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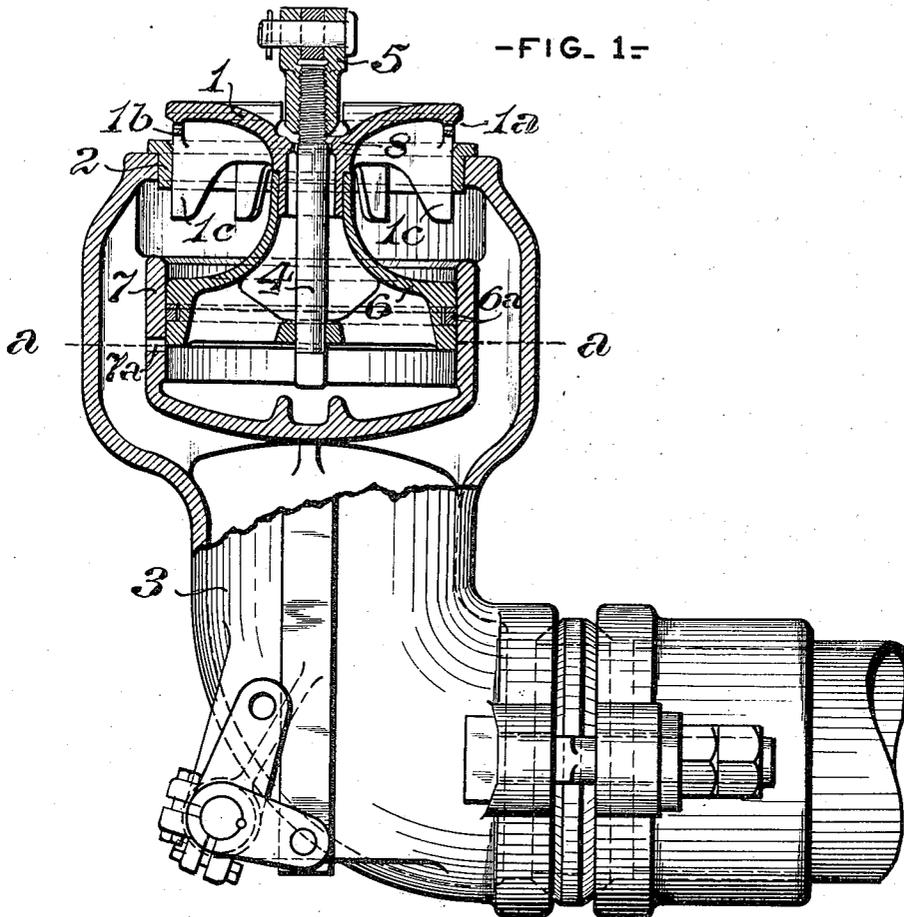
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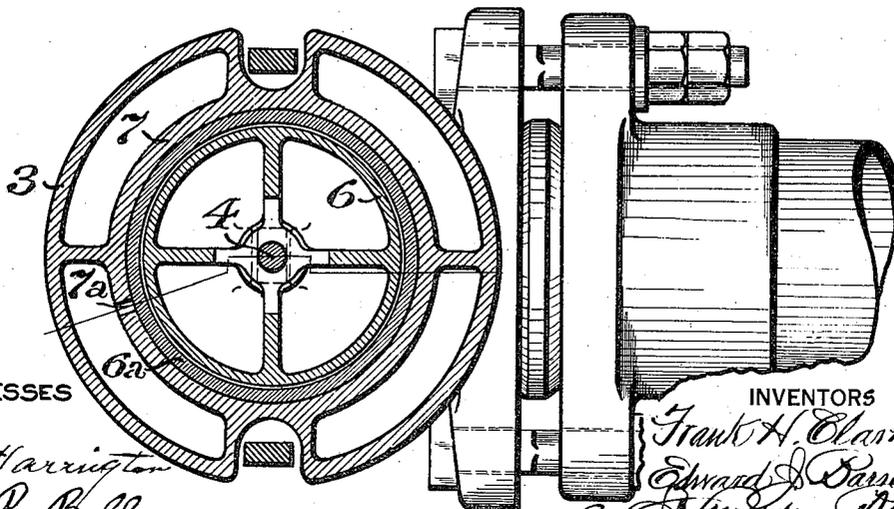
THROTTLE VALVE

Filed Feb. 17, 1921

2 Sheets-Sheet 1



-FIG. 2-



WITNESSES

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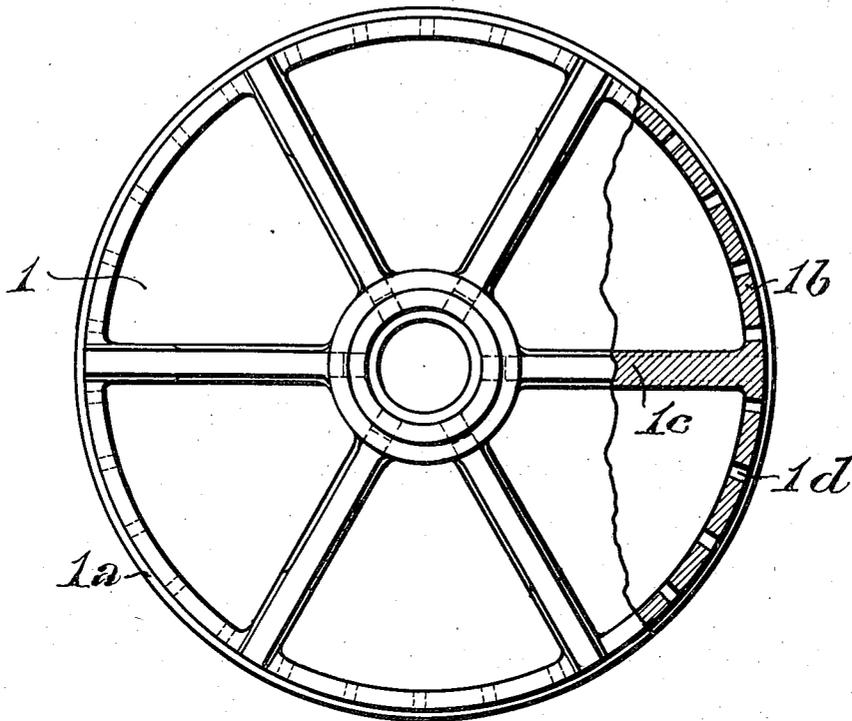
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THROTTLE VALVE

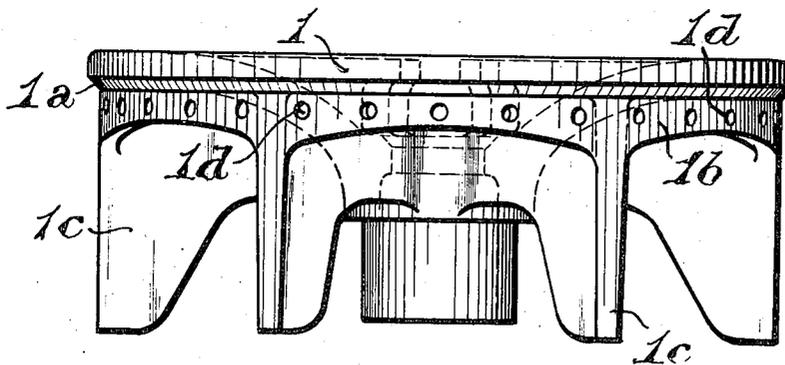
-FIG. 3.-

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2 Sheets-Sheet 2



-FIG. 4.-



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# UNITED STATES PATENT OFFICE.

FRANK H. CLARK, OF NEW YORK, N. Y., AND EDWARD J. BARNETT, OF CHICAGO, ILLINOIS; SAID BARNETT ASSIGNOR TO SAID CLARK.

## THROTTLE VALVE.

Application filed February 17, 1921. Serial No. 445,584.

*To all whom it may concern:*

Be it known that we, FRANK H. CLARK, of New York, in the county and State of New York, and EDWARD J. BARNETT, of Chicago, in the county of Cook and State of Illinois, have jointly invented a certain new and useful Improvement in Throttle Valves, of which improvement the following is a specification.

Our invention relates to valves for controlling the passage of steam and other fluids through conduits interposed between sources of supply and locations of delivery, and is more particularly designed for application in throttle valves of locomotive engines. The object of our invention is to enable a more perfect graduation of the supply of fluid controlled by the valve to be obtained, than has heretofore been practicable, by the provision of means whereby, in the preliminary stages of the unseating movement of the valve, its area of delivery opening is, at first, slight, and is gradually and progressively increased; then steam delivery is continued, briefly, without increase of area of delivery opening; and, thereafter, the area of delivery opening is progressively increased to the maximum afforded by the limit of lift of the valve. A further object of our invention is to provide means for relieving the pressure acting on the balancing piston of a single seated throttle valve after the valve has been unseated, in order to prevent the piston from being moved upward by a slight reduction of pressure on its upper side or from being cushioned in the closure of the main throttle valve.

The improvement claimed is hereinafter fully set forth.

In ordinary practice, it is often found that a sudden and abnormal increase in speed is occasioned by reason of the engineer moving the throttle lever too quickly in starting a train and consequently admitting steam too suddenly in time and too great in volume to the cylinders, with the result of causing jerks on the draft gear which impair the safety of handling the train, and are correspondingly detrimental to the car equipment and objectionable to passengers. This objection is obviated by the slower and graduated preliminary admission of steam which is effected in the operation of our invention.

In the accompanying drawings: Figure 1

is a vertical central section through a throttle valve mechanism illustrating an application of our invention; Fig. 2, a horizontal section, on the line *a a* of Fig. 1; Fig. 3, a bottom plan view, partly in section, of the main throttle valve; and, Fig. 4, a side view, in elevation, of the same.

Our invention is herein exemplified as applied in connection with a single seated balanced locomotive throttle valve mechanism, which, except as to our improvement, hereinafter described, is of known and standard type, comprising a single seated poppet main throttle valve, 1, having a conical face, 1<sup>a</sup>, adapted to fit against a similarly coned face on a seat ring, 2, which is inserted in the open top of a stand pipe, 3, the lower end of which is connected to the dry pipe leading to the locomotive cylinders (not shown) in the ordinary manner. The main throttle valve is raised and lowered from and to its seat on the ring, 2, by a valve stem, 4, connected to a cross head, 5, which is raised and lowered, as desired, by connections to any suitable known operating mechanism, which, as it does not constitute any part of our present invention, need not be herein set forth.

A balancing piston, 6, having a suitable packing ring, 6<sup>a</sup>, is fitted, with the capacity of easy vertical movement, in an open topped balancing chamber, 7, fixed in the stand pipe, at such distance below the seat ring as to afford free passage above and around it for steam which passes the main throttle valve, to the dry pipe. A balancing valve, 8, controlling a central passage through the main throttle valve, 1, is formed upon, or fixed to, the valve stem. The passage controlled by the balancing valve, communicates with a central passage in the balancing piston, thereby establishing communication, when the balancing valve is unseated, between the steam space of the boiler and the balancing chamber. The valve stem, 4, is connected at its lower end, to the balancing piston, between the top of which and the main throttle valve a short space is interposed, when the valve is closed, so that, in the preliminary upward movement of the valve stem, the balancing valve is unseated without movement of the main throttle valve, and thereafter, opening movement is imparted to the main throttle valve by engagement thereof by the top of the

balancing piston, which valve is balanced by the admission of steam below the balancing piston, which is effected by the unseating of the balancing valve. By reason of the interposed space between the shoulder on the main throttle valve and the balancing piston, a limited degree of relative movement between the valve and valve stem, is permitted, and the valve is therefore what is termed a "floating" valve.

A cylindrical "shell" or "curtain", 1<sup>b</sup> of diameter such as affords a sliding fit in the seat ring, 2, is formed on the main throttle valve, 1, immediately below its conical seating face, and a plurality of radial guide wings, 1<sup>c</sup>, is formed on the lower side of the throttle valve, the outer ends of said wings projecting below, and coinciding circumferentially with the curtain, 1<sup>b</sup>.

In the practice of our invention, we form a plurality of perforations, 1<sup>d</sup>, in the curtain, the common level of the bottoms of said perforations being, as clearly shown in Fig. 4, located a short distance above the tops of the spaces below the curtain which are interposed between the guide wings, 1<sup>c</sup>. The main throttle valve is shown, in Fig. 1, as raised from its seat on the ring, 2, through a portion of its upward range of traverse, and it will be obvious that if, as in prior practice, it was imperforate, no steam would be admitted by it to the stand pipe until it was raised so far that the curved top walls of the spaces which are interposed between the guide wings, 1<sup>c</sup>, will stand above the bottom of the coned face in the seat ring, 2. In the operation of the valve, when provided with the perforations, 1<sup>d</sup>, the admission of a limited volume of steam to the stand pipe, will commence as soon as the valve is unseated sufficiently to bring the tops of the perforations to a level at which they begin to open to the steam space around the curtain, 1<sup>b</sup>, and the area of admission will be continuously and gradually increased, until, in the continued upward movement of the valve, it is raised so far that the perforations are fully open to the outer steam space. When this level is reached, while the admission of steam will continue, there will be no increase in the area of admission opening or consequent volume of steam admitted, until the valve is raised through the distance between the bottoms of the perforations and the tops of the spaces between the guide wings, after which the area of admission opening will be continuously increased until the valve reaches the upper limit of its range of movement. By this regulation of the preliminary admission of steam, a range of preliminary movement of the throttle lever is permitted during which the admission of steam will be so graduated as to prevent such a sudden shock and jar as is fre-

quently resultant upon an unduly quick movement of the throttle lever by the engineer.

A port, 7<sup>a</sup>, is formed in the wall of the balancing chamber, 7, at such a distance above the bottom thereof that the packing ring, 6<sup>a</sup>, of the balancing piston, will cover or stand below it when the main throttle valve is seated, and until said valve has become sufficiently balanced. As soon as said port is opened by the upward movement of the balancing piston, communication is established, through it, between the balancing chamber and the interior of the surrounding stand pipe. The port, 7<sup>a</sup>, serves to relieve any excess of pressure below the balancing piston which would tend to move it upwardly in the event of a slight reduction of pressure on its upper side, and admits of a quick release of pressure below the piston, preventing undue cushioning action in seating the main throttle valve.

We claim as our invention and desire to secure by Letters Patent:

1. The combination of a throttle valve, controlling a fluid flow passage; a stem, on which said valve is fitted, with the capacity of relative movement; a seat on which said valve is adapted to close; means, connected with said valve for first effecting a gradually increasing degree of fluid admission, in the preliminary stage of unseating the valve, then continuing admission without substantial increase in degree, and thereafter progressively increasing the degree of admission throughout the unseating traverse of the valve; and a balancing valve, fixed on the valve stem.

2. The combination of a throttle valve, controlling a fluid flow passage; a stem, on which said valve is fitted, with the capacity of relative movement; a seat ring on which said valve is adapted to close; a cylindrical shell or curtain, fixed on said throttle valve, and fitting in the seat ring, and having a circular row of circumferential perforations; and a balancing valve, fixed on the valve stem.

3. The combination of a throttle valve, controlling a fluid flow passage; a stem, on which said valve is fitted, with the capacity of relative movement; a seat ring on which said valve is adapted to close; a cylindrical shell or curtain fixed on said throttle valve and fitting in the seat ring, and having a circular row of circumferential perforations, a plurality of radial guide wings, projecting downwardly from the curtain and fitting in the seat ring; and a balancing valve, fixed on the valve stem.

4. The combination of a stand pipe; a throttle valve, seating therein; a stem, on which said valve is fitted, with the capacity of relative movement; a balancing chamber, enclosed within the stand pipe; a balancing

piston, fixed on the valve stem, and movable in said chamber; means for releasing pressure from the balancing chamber, below the balancing piston; and a balancing valve, fixed on the valve stem.

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5. The combination of a stand pipe; a throttle valve, seating therein; a stem, on which said valve is fitted, with the capacity of relative movement; a balancing chamber, enclosed within the stand pipe, having a release port in its wall; and a balancing

piston, fixed on the valve stem, and movable in said chamber; and a balancing valve, fixed on the valve stem.

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