(No Model.) 3 Sheets—Sheet 1.

J. H. BROOKMIRE, Jr.

AIR BRAKE SYSTEM.

No. 558,670. Patented Apr. 21, 1896.

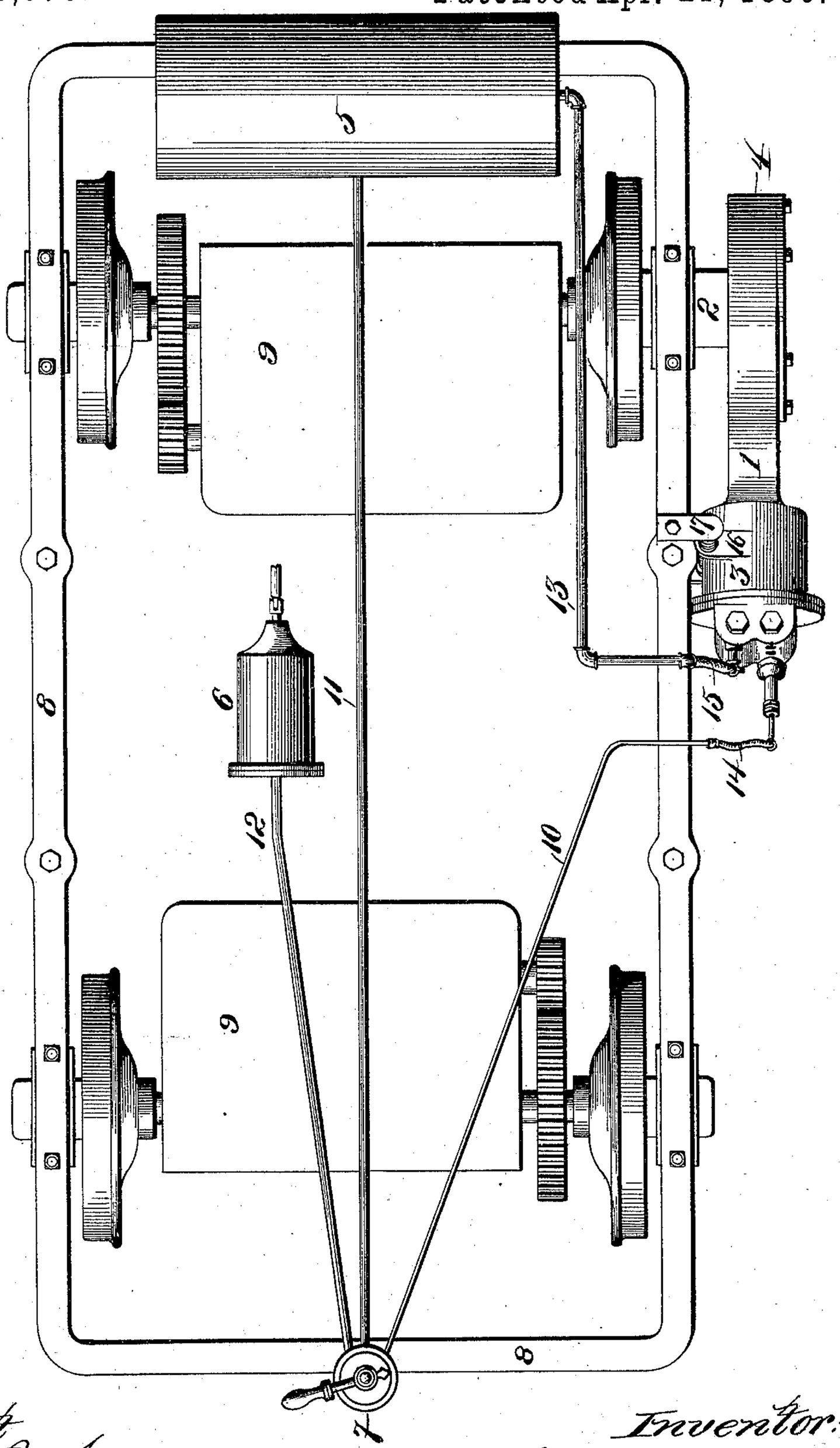


Fig. 1.

Attest
W. Hoffman
H. E. Richards.

Inventor:
James H. Brookmire Jr.
By Wellington Adams.
Attys

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

(No Model.) 3 Sheets—Sheet 2.

J. H. BROOKMIRE, Jr.

AIR BRAKE SYSTEM.

No. 558,670. Patented Apr. 21, 1896.

Fig. 2.

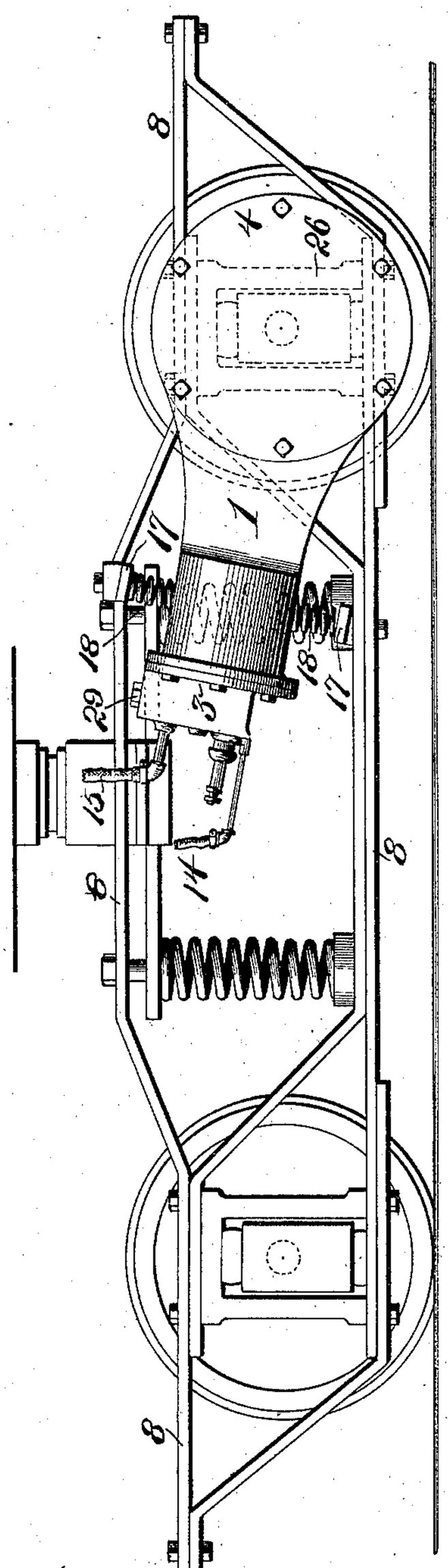


Fig. 5.

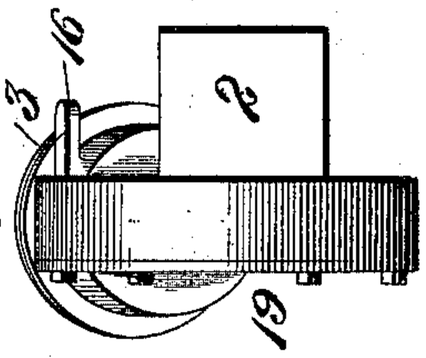


Fig. 4.

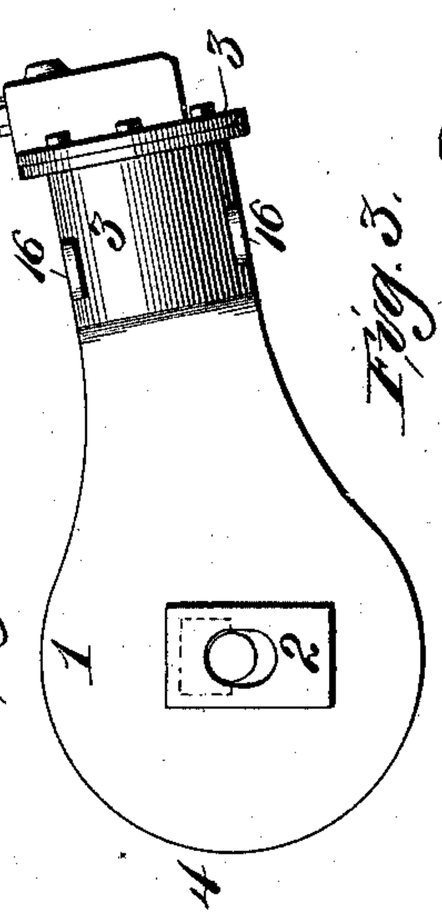
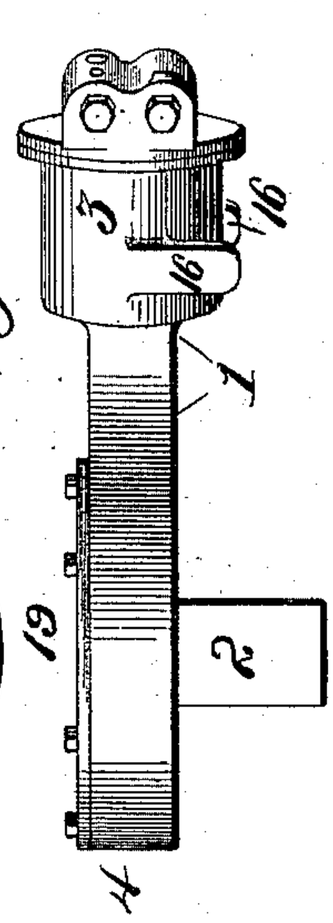


Fig. 3.



Witnesses:
W. A. Scott.
H. Richards.

Inventor:
James H. Brookmire Jr.
By Wellington Adams.
Atty

(No Model.) 3 Sheets—Sheet 3.

J. H. BROOKMIRE, Jr.

AIR BRAKE SYSTEM.

No. 558,670. Patented Apr. 21, 1896.

Fig. 6.

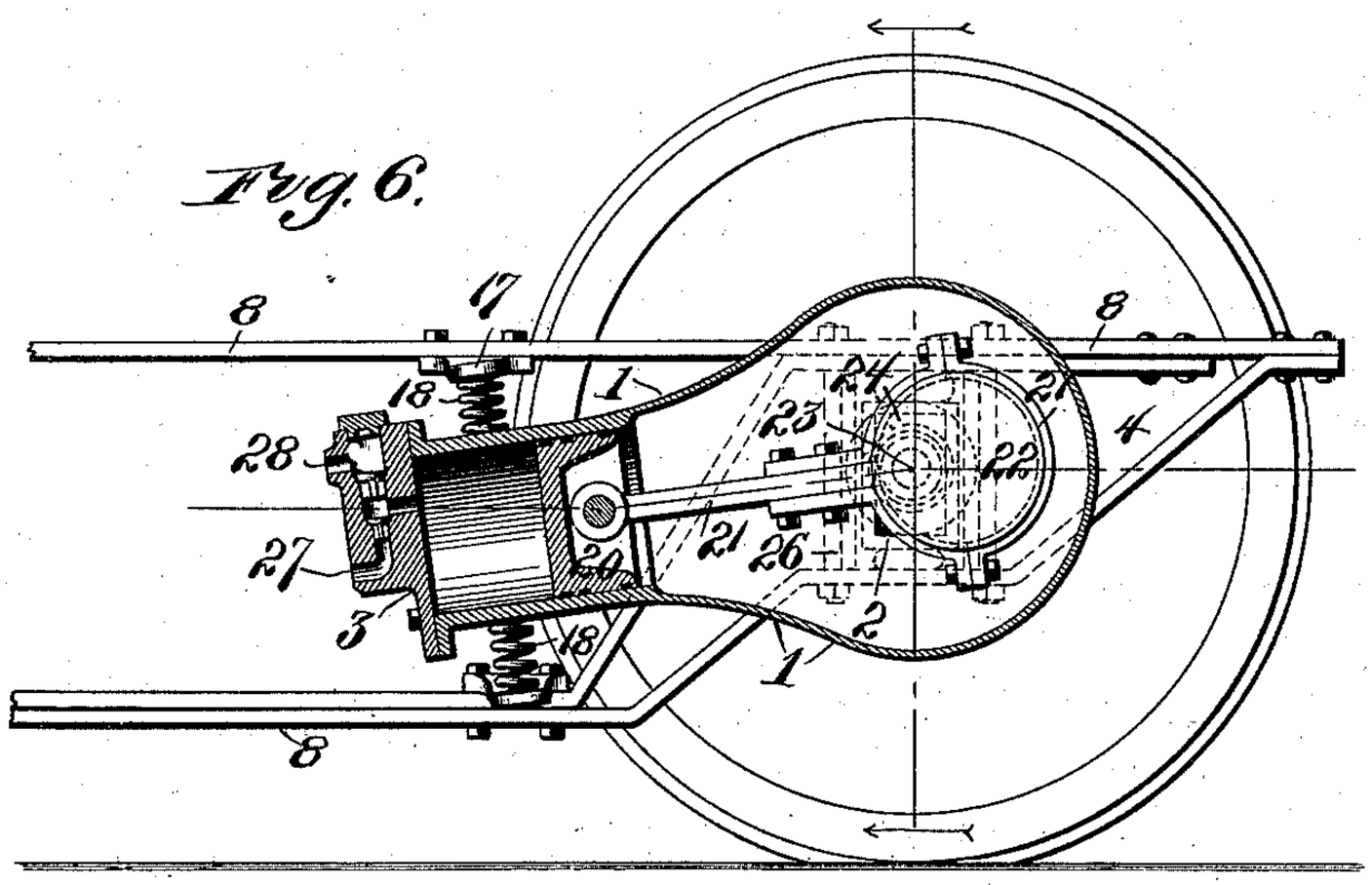


Fig. 7.

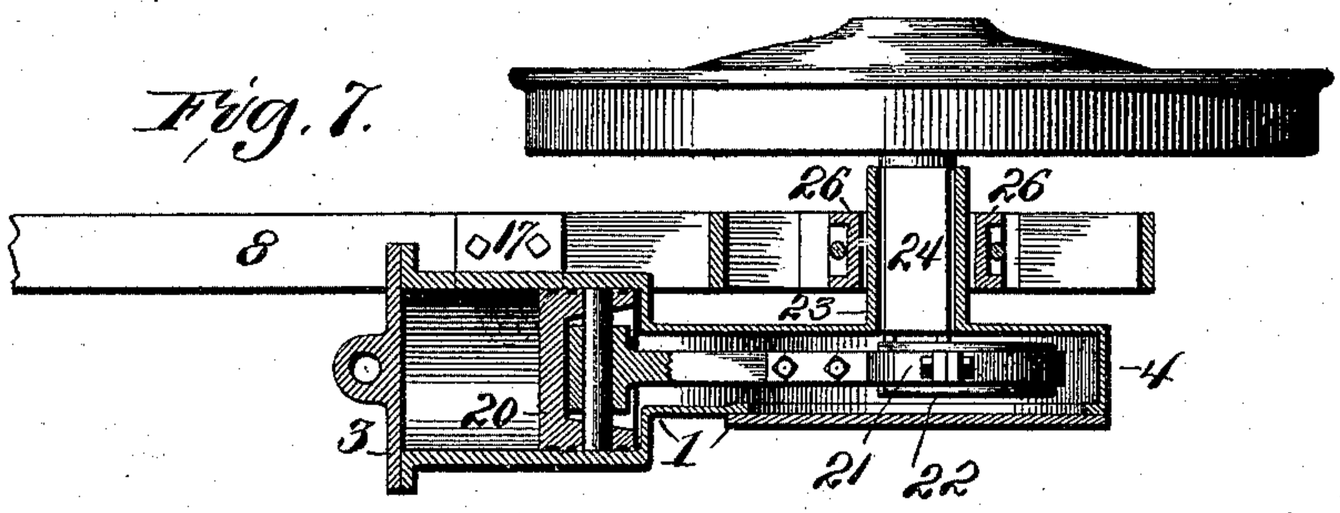


Fig. 8.

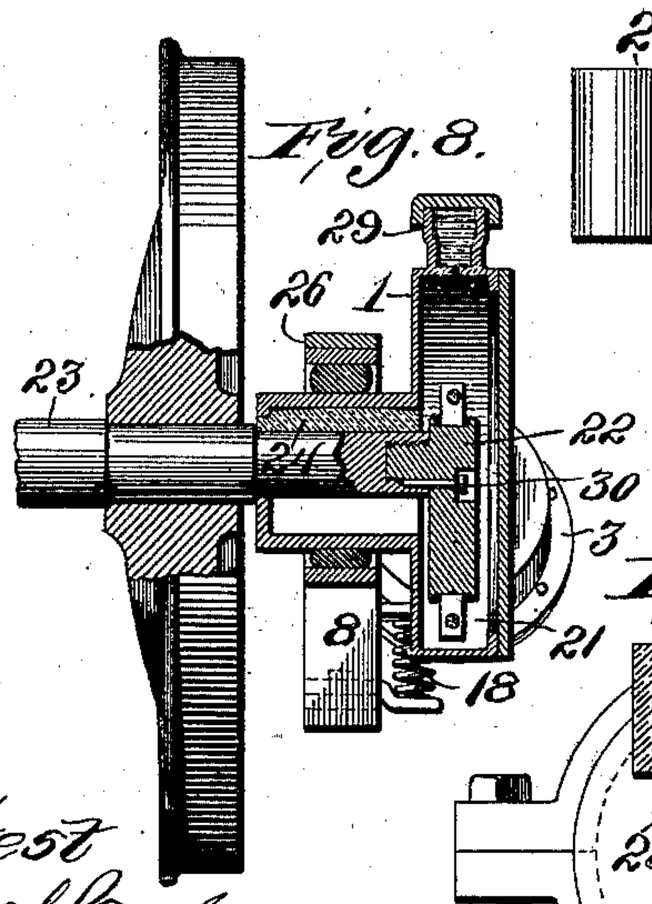


Fig. 9.

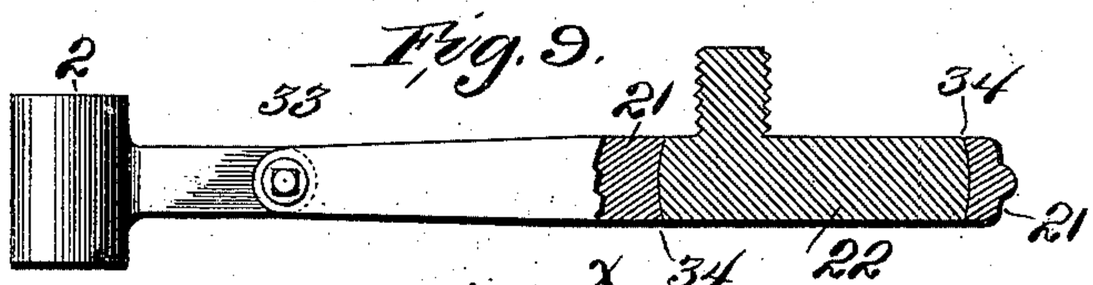


Fig. 10.

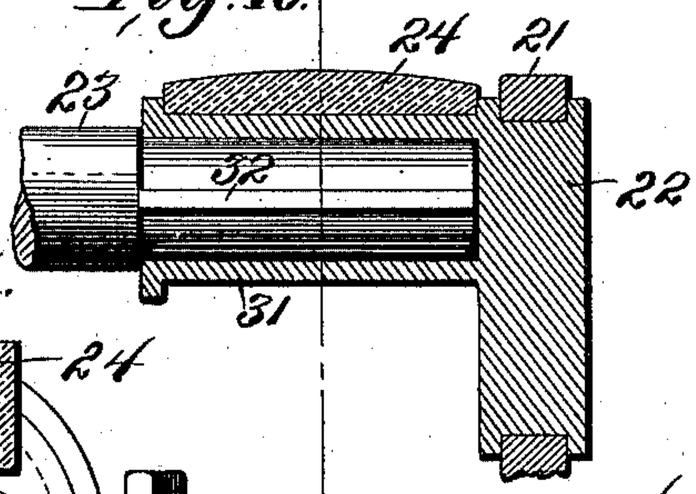
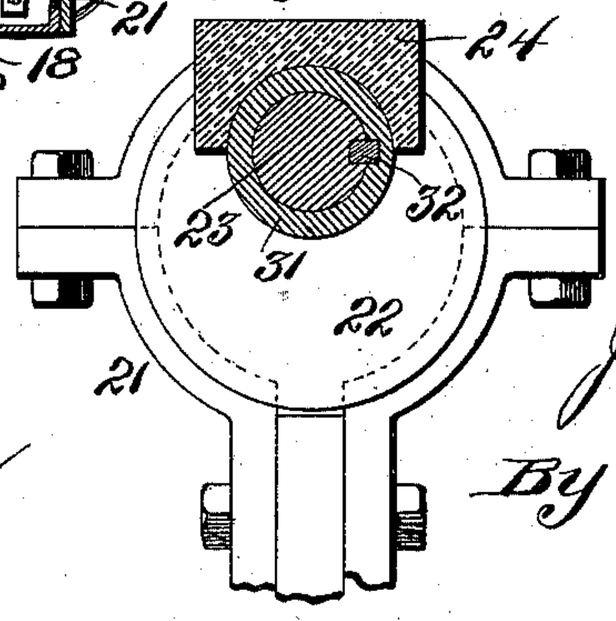


Fig. 11.



Attest
W. A. Scott.
E. F. Richards.

Inventor:
James H. Brookmire, Jr.
By Wellington Adams.
Atty's

UNITED STATES PATENT OFFICE.

JAMES H. BROOKMIRE, JR., OF ST. LOUIS, MISSOURI.

AIR-BRAKE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 558,670, dated April 21, 1896.

Application filed October 31, 1894. Serial No. 527,595. (No model.)

To all whom it may concern:

Be it known that I, JAMES H. BROOKMIRE, Jr., residing at the city of St. Louis, State of Missouri, have invented a new and useful Improvement in Air-Brake Systems for Street and other Cars, of which the following is a specification.

My invention relates primarily to the method of mounting air-pumps on street and other cars to supply compressed air for braking purposes; but I do not desire to restrict myself to its use in that particular field.

The invention is particularly applicable to the types of cars now being used, where the car-axles are so occupied by electric motors and their gearing that the known styles of pumps journaled on an axle and operated by the rotation of the same cannot be used for want of adequate space; but my invention is also an improvement on the old proposed forms of said mounting, even where there exists ample room for such pumps on the axle between the wheels. I have discovered what I consider to be two fundamental defects in all prior proposed methods of mounting such pumps, and these are as follows:

First. When located beneath the car upon the driving-axle between the wheels, the pump is inconveniently located, is inaccessible, and is frequently cramped for room or impracticable for lack of space.

Second. In all methods heretofore proposed the pump has not been properly mounted, so that these systems or proposed plans have all proved to be commercially impracticable. For instance, it has been found to be desirable to mount the pump directly upon one of the car-axles by boxes or bearings and to drive the pump directly from said axle by means of eccentrics or their equivalent; but in order to mount the pump in this way and yet have it independent of the movements of the car-body or truck-frame and other axle or axles it is necessary to connect the pump only loosely with some portion of the car-body or truck-frame or other axle than that upon which the pump is journaled. When thus loosely connected, however, the vibratory movement of the pump, due to the reciprocating action of the piston against the air-pressure in the air-reservoir, produces a constant thumping or pounding at such loose connection, causing disagreeable noise and deleterious action upon the working parts of the pump, which it is one of the objects of my invention to prevent, while yet preserving the loose connection of the pump with the remainder of the vehicle outside of its point of support upon the driving-axle on which it is journaled.

The first difficulty I obviate by journaling the pump upon its driving-axle outside of the wheels through the instrumentality of one of the axle boxes or bearings supporting the car, or "axle-boxes," as they are technically termed, and this I do by forming said pump in one with, or rigidly attaching it to, said car-box or bearing, hereinafter called "axle-box" throughout specification and claims.

I wish to define the term "axle-box" as meaning the box or bearing in which the journals of the car-axles revolve and upon which the car is carried. The axle-box is usually fitted with a removable "brass" and has a chamber for waste and oil and is held in pedestals on car-body or truck-frame.

The second difficulty I obviate by making the connection between the pump and the remainder of the vehicle—such as the car-body or truck-frame or non-driving axle, which restrains the pump—an elastic as well as a loose connection, which, while providing for all necessary movements at the point of such connection, yet takes up any lost motion, such as would result in the annoying and deleterious pounding or thumping above referred to. I have found by actual experiments that it is absolutely necessary to thus elastically connect and restrain the pump, because of the peculiar upward and downward and varying vibratory movements of the pump with each rotation of the axle. I have found that the action of a pump working against the pressure of the air-reservoir introduces new conditions and phenomena which have apparently never before been appreciated by any experimenters, and I believe it is the absence of adequate and satisfactory provision of means of avoiding the bad results of such phenomena which has militated against the adoption of any of the heretofore-proposed systems of air-brakes for street and other cars

in which the pump is journaled upon one of the axles which serves to actuate the pump.

Although pumps have heretofore been proposed to be mounted by boxes or bearings upon an axle of the car, which latter drives the pump, and with a loose connection between the pump and the remainder of the vehicle, I am not aware that this connection has ever been made elastic as well as loose, and it is in this way that I secure the desired result, and which constitutes a part of my said invention. In this way the pump and the axle upon which it is journaled are made absolutely independent of the movements of the other axle or axles and of the car-body or truck-frame, and the operative relationship of the various working parts of the pump is preserved without the introduction of torsional stresses and strains, and at the same time the noise is avoided, and the pump is relieved from the shock, jars, and pounding due to the peculiar erratic vibratory action of the pump under to-and-fro excursions of its piston against the air-pressure of the air-reservoir.

Another feature of my said improvement consists in utilizing the ordinary axle-boxes as a means of journaling the pump upon the car-axle. In this way I avoid having to make additional journals upon the car-axle and I utilize the bearings of the car on such axle to also constitute a bearing for the pump, so that this feature of my improvement is attained whether the pump be located outside of or between the wheels. By locating the pump outside of the wheels, however, I secure for it a location where it can be constantly seen and conveniently receive proper care and attention, while at the same time avoiding the difficulty of lack of space between the wheels.

The improvement, which consists in providing an elastic as well as a loose connection for the pump with the car-body or truck-frame, is of course applicable whether the pump is located outside of or between the wheels.

I attain the foregoing objects in the manner and by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a plan view of the system as seen from above; Fig. 2, a side view of a railway-truck with the pump mounted on one of the axles thereof and elastically connected with the frame of said truck. Fig. 3 shows a plan of the combined pump and axle-box detached from its connection with the car axle and truck. Fig. 4 is a side view of Fig. 3, looking toward the axle-box side of the pump. Fig. 5 is an end view of Fig. 3, looking from the eccentric end toward the cylinder end of the pump. Fig. 6 is a vertical longitudinal section of said pump mounted in the manner described. Fig. 7 is a horizontal longitudinal section of said pump mounted in the manner described. Fig. 8 is an irregular transverse vertical section through part of a car-axle and one of its wheels and said combined pump and box mounted in the manner described. Figs. 9 and 10 show different methods of allowing for the lateral play of the car-axle without interference with the action of the pump. Fig. 11 is a transverse section through $x\,x$ of Fig. 10.

Similar reference-numerals refer to similar parts throughout the several views.

1 is the pump-casing; 2, the axle-box, which the pump-casing is formed in one with or rigidly attached to.

3 is the cylinder end of the pump, and 4 the eccentric end of the pump.

5 is the air-reservoir; 6, the brake-cylinder; 7, the engineer's valve; 8, the truck-frame or car-frame; 9, the driving-motor; 10, pipe connecting the governing-valve on the pump with the engineer's valve; 11, pipe connecting the engineer's valve with the air-reservoir; 12, pipe connecting the engineer's valve with the brake-cylinder; 13, pipe connecting the cylinder of the pump with the air-reservoir.

14 and 15 are flexible sections of pipe to admit of independent motions of the pump and car-body or truck-frame.

16 is a lug or lugs upon the pump to which the spring connecting the pump with the truck or car frame may be attached.

17 is a similar lug or lugs upon the truck-frame.

18 is the spring connecting the pump with the car-body or truck-frame.

In Figs. 3 and 5, 19 is a removable side plate rendering accessible the movable parts of the pump.

In Fig. 6, 20 is the piston; 21, the crank or eccentric shaft and strap; 22, the eccentric; 23, the car-axle; 24, the bearing; 2, the axle-box; 26, the axle-box frame or pedestals; 27, the suction-port of the pump; 28, the discharge-port of the pump.

In Fig. 8, 29 is the oiling-port.

I do not wish to confine myself to making the pump-casing in one with or rigidly attached to an axle-box, as it may be formed in one with or attached to a simple bearing upon which the car is supported without any box or receptacle for oil and waste. I therefore use the expressions "box" or "bearing" as alternative terms; or the pump could be fastened to the brass bearing in the ordinary box.

I wish to cover, broadly, the principle of utilizing the regular axle-journal which has bearing in the axle-box as a journal for the air-pump which the axle operates; also of using the axle-box as a bearing to journal the air-pump on the axle which is to operate it.

The eccentric or its equivalent may be fastened to the car-axle in any way found to be most desirable. I have shown it in Fig. 8 as screwed into the end of the car-axle and fastened by means of a pin 30, while in Fig. 10 I have shown it as formed in one with or at-

tached to a sleeve 31, which slides over the journal of the car-axle and is prevented from rotating therewith by means of a key 32.

In the arrangement shown in Fig. 10 the lateral play of the axle is provided for and limited by this construction, the axle being allowed to play back and forth in the sleeve 31, while the relationship between the eccentric and the eccentric-strap and its rod is maintained constant.

In Fig. 9 I show an arrangement whereby relative motion is allowed between the eccentric and the eccentric-strap and its rod, and between the latter and the piston by reason of the joint 33 in conjunction with the curved surface of the eccentric, as shown at 34. This arrangement provides for the lateral motion of the car-axle, or "end play," as it is sometimes called. In Fig. 8 this lateral play is provided for by making the eccentric-strap narrower than the groove in the eccentric and allowing the strap to slide or play back and forth upon the eccentric. Any of these principles of construction, or any other suitable principle of construction, may be adopted which will admit of the necessary end play of the car-axle, while not interfering with the proper operation of the pump, without departing from the spirit of my invention, as I do not wish to limit myself to any specific details of construction. The natural clearance or play between the axle-box and axle-box frame or pedestal will allow sufficient rocking motion of the axle box or bearing to admit of the vibratory action of the pump, heretofore referred to, as a very slight clearance at this point will admit of considerable extent of motion at the free end of the pump remote from the driving-axle on which it is journaled; or special provision for this oscillation may be made by making the box or bearing round or oval rather than square or rectangular.

I am aware that the combination of a car-axle, a pump-piston, power-transmitting mechanism connecting said axle and piston, and a casing supported at one end and adapted to be supported on the car-body at the other end, entirely enveloping the said power-transmitting mechanism and having the expanded part adapted to exclude dust from said mechanism and a part forming a pump-cylinder is old to this art, and I do not claim same as part of the invention herein disclosed, which has for its main objects the elastic restraint of an air-pump journaled on a car-axle and operated by said axle, said restraint being between pump and car-body or other non-rotating part of car, and the utilization of the ordinary axle-journal as the journal for the air-pump which the axle operates.

Having now fully described the purposes and manner of carrying out my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a pump to be operated by the rotation of a car-axle, a pump-cylinder or casing formed in one with or rigidly attached to an axle-box.

2. An axle-box made in one with a pump-frame arranged to receive the component parts of the pump mechanism.

3. A pump-casing and cylinder, reciprocating parts, connections and valves, in combination with an axle box or bearing formed in one with or made fast to said casing and designed to replace the ordinary axle-box.

4. The combination of a car-axle, and a pump designed to be operated by said car-axle and journaled thereon through the instrumentality of the ordinary axle-box.

5. The combination of a car-axle, and a pump designed to be operated by said car-axle and journaled thereon through means of the ordinary removable bearing in the axle-box.

6. An air-pump operated by the rotation of a car-axle, and journaled upon said axle by means of the ordinary axle-box journals of the axle, substantially as and for the purposes herein set forth.

7. A car in combination with a car-axle therefor, having a crank or eccentric attached to said axle adapted to operate an air-pump carried along with said car and journaled on said axle by means of the ordinary axle-box.

8. A car in combination with a car-axle therefor, having a crank or eccentric attached to the end of said axle and adapted to operate an air-pump carried along with said car, and journaled on said axle by means of the ordinary axle-box.

9. A car-axle and a crank or eccentric attached thereto outside of the wheels, in combination with an air-pump cylinder and casing therefor formed in one with or attached to one of the axle boxes or bearings of said car-axle, a piston in said cylinder operated by said eccentric or crank, springs elastically restraining said pump, and induction and eduction valves for said pump, substantially as and for the purposes herein set forth.

JAMES H. BROOKMIRE, JR.

Witnesses:
W. F. RICHARDS,
T. C. HUGHES.