(No Model.) 2 Sheets—Sheet 1.

H. C. JOHNSON & F. H. CUSHING.

DEVICE FOR AND METHOD OF COOLING JOURNALS AND BEARINGS.

No. 301,607. Patented July 8, 1884.

Fig. 1.

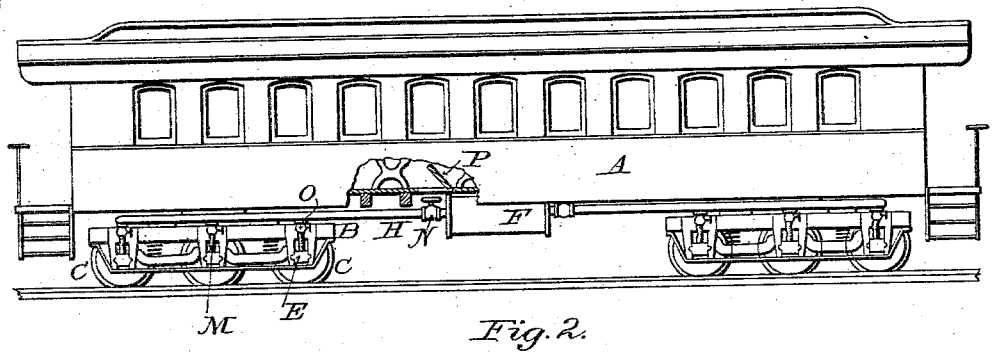


Fig. 2.

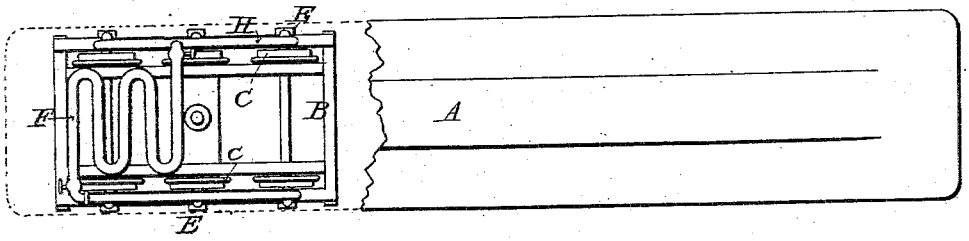
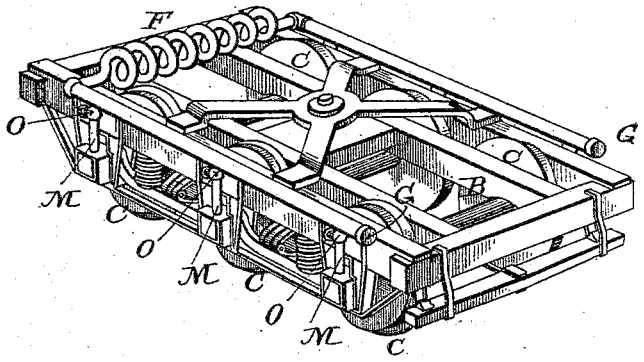


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

H. C. JOHNSON & F. H. CUSHING.

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Fig. 4.

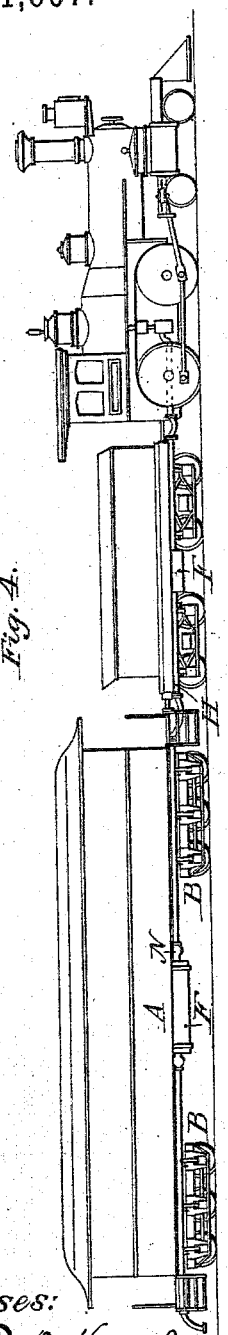


Fig. 7.

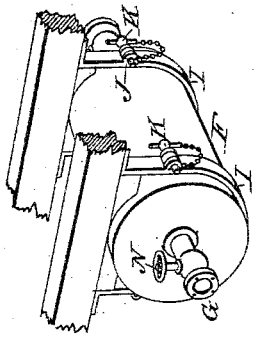


Fig. 6.

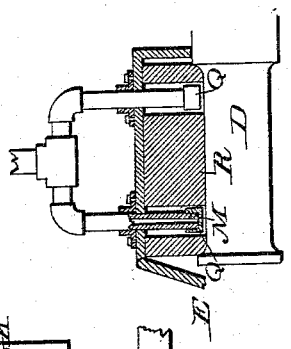
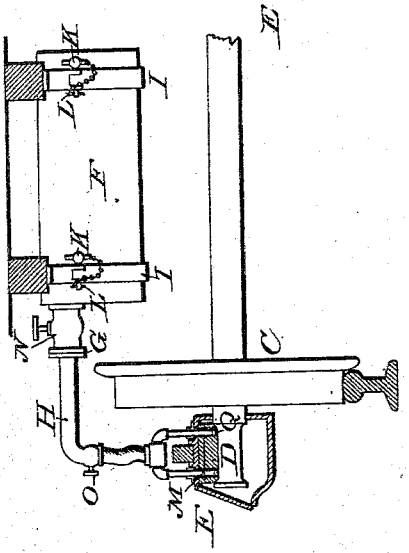


Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY C. JOHNSON, OF MEADVILLE, PENNSYLVANIA, AND FRANK H. CUSHING, OF WASHINGTON, DISTRICT OF COLUMBIA.

DEVICE FOR AND METHOD OF COOLING JOURNALS AND BEARINGS.

SPECIFICATION forming part of Letters Patent No. 301,607, dated July 8, 1884.

Application filed May 28, 1884. (No model.)

To all whom it may concern:

Be it known that we, HENRY C. JOHNSON, of Meadville, Crawford county, Pennsylvania, and FRANK H. CUSHING, of Washington city, in the District of Columbia, have invented certain new and useful Improvements in Methods of and Apparatus for Cooling Journals and Bearings, of which the following is a specification.

This invention has for its object the prevention of heating of journals and bearings, and particularly those of car-axles.

The invention consists in applying to such journals or bearings a fine stream, jet, or series of jets of compressed fluid—air or gas—either constantly or at such time or times as may be required, the sudden expansion of which produces cold, and, in the case of certain preferred gases, prevents combustion.

In the drawings, Figure 1 is a side elevation of a car having the improved cooling apparatus applied; Fig. 2, a top plan view of a car with one end broken away to show the truck and the cooling apparatus applied thereto; Fig. 3, a perspective view of a car-truck having said improvement applied in a slightly-different but equivalent form; Fig. 4, a side elevation of the running-gear of a car having the cooling apparatus arranged to receive compressed air from a pump carried on and operated by steam from the locomotive, in the same manner as the air-brakes now in common use; Figs. 5 and 6, detail views of the fusible sealing apparatus for permitting the flow of air or gas to take place when the journal heats to a certain temperature; Fig. 7, a view of the tank fasteners or holder.

Great difficulty is experienced in securing for machinery journals and bearings which will not heat, bind, and cut when the machinery is run at high speed, and this difficulty is especially noticeable on modern railway-cars, of which the weight and the rate of travel have both been greatly increased of late years. The serious consequences often attending such heating are too well known to need explanation here; and the object of this invention is to prevent such heating and the results thereof. A study of the causes of the troubles mentioned shows that even with very perfect lubrication the weight applied to and the rapid motion of journals cause a considerable rise in temperature, which of course causes an expansion of the journal, a closer fit of the same within its bearing, consequently greater friction and a more rapid increase in heat, and so on, the heat and friction increasing in a rapidly-increasing ratio until a point is reached where the lubricant ignites, adding its heat to that produced by friction, removing all remaining lubricant from the surfaces in contact, and permitting actual wearing contact. An important point to be gained, then, is to prevent the lubricant from igniting, as well as to keep down the temperature. With these objects in view we discharge upon the journal, the lubricant, or the waste or packing used in the bearings or boxes compressed carbonic-acid gas, which is a preventive of combustion, or, in some cases, other compressed gas or air, carbonic-acid gas being, however, preferred, because of its great compressibility, its consequent convenience of storage and great cooling capacity, its antagonism to combustion, and its cheapness of manufacture as compared with other suitable gases. The manner of applying these compressed gases or compressed air is susceptible of considerable variation without departing from the spirit of our invention; but the following will be found convenient and efficient plans.

Referring again to the drawings, A indicates a railway-car; B B, its trucks; C, the wheels; D, the car-axle journals; E, the boxes or bearings therefor, and F a tank, holder, or receiver for containing compressed gas or air. The tank or receiver must be made of great strength, to withstand the high pressure to which the gases or air are subjected, the gases being usually or preferably compressed to liquefaction, as for general refrigerating purposes.

A convenient, cheap, and safe receiver is that patented to David D. Johnson, October 17, 1882, and numbered 266,160, which is represented in Figs. 2 and 3. The tank or receiver, in whatever form it may be made, should be furnished with couplings G at its ends, to permit it to be readily connected with or disconnected from the distributing-pipes H,

which conduct the gas or air from the tank or receiver to the axle boxes or bearings, and said receiver is held in place by fastenings or holders of such form as will permit it to be quickly applied or removed at will.

A convenient form of fastening consists, simply, of metal straps I, hinged near one end, and adapted to swing up, like hasps, around the receiver and over staples or eyes J, in which position they are secured by fastening-pins K, having gravitating keepers or latches L, as shown in Fig. 7. Any other simple retaining device may, however, be used which will permit the tank to be removed for recharging or replacement by one already charged.

The receiver may be applied to the car-body, either beneath the same, as in Fig. 1, or inside of the car at any convenient point; or it may be carried directly upon the truck. The latter plan is preferred, since it permits the use of rigid metal distributing-pipes throughout, whereas flexible connecting-pipes must be used if the receiver be applied to the car-body, to permit the movement of the trucks relatively to the car-body. The receivers should be made readily portable, to permit them to be carried to a charging-station, though they may be charged while in position, if preferred. From the tank, holder, or receiver the gas or air is conveyed through pipes H, of small internal diameter, to the axle-boxes E, where it is discharged, in a fine stream or streams, through nozzles M, the flow being permitted, regulated, or prevented at will by valves N at the tank or receiver and between its body and the couplings G, where they must be provided to permit the receivers to be closed when not connected with the distributing-pipes, or such regulation and control being effected by valves O in the several branches of the distributing-pipes. The latter arrangement is preferred, because there is not any considerable loss of cold between the tank and the jets, as where the regulation is effected at the tank. The stems or valves N may be carried up through the bottom of the car or close to the floor thereof, and the floor furnished with a trap-door, P, through which access may be had to the valve. The same may be done with valves O, and thus the whole system placed under control of the conductor or other proper officer of the moving train.

The jet pipes or nozzles M of the distributing-pipes are made with quite small openings, so that when the valves are fully opened the flow will be very slow, and hence extend over a long period of time, thus rendering it possible to start the flow at the beginning of a long trip and have it continue throughout the same, thereby avoiding all chance of heating and binding. If preferred, however, the gas or air may be held in reserve until such time as it is needed, as indicated by the smell attendant upon the heating of a box; or it may be applied at stated intervals, either by the train officials or by automatic mechanism; but the most desirable plan is believed to be that illustrated in Figs. 5 and 6, in which readily-fusible caps Q are applied to the nipples or nozzles M, which melt whenever the axle heats sufficiently to cause trouble or render it probable. Such caps may be made of any well-known alloy or composition and in such relative proportions as will insure its melting at any predetermined point or degree of temperature. The melting-point will of course be dependent, in a great measure, upon the manner or place of applying the nipples M, which may be carried through holes or openings *b* in the bearing-blocks R, as in Fig. 6, or otherwise applied, as circumstances require or render advisable. Such compositions or alloys are commonly composed of lead, tin, and bismuth, or lead, tin, and cadmium, for low fusing points, the proportions being varied according to the degree of fusibility desired. No precise proportions are deemed necessary, nor can any be prescribed that will answer under all circumstances, it being only necessary, however, to make a selection from the tables given in standard text-books to suit the particular point and method of application. Under this last-mentioned plan the gas or air will remain unused until heating of the journal begins, when the gas will be discharged upon such journal, and on that only; hence there will be no waste of gas and no delay or uncertainty as to its application when required.

In Fig. 4 the tank F is shown provided with flexible pipes and couplings to connect with an air-compressing engine, as is now done with ordinary air-brakes, so that, instead of carrying a previously-charged receiver or a receiver containing compressed gas, a body of air may be compressed by the pump and discharged into the boxes and upon the journals, taking up a volume of heat equal to that given off while undergoing compression, and thereby cooling the journal and bearing. The same receiver may supply the brakes and the bearings with air.

As stated, the invention is susceptible of application to journals and bearings generally in all classes of machinery.

Gases of different kinds, or gas and air, may be used conjointly, if desired.

The gas or air entering the box and passing outward will effectually exclude dust and grit, which usually enters the boxes to some extent, and causes the shaft or bearing to cut and wear rapidly.

We make no claim to cooling journals by blowing a current of air over water, ice, or other cooling body, and thence upon the journal.

Our plan consists in compressing the fluid to a great degree, by which operation it is deprived of its heat, then permitting it to expand about the journal, where it absorbs a volume of heat equal or about equal to that lost in compression.

Having thus described our invention, what we claim is—

1. In combination with a journal and its bearing, a receiver for containing compressed air or gas, and a jet or nozzle communicating with said receiver, and arranged to deliver the compressed gas or air to the journal or bearing, substantially as explained.

2. In combination with a journal and its bearing, a compressed gas or air receiver, a pipe extending from the receiver to the bearing, and a valve between the receiver and outlet end of the pipe to control the discharge of the gas or air, substantially as explained.

3. In combination with journal D and bearing E, compressed-gas receiver F, pipe H, and valve N, all substantially as described and shown.

4. In combination with journal D and bearing E, receiver F, pipe H, coupling G, and valves N and O, all combined and arranged to operate substantially as set forth.

5. In combination with a journal and its bearing, a pipe having a delivery-nozzle communicating with the latter, and a detachable portable receiver adapted to contain compressed gas or air, substantially as set forth.

6. In combination with a journal and its bearing, a receiver adapted to contain a compressed fluid, a pipe or nozzle communicating with said receiver and with the axle or bearing, and a fusible seal applied to the nozzle and adapted to melt when a predetermined temperature is reached, and thereby permit the discharge of the compressed fluid, as and for the purpose set forth.

7. The herein-described method of cooling journals and bearings, consisting in discharging thereon highly-compressed fluid.

8. The herein-described method of cooling journals and bearings, and preventing combustion of the lubricant used therewith, which consists in discharging thereon compressed carbonic-acid gas or equivalent non-inflammable gas.

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FRANK H. CUSHING.

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