No. 776,765. PATENTED DEC. 6, 1904.

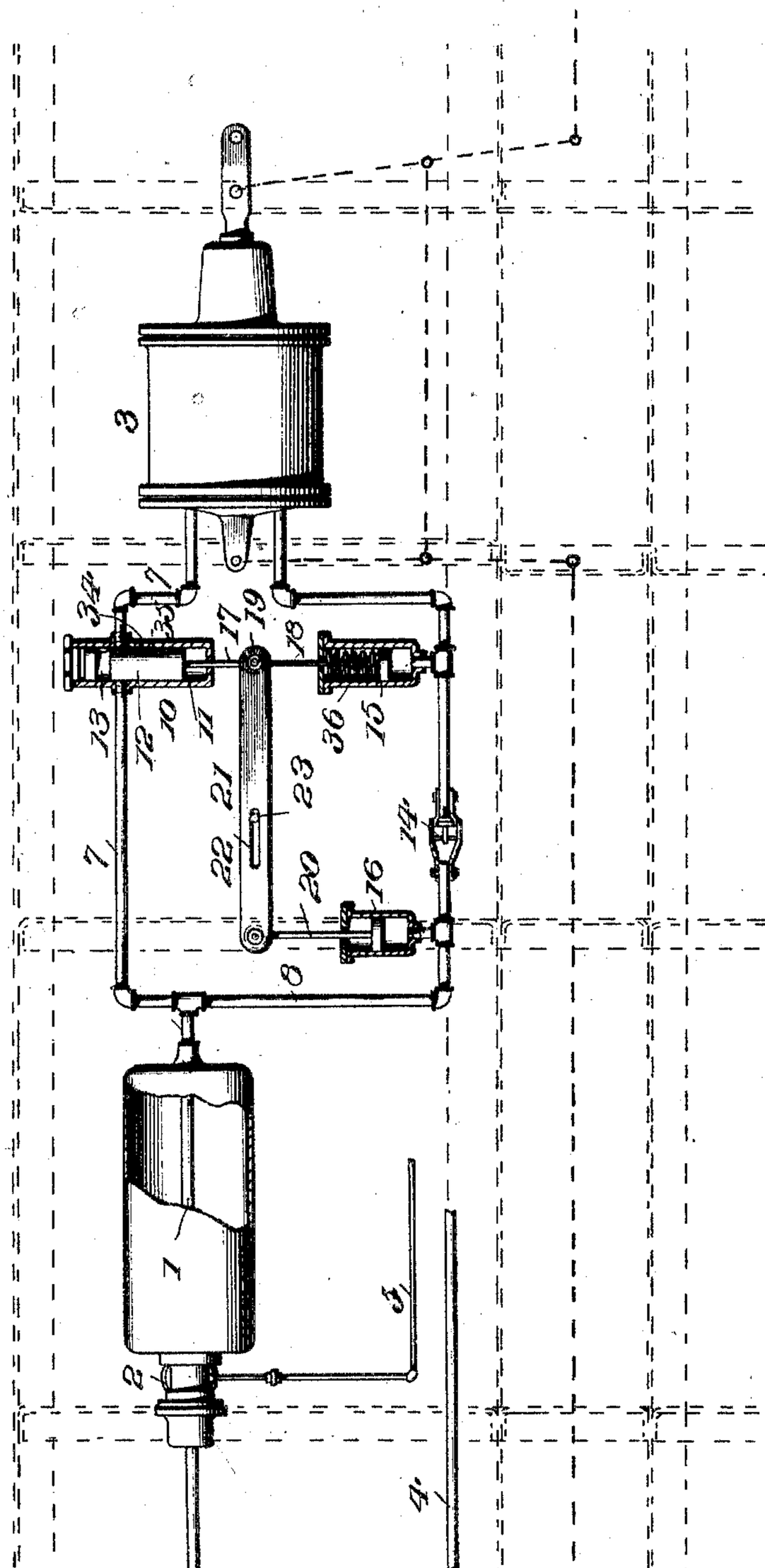
J. J. TURNER.

AIR BRAKE.

APPLICATION FILED NOV. 9, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.

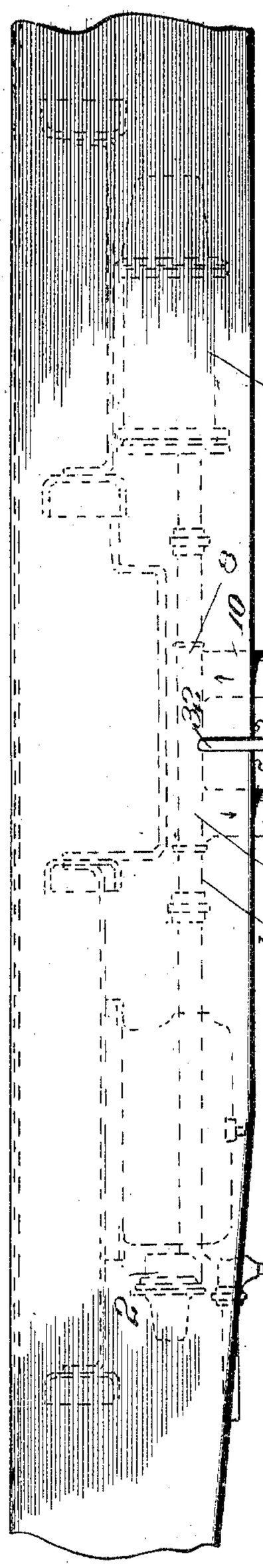
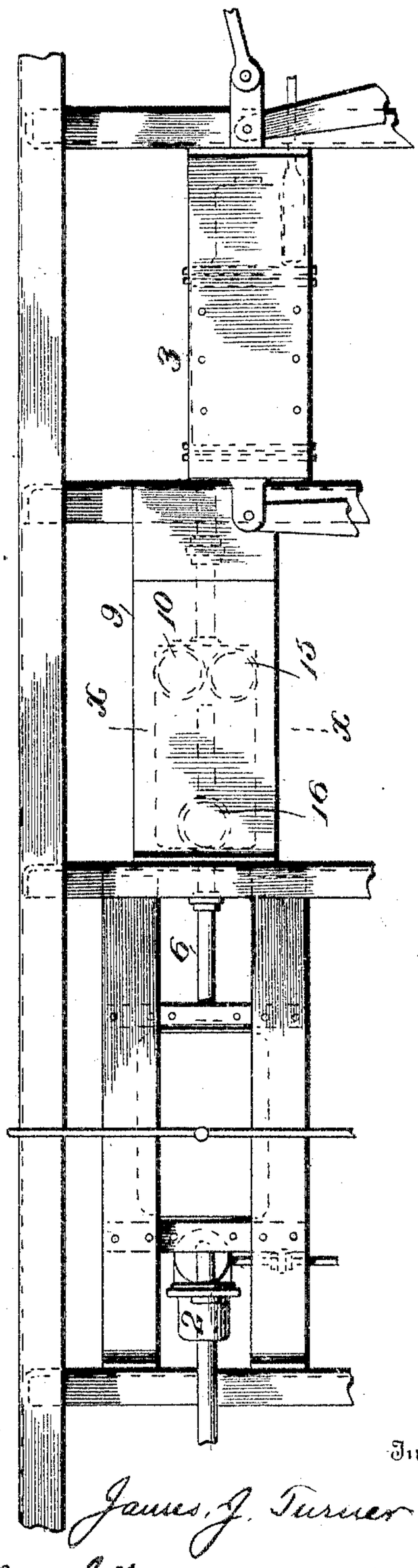


Fig. 3.



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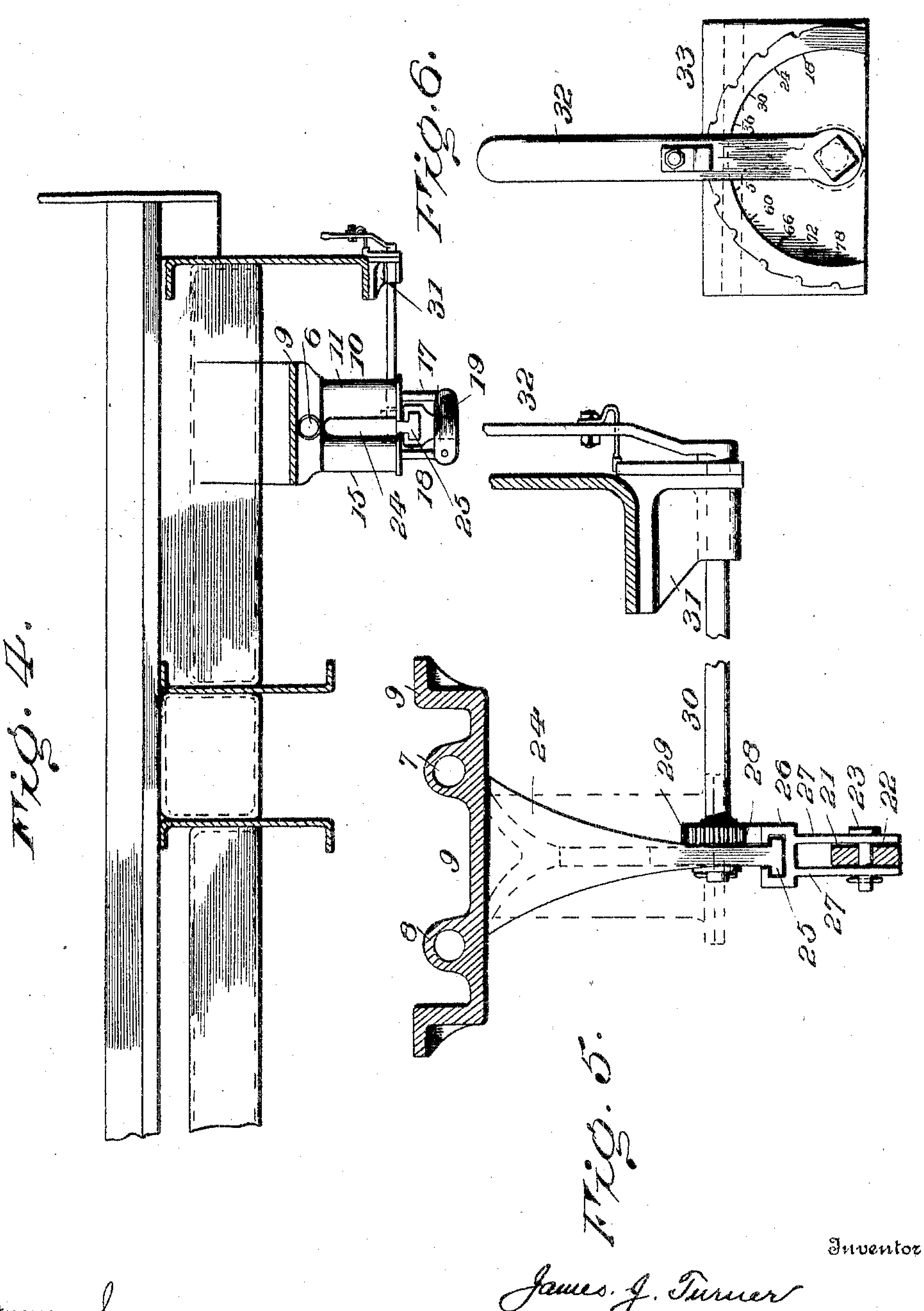
NO MODEL. 4 SHEETS—SHEET 3.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 7.

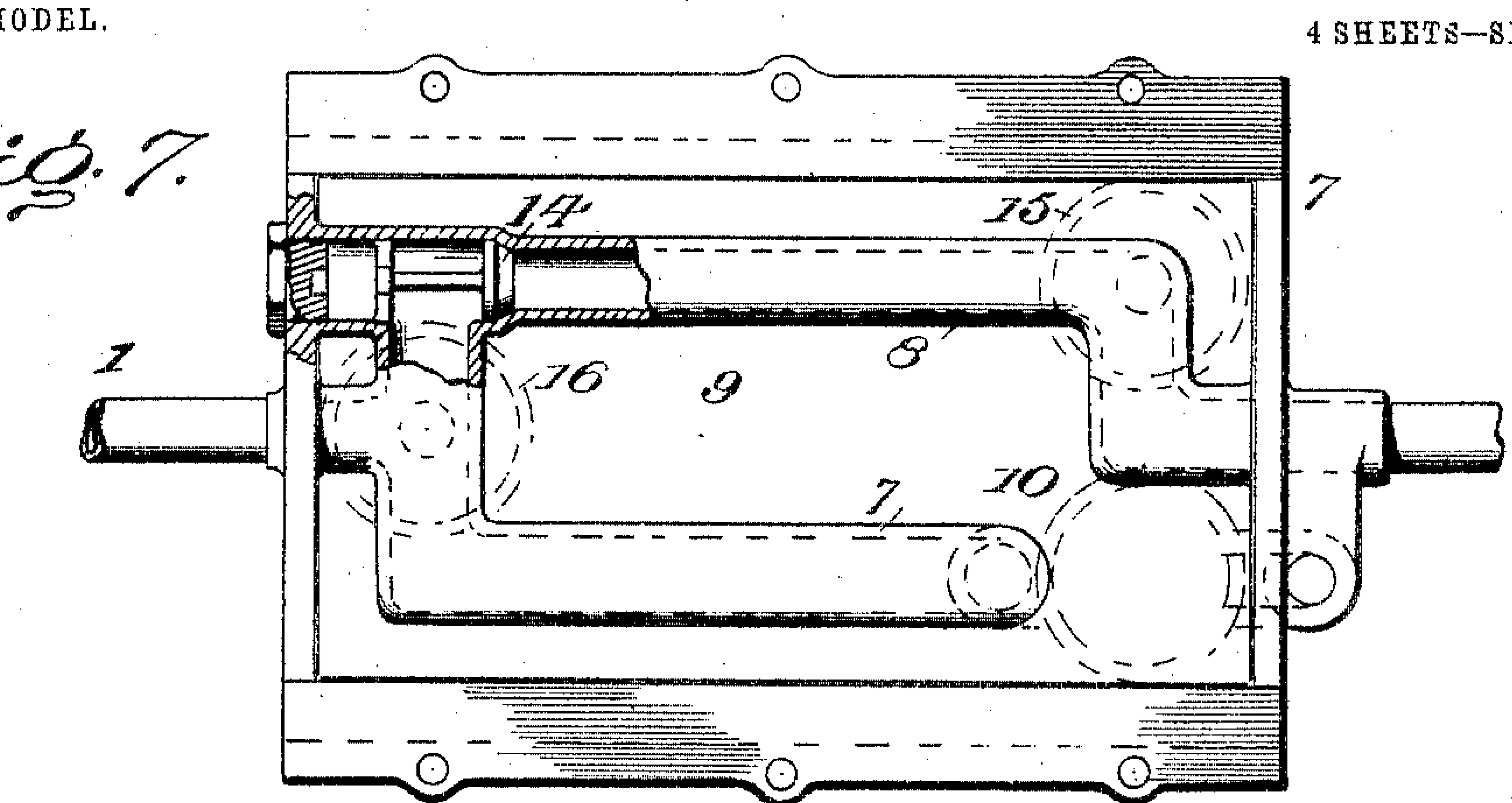


Fig. 8.

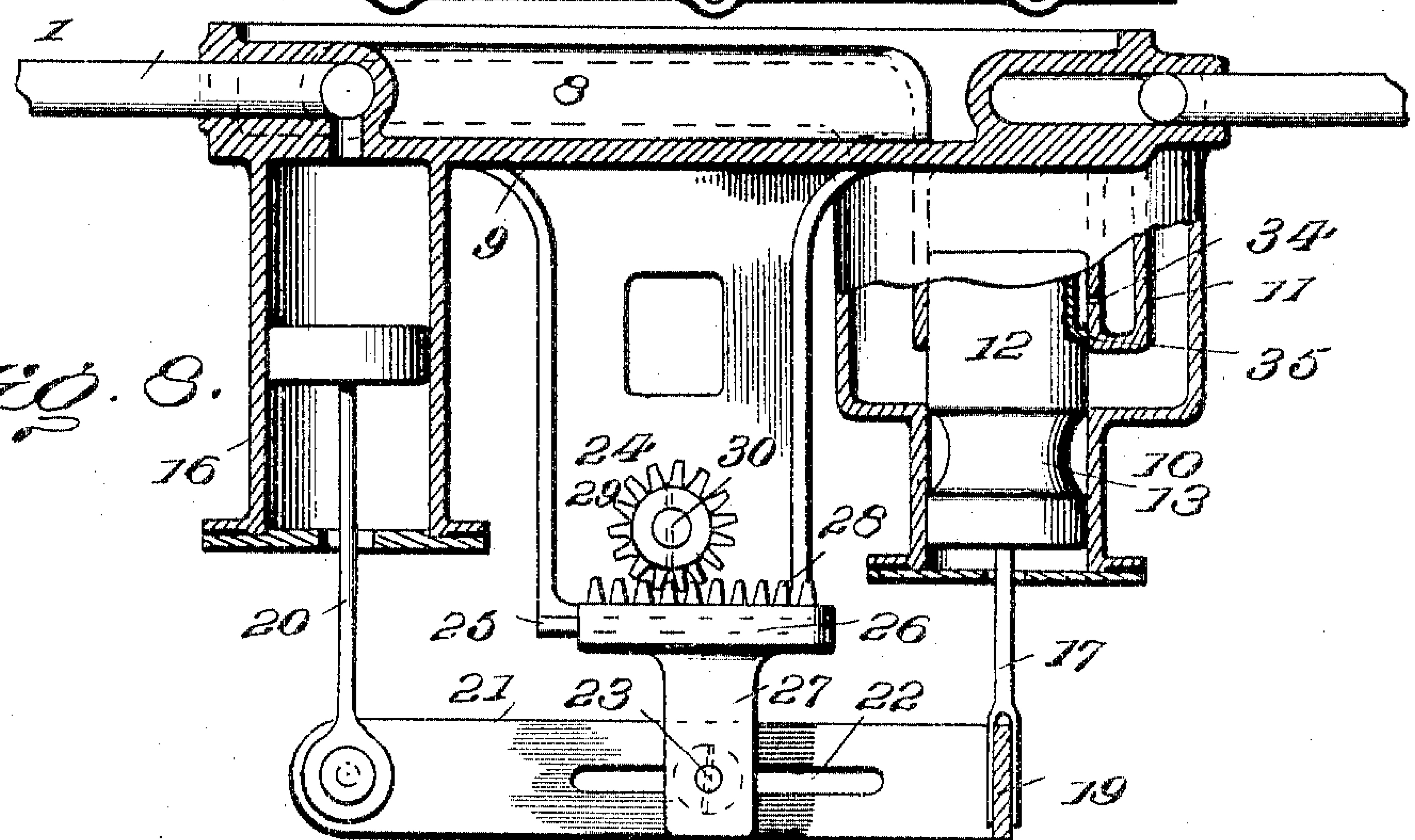
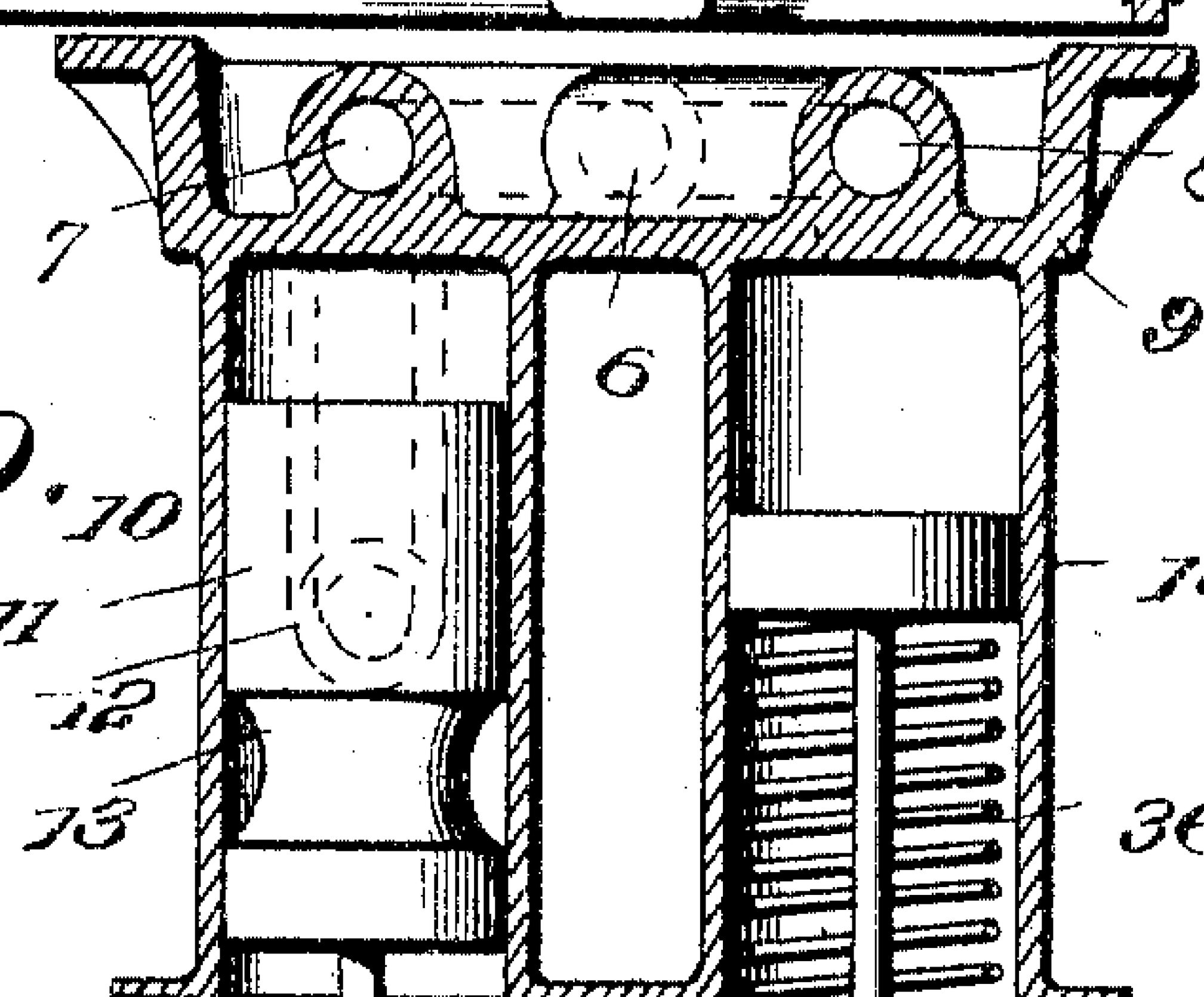


Fig. 9.



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[illegible]

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No. 776,765. Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

JAMES J. TURNER, OF PITTSBURG, PENNSYLVANIA.

AIR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 776,765, dated December 6, 1904.

Application filed November 9, 1903. Serial No. 180,451. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. TURNER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Air-Brakes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates generally to an improvement in air-brake apparatus, and specifically to means carried by each car of a train and arranged to permit the application to the braking-cylinder of that car of such percentage only of the storage-pressure of the feed-pipe as will properly brake the car, said means being adjustable to vary at will the percentage of feed-pipe pressure admitted to the braking-cylinder. In present practice each car of a train is subjected to the same braking pressure without regard to the loaded condition of some cars and the "light" condition of others. As an effective braking pressure for a light car will be inefficient for a loaded car and the necessary pressure for a loaded car will lock the wheels of the light car, it follows that the best results are not gained by using the same pressure on all cars.

My invention is designed to gain the most effective results from the feed-pipe pressure by providing means which are to be manually adjusted with regard to the load of the particular car, which means when adjusted permits the supply of that certain percentage only of the train-pipe pressure to the braking-cylinders of the particular car as will give the most effective braking power.

The invention in its preferred form will be described in detail with particular reference to the accompanying drawings, in which—

Figure 1 is a diagrammatic view showing the device applied to a car. Fig. 2 is a side elevation of the device in use. Fig. 3 is a top plan view of the device applied to a car. Fig. 4 is an elevation of the same. Fig. 5 is a vertical section approximately on line *x x*, Fig. 3. Fig. 6 is a face view of the operating-handle and indicating-segment. Fig. 7 is a top plan view of the supporting-casting with my improved device. Fig. 8 is a vertical section of the same. Fig. 9 is a transverse section of the same.

Referring to the accompanying drawings, 1 represents the feed-pipe, 2 the triple-feed valve, 3 the braking-cylinder, 4 the main pressure-pipe, and 5 the relief-pipe, of a particular car, all of which parts are of usual construction and operation. The brake-shoes and system of levers mediately operating said shoes from the piston of the braking-cylinder are not illustrated, being immaterial to the present invention.

My invention now to be described comprehends manually-adjustable means arranged between the feed-pipe 1 and the braking-cylinder 3, whereby a certain predetermined percentage of the pressure in the feed-pipe is admitted to the braking-cylinder.

The feed-pipe 1 for the individual car to convey the pressure through the triple valve to the braking-cylinder is for the purpose of my invention branched before reaching the braking-cylinder, forming pipes 7 and 8, both of which pipes lead into the braking-cylinder. These branch pipes are preferably formed as integral parts of a casting 9, whereby the parts of my invention are supported from the floor of the car.

The continuity of pipe 7 is broken by a regulating-valve 10, into and out of the casing 11 of which the pipe 7 leads, the inlet and outlet being in the same plane. The piston 12 within casing 11 has a body snugly fitting the interior of the casing and is formed near its lower end with a circumferential groove 13. The groove is arranged to permit the passage of air around the piston 12 when said piston is properly positioned—that is, raised—giving a direct air-supply to the braking-cylinder and to cut off this when the piston is lowered, which latter is its normal position.

Pipe 8 is provided with a check-valve 14, opening only toward the feed-pipe, and with valves 15 and 16, one on each side of the check-valve. Both these latter valves are of course supported from the casting 9. By preference the valve 16 is located at the junc-

tion of the branch pipes 7 and 8 and pipe 6, so that said valve is practically in a plane centrally between valves 10 and 15.

Valve 15 is arranged opposite the regulating-valve 10, and the pistons of each are provided with depending stems 17 and 18, the free or lower ends of which are joined by a cross-bar 19. Valve 16 has also a depending stem 20, connected at its free end with one end of a lever 21, the opposite end of which is connected to the cross-bar 19. The lever is formed with a longitudinal slot 22 to receive the lever-fulcrum—a pin 23—supported and moved in the following manner: A casting 24, depending in proximity to the lever 22, has an inverted-T-shaped end 25. A slide 26, grooved to embrace the end 25 of the casting, is fitted thereon and has depending arms 27, between which the lever 21 is supported by the pin 23, passing through both arms 27 and the slot 22 of the lever, as shown in Fig. 5. The upper edge of slide 26 is provided with a rack 28, movably engaged by a gear-pinion 29, fixed on one end of a shaft 30. The shaft projects laterally to the side of the car, being revolubly supported in casting 24 and in a journal-casting 31, depending from the car-sill.

The outer end of the shaft 30 is provided with a handle 32, movable over the face of a notched segment 33, and provided with the usual lug for engagement with the notches of segment 33 to lock the handle in adjusted position. The face of the segment bears certain definite numerals contiguous the notches—in the present instance extending from "18" to "78" and representing ton-weights—to determine the movement of the handle necessary to properly adjust the parts, as hereinafter described.

The regulating-valve casing 11 is formed with a port 34 just above the outlet connection of pipe 7, and the valve-piston 12 is formed with a by-pass 35 of a length to establish communication between outlet-pipe 7 and port 34 when piston 12 has been forced to an extreme lowered position under conditions to be described, though such by-pass is out of such communicating registry at all other times. Valve 15 is provided with a coil-spring 36, bearing against the piston and the head of the casing.

Assuming all the parts to be in normal position, as shown in diagram in Fig. 1, the operation of my improved device is as follows: On opening the valve to set the brake air under pressure in the feed-pipe passes into pipes 7 and 8, the passage through the former of which is checked by valve 10 and through the latter by valve 14. The pressure, however, operates to force the piston of valve 16 downward, and thereby moving the contiguous end of lever 21 downward and its opposite end upward. This movement of the lever through cross-bar 19 and valve-stems 17 and 18 moves the pistons of valves 10 and 15 upward, causing a registry of the groove 13 of piston 12 into the inlet and outlet openings of pipe 7, thereby permitting a free flow of air to the braking-cylinder to move the piston therein and set the brakes. The flow of air through valve 10 continues until the back pressure from the braking-cylinder affects the piston of valve 15 and forces the same downward, which operation carries downward piston 12 of valve 10 and cuts off the supply through pipe 7. It will be seen from the construction that the pressure on the piston of valve 15 has to overcome the pressure on the piston of valve 16 before it can move to close valve 10, as valves 15 and 16 are connected by lever 21. The lever, however, is fulcrumed so that its longer arm is generally in favor of valve 15, thereby adding to the effect of the back pressure. It is in this connection that the important feature of my invention resides, but is the sliding fulcrum of lever 21, by which valve 15 may be favored by a greater or less length of arm, as occasion may demand. It is obvious that if the extreme length of arm possible is in favor of valve 15 a much less back pressure than normal will operate it to close valve 10 against the pressure on valve 16, while a shorter length of arm will require a pressure more nearly approaching the normal feed-pipe pressure. It is understood that the slot 22 is of a length to permit the fulcrum to be adjusted to give the valve 15 all such lengths of the arm of the lever as will vary the back pressure needed to operate the valve 15 against the pressure on valve 16 and shut off the air-supply to the braking-cylinder in accordance with the demands of the particular occasion—that is to say, when the handle 32 has been moved to that notch of the segment indicated by 60, for example, the sliding fulcrum of the lever has been so moved as to give the valve 15 such length of arm of lever 21 as will enable a back pressure of a certain determinate proportion of the feed-pipe pressure to overcome the pressure on valve 16 and operate the ports to shut off the supply to the braking-cylinder. The necessary back pressure, which is the same as the operating pressure, is therefore controlled by moving the fulcrum of the lever, as will be obvious, and hence the percentage of feed-pipe pressure admitted to the braking-cylinder is absolutely controlled and the mechanical correlation of the parts necessary to carry out this adjustment for any particular weight of car and contents is merely a question of a proper movement of the lever-fulcrum. On opening the usual valve to relieve the brake-pressure the pressure in pipe 1 and the contiguous parts of pipes 7 and 8 and above the piston of valve 16 is reduced. As the pressure above the valve 15 is still the

original braking pressure, it follows that valve 16 will be forced upward and valves 10 and 15 downward, the piston of the latter moving against the tension of spring 30. The downward movement of valve 10 carries a registry of by-pass 35 of that valve with outlet end of pipe 7 and port 34 in casing 11, permitting the escape of air from the braking-cylinder into the atmosphere, as will be evident. The strength of spring 36 is the controlling means for the reduction of pressure in the braking-cylinder, as where the pressure has been reduced an amount equal to the strength of the spring the latter will exert its force to move the piston of valve 15 upward and with it piston 11, cutting off the escape from port 34.

The reduction of the pressure in the braking-cylinder through by-pass 35, as just described, will depend upon the strength of spring 36, as should the tension of the latter be, say, one-half pound the pressure will be reduced just that amount, as will be apparent. A further reduction of pressure from the feed-pipe will relieve the pressure against the check-valve 14 and the pressure from the braking-cylinder will force said valve open and equalize throughout the system of the particular car. The normal operating pressure of the train-pipe is usually greater than that in the braking-cylinder, hence permitting the reduction of the cylinder-pressure through by-pass 35 to some degree without a sufficient reduction on the opening side of the check-valve to permit the operation. This construction provides for the convenient release of the brakes of the particular car without regard to the braking pressures of any other car in the train.

By the above-described construction the proper proportion of storage-pressure may be admitted to the braking-cylinders of each car with due regard to its weight and without interfering in the slightest degree with the braking action of any other car—that is to say, the sliding lever-fulcrum may be so set on one car as to admit the percentage of storage-pressure to the braking-cylinder sufficient to check a weight of sixty tons, while the neighboring car may be set for a pressure necessary for a weight of eighteen tons. In each instance only the proper percentage of storage-pressure will be utilized, and this percentage will be maintained without regard to any variations of pressure in the feed-pipe.

A simple manipulation of handle 32 to register with the notch or line marked to correspond to the weight of the car and contents is all that is necessary for the proper setting of the parts, the operation thereafter being entirely automatic and unaffected by any conditions other than a change of the position of the handle 32.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an air-brake apparatus, a feed-pipe, a braking-cylinder, and manually-adjustable means to admit any desired percentage of the feed-pipe pressure to the braking-cylinder.

2. In an air-brake apparatus, a feed-pipe, a braking-cylinder, means between the feed-pipe and braking-cylinder to admit a certain percentage only of the pressure to the cylinder, and means to manually adjust said latter means.

3. In an air-brake apparatus, a feed-pipe, a braking-cylinder, means between the feed-pipe and cylinder by which any percentage of the feed-pipe pressure may be admitted to the cylinder, said means being manually adjustable to vary the percentage of pressure admitted to the braking-cylinder.

4. The combination in an air-brake apparatus with a feed-pipe and a braking-cylinder, of a regulating-valve to control the pressure-supply to the braking-cylinder, and manually-operable means to control said valve to admit a predetermined percentage only of the feed-pipe pressure to the braking-cylinder.

5. The combination in an air-brake apparatus with a feed-pipe and a braking-cylinder, of a regulating-valve to control the pressure-supply to the braking-cylinder, and manually-operable means to control said valve to admit a predetermined percentage only of the feed-pipe pressure to the braking-cylinder.

6. The combination in an air-brake apparatus with a feed-pipe and a braking-cylinder, of a regulating-valve to control the pressure-supply to the braking-cylinder, automatic means to control said valve to admit a predetermined percentage only of the feed-pipe pressure to the braking-cylinder, and means for adjusting said controlling means to vary the percentage of pressure admitted to the braking-cylinder.

7. In an air-brake apparatus, a feed-pipe and a braking-cylinder, a regulating-valve to control the pressure-supply to the cylinder, a valve governing the position of the regulating-valve, and means to manually control the the effective operation of said latter valve.

8. In an air-brake apparatus, a feed-pipe, and a braking-cylinder, a regulating-valve to admit pressure to the braking-cylinder, said regulating-valve being normally closed, a governing-valve operated by the normal pressure in the supply-pipe and connected to and operating the regulating-valve, and a controlling-valve for closing the regulating-valve.

9. In an air-brake apparatus, a feed-pipe and a braking-cylinder, a regulating-valve to admit pressure to the braking-cylinder, said regulating-valve being normally closed, a governing-valve operated by the normal pressure in the supply-pipe and connected to and operating the regulating-valve, and a controlling-valve operated by the pressure in the braking-cylinder to close the regulating-valve.

10. In an air-brake apparatus, a feed-pipe and a braking-cylinder, a regulating-valve to

admit pressure to the braking-cylinder, said regulating-valve being normally closed, a governing-valve operated by the normal pressure in the feed-pipe and connected to and operating the regulating-valve, and a controlling-valve operated by the pressure in the braking-cylinder to close the regulating-valve, and means to vary the pressure necessary to operate the controlling-valve.

11. In an air-brake apparatus, a feed-pipe and a braking-cylinder, a regulating-valve to admit pressure to the braking-cylinder, a controlling-valve connected to the regulating-valve, a second valve operated by direct feed-pipe pressure, a lever connecting said second valve and the regulating and controlling valves, and means for moving the fulcrum of said lever, as and for the purpose stated.

12. In an air-brake apparatus, a feed-pipe and a braking-cylinder, a regulating-valve to admit pressure to the braking-cylinder, a controlling-valve connected to the regulating-valve, a second valve operated by direct feed-pipe pressure, a lever connecting said second valve and the regulating and controlling valves, a fulcrum for the lever, a slide carrying said fulcrum, and means to move the slide.

13. In an air-brake apparatus, a feed-pipe and a braking-cylinder, a regulating-valve to admit pressure to the braking-cylinder, a controlling-valve connected to the regulating-valve, a second valve operated by direct feed-pipe pressure, a lever connecting said second valve and the regulating and controlling valves, a fulcrum for the lever, a slide carrying said fulcrum, a rack carried by the slide, a shaft supported by the car, a pinion carried by the shaft and engaging the rack, and a handle for turning the shaft.

14. The combination in an air-brake apparatus, with a feed-pipe and a braking-cylinder, of a regulating-valve to control the pressure-supply to the braking-cylinder, means to control said valve to admit a predetermined percentage only of the feed-pipe pressure to the braking-cylinder, and means to manually adjust said latter means.

15. In an air-brake apparatus, a feed-pipe, a braking-cylinder, a regulating-valve for admitting the feed-pipe pressure to the braking-cylinder, said valve being opened and closed by feed-pipe pressure, and manually-operable means to vary the effect of the closing pressure on said valve.

16. In an air-brake apparatus, a feed-pipe, a braking-cylinder, regulating means for admitting the feed-pipe pressure to the braking-cylinder, said means being operated in both directions by the feed-pipe pressure, and manually-controlled means to adjust the effect of the feed-pipe pressure when operating said regulating means in one direction.

17. In an air-brake apparatus, a feed-pipe, a braking-cylinder, means for admitting the feed-pipe pressure to the braking-cylinder, a lever operated by the feed-pipe pressure to open and close said means, and manually-operable means to alter the closing effect of the feed-pipe pressure on said lever.

18. In an air-brake apparatus, a feed-pipe, a braking-cylinder, means for admitting the feed-pipe pressure to the braking-cylinder, a lever operated by the feed-pipe pressure to open and close said means, a movable fulcrum for said lever, and manually-operable means to shift the fulcrum of the lever, whereby to alter the closing effect of the feed-pipe pressure.

19. In an air-brake apparatus, a feed-pipe, a braking-cylinder, means for admitting the feed-pipe pressure to the braking-cylinder, a lever operated by the feed-pipe pressure to open and close said means, a sliding fulcrum for the lever, a shaft operable to move the fulcrum, and a handle to turn the shaft.

20. In an air-brake apparatus, a feed-pipe, a braking-cylinder, means for regulating the admission of the feed-pipe pressure to the braking-cylinder, means operated by the train-pipe pressure to open said regulating means, a valve operated by train-pipe pressure for controlling the closing of the regulating means, and manually-operable means to vary the effect of the train-pipe pressure on said valve.

21. In air-brake apparatus, a feed-pipe, a braking-cylinder, means for regulating the admission of the feed-pipe pressure to the braking-cylinder, means operated by the train-pipe pressure to open said regulating means, a valve operated by train-pipe pressure for controlling the closing of the regulating means, and manually-operable means to control the amount of pressure necessary to operate said valve.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES J. TURNER.

Witnesses:
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D. G. STUART.