the throttle is substantially opened.

7. A starting device for an internal combustion engine having a supply conduit for fuel and air mixture and a throttle therein comprising an unbalanced choke valve in the air inlet of said conduit, a thermostat for moving said valve toward mixture enriching position when the temperature is low, cooperating elements for locking said valve in substantially any assumed position when the engine is not in operation including a first element rigidly movable with said valve, means normally urging a second of said elements into locking relationship with said first element, a poppet valve yieldingly carried by said choke valve and openable by engine suction when said choke valve is locked closed, suction responsive means for withdrawing said second locking element from said locking relationship, and throttle actuated means for withdrawing said second element from said locking relationship when said throttle is closed, said choke valve being constructed and arranged to move to and remain in fully open position when the engine is at normal operating temperature.

8. A starting device for an internal combustion engine having a mixture conduit with choke and throttle valves therein comprising a thermostat for moving said choke valve toward mixture enriching position when the temperature is low, a member movable with said choke valve, an element for engaging said member in substantially any assumed position of said choke valve when the engine is not in operation to lock said choke valve, a spring normally urging said element into locking relationship with said member, a device movable responsive to engine suction when the engine starts to operate under its own power for withdrawing said element from locking relationship with said member, and a mechanical connection between said element and said throttle valve for withdrawing said element from said member when said throttle valve is closed.

9. A starting device for an internal combustion engine having an induction conduit with choke and throttle valves therein, a thermostat for moving said choke valve toward closed position when the temperature is low, cooperating elements capable of locking said choke valve in any intermediately open position thereof, and including a first element movable with said choke valve, means normally urging a second of said elements into locking relationship with said first element, and means for withdrawing said second element from said locking relationship responsive to movement of said throttle valve to its fully opened position.

10. A starting device for an internal combustion engine having an induction conduit with choke and throttle valves therein, a thermostat for moving said choke valve toward closed position when the temperature is low, cooperating elements capable of locking said valve in any intermediately open position thereof and including a first element movable with said choke valve, means normally urging a second of said elements into locking relationship with said first element, means responsive to suction when the engine starts to operate under its own power for withdrawing said second element from said locking relationship, and additional means for withdrawing said element from said locking position when said throttle valve is in substantially fully open or fully closed position.

11. A starting device for an internal combustion

7

tion engine having an induction conduit with choke and throttle valves therein, a thermostat for moving said choke valve toward closed position when the temperature is low, cooperating elements capable of locking said valve in any intermediately open position thereof and including a first element movable with said choke valve, means normally urging a second of said elements into locking relationship with said first element, means responsive to suction when the engine starts to operate under its own power for withdrawing said second element from said locking relationship, and means for forcing said choke open upon substantially full opening of said throttle valve.

12. A starting device for an internal combustion engine having an induction conduit with choke and throttle valves therein, a thermostat for moving said choke valve toward closed position when the temperature is low, cooperating elements capable of locking said valve in substantially any intermediately open position there-

8

of and including a first element movable with said choke valve, means normally urging a second of said elements into locking relationship with said choke valve, means responsive to suction when the engine starts to operate under its own power for withdrawing said second element from said locking relationship, and means for releasing said locking elements and forcing said choke open upon substantially full opening of said choke valve.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,215,682	Winkler	Sept. 24, 1940
2,394,665	Christian	Feb. 12, 1946
2,403,720	Hunt	July 9, 1946