A. S. SWEET, Jr.

Furnace for Expanding Metals by Steam.

No. 50,511. Patented Oct. 17, 1865.

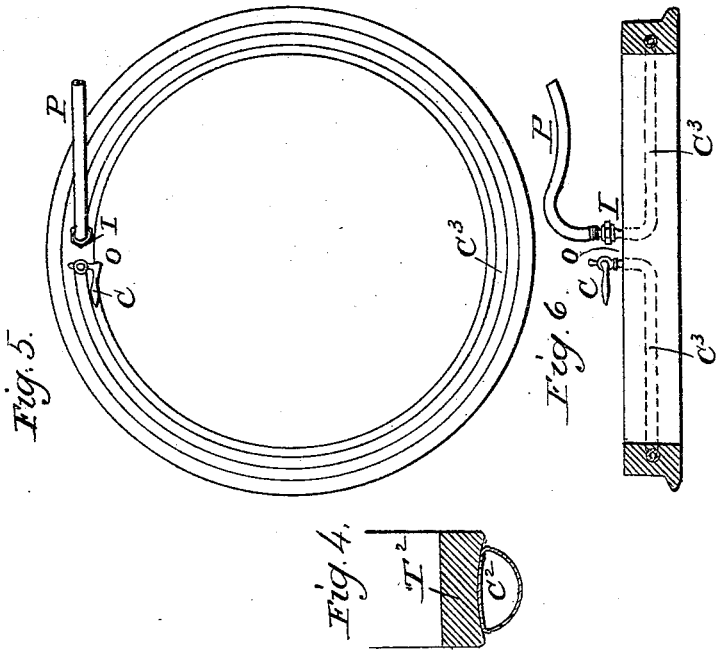

Fig. 5.

Fig. 6.

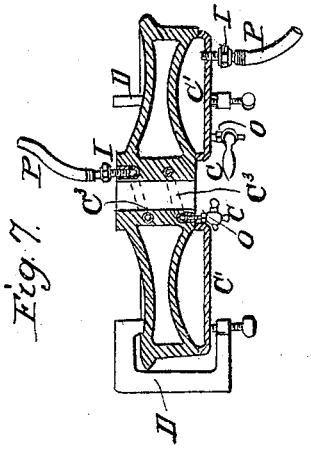

Fig. 7.

Fig. 4.

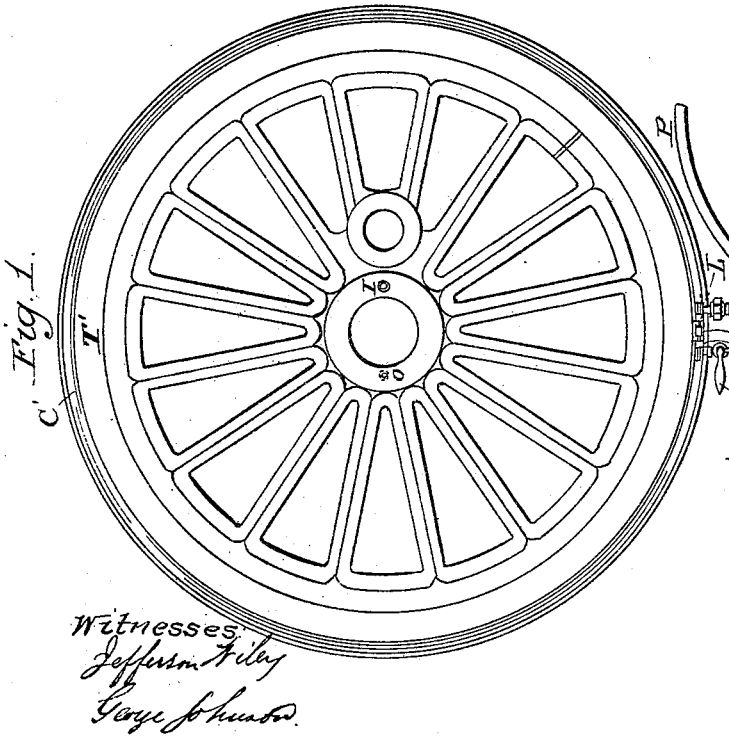

Fig. 1.

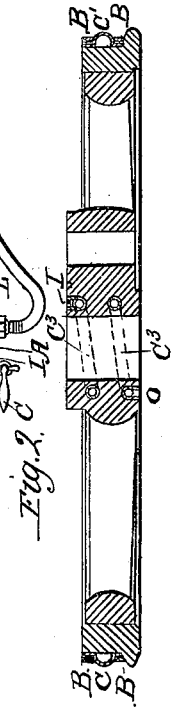

Fig. 2.

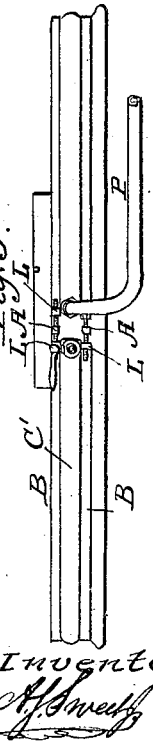

Fig. 3.

Witnesses:
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UNITED STATES PATENT OFFICE.

ALLAN S. SWEET, JR., OF DETROIT, MICHIGAN.

EXPANDING METALS BY STEAM HEAT.

Specification forming part of Letters Patent No. **50,511**, dated October 17, 1865.

To all whom it may concern:

Be it known that I, ALLAN S. SWEET, Jr., of the city of Detroit, in the county of Wayne and State of Michigan, have invented a new and improved mode of heating and expanding such part or parts of machines, stationary or locomotive, as it may be necessary or desirable to so heat and expand for the purpose of making shrunken fits, as in wheels upon axles, tires upon wheels, cranks upon shafts, &c.; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figures 1, 2, and 3 represent, respectively, a side elevation, transverse section, and edge view of a locomotive driving-wheel having my expanding apparatus attached; Fig. 4, a cross-section of worn tire with modified steam-belt. Figs. 5, 6, 7 represent a plan and sectional view of proposed mode of expanding chilled cast wheel-tire and truck-wheels.

Similar letters of reference indicate corresponding parts in the several figures.

The nature of my invention is to heat and expand such part or parts of machines intended for shrinkage by admitting steam of the requisite temperature to flow in a continuous current through channels or chambers formed by certain casings, tubes, or belts, to be hereinafter described, which casings, &c., are so formed, arranged, attached, or connected temporarily or otherwise, in relation to and with such part or parts to be expanded that the sensible heat of the steam may be best transmitted.

The better to enable others skilled in the art to construct and use my invention, I will now proceed to describe it, with such modifications as will sufficiently indicate its general applicability to the purpose designated.

There are various modes in which the casings or belts may be constructed to apply the steam to the object to be expanded, and I propose to employ them as an apparatus of a portable nature to be entirely detached as soon as the object is accomplished for which it was applied, or to form such channels or chambers permanently in the body of the metal by coring out or by the casting in of casings of any suitable size or form properly arranged.

My invention also contemplates the employment of annular grooves to be sunk in both faces of such part of a casting as may require expanding—as, for instance, contiguous to and surrounding the eyes of wheels, cranks, and levers. These grooves, by first drilling or coring out one or more holes between them and inclosing and incasing them temporarily by metal plates, whole or in sections, with central openings to clear the shaft or axle, can be converted into very efficient steam-channels for the purpose designed. The various forms that such grooves may be made to assume, so as to add both to the symmetry and strength of the casting, are so well known to skill artisans in iron that I do not deem it necessary to illustrate or to further explain them.

Before proceeding to describe in detail my invention, I will briefly state its general and leading features.

First. The channels or chambers for the steam-current are each provided with an induction and eduction port or opening for the admission and escape of steam, (shown, respectively, at I and O,) which openings are usually adjacent to each other, with a partition between for circular currents to break the continuity, so that a distinct and continuous passage may be maintained between the inlet and outlet.

Second. I propose to convey steam from a steam boiler or heater (not shown) into such channels, chambers, or cavities, to be hereinafter more fully described, through a steam tube or pipe, a broken-off section of which is seen at P, and as some degree of flexibility or facility of motion is necessary to allow the object expanded to be moved (with the pipe connected to it) into its place, I usually employ a vulcanized-rubber hose, and in cases where steam of very high temperature is needed a pipe of copper or other suitable sheet metal, provided with swivel-elbows or telescopic slides, or both, constructed in the usual way. I usually couple this pipe with the screw-union connection at both ends, and insert a waste-cock, C, in the outlet, as it is sometimes useful to check the escape of the steam when putting the object expanded in place, and convenient for other uses.

Figs. 1, 2, and 3 represent my plan of open steam-belt, in which the steam acts directly on the metal of the tire T′, around its outer pe-

riphery, the belt C′, with closed ends, nearly encircling it. This belt, in cross-section, may nearly resemble a shallow U having side flanges, which are drawn up snugly round the tire, steam-tight, by means of sheet-metal bands B B, tightened by screw-bolts A, passing through lugs L at the ends.

When the surface is worn and a joint sufficiently steam-tight cannot readily be made, I employ a tight belt having a contact-face to conform as nearly as practicable with the surface to which it is to be applied, as in Fig. 4, where C^2 represents a cross-section of a tight steam-belt, drawn around snugly, in any convenient way, the worn tire T^2. I propose also to take advantage of any suitable conformation in actual use—as, for instance, in Fig. 7, which represents, in transverse section, a cored truck-wheel in which the hollow molded face is converted into a steam-channel by attaching to it, by clamps D or other convenient means, a ring-shaped disk-plate, C′, furnished with a radial partition (not seen) to break the continuity, for reasons previously given.

In cases analogous to Figs. 5 and 6, which exhibit a plan and half-section of a chilled wheel-tire, where the arrangement of the crystals in the chilled metal tread is not favorable to the transmission of heat by either of the steam-belts previously described, I prefer to construct the steam-channel by coring out or casting a tube, C^3, in which I is the inlet and O the outlet in and around the body of the metal itself. Such channels or casings may be arranged in convolutions and applied, as illustrated, around the centers of Figs. 1, 2, and 7.

My object in this invention is to reverse the rule of practice and rely no longer on the skill of the workman in allowing for shrinkage—a skill often based on both false theory and experience, and extremely uncertain in its results. Should a shaft or axle be left too large for its wheel, or a tire too small, the wheel or tire will be overheated and overexpanded to get it on, and when, after a short use, they break, the cause is generally attributed to almost everything else but the depreciation of the metal and overstrain.

This invention furnishes a uniformly reliable test of the correctness of a shrunk fit, for as the temperature of the steam (which can be readily known) and the required expansion of the wheel or tire can be maintained until they are in place, nothing is left to chance, and if they will not go into place, or go too loosely, it is a misfit, and must be corrected.

A brief description of the operation of setting the tire T by means of the belt-casing C′ will sufficiently explain the general mode of using my invention.

Having drawn and secured the belt-casing C′, as previously described, snugly around the tire, (placed in reference to the wheel conveniently,) then couple one end of the flexible steam-pipe P, by means of the union, to the inlet at I and the other end (not shown) to a stop-cock branch in a steam boiler or heater, in such manner as to leave sufficient slack in the pipe to allow free movement for putting the tire, when sufficiently expanded, on the wheel. Then admit the steam at a proper temperature through the pipe and the belt-casing, letting it pass out freely by the cock C until the tire is heated to correspond with the flowing steam, when the cock may be partially or wholly closed and the tire put on and adjusted to its place. Then shut the cock in the boiler or heater, and allow the steam in the pipe and belt to escape, and when cool enough remove the apparatus. I, however, generally expediate the cooling by a coupling, so as to force a stream of cold water through the belt-channel from some pump, hydrant, or water-tank.

In the troublesome, but necessary, process of "shimming" the railroad engineer will find it more pleasant and much more profitable when he houses his engine with a loose tire to wrap one of my steam-belt casings around it and throw in steam, by means of the flexible pipe, from his own boiler, while he leisurely fits in his "shims," in place of building up his customary fire and blistering and otherwise defacing his, perhaps, newly painted and varnished wheels.

There is no doubt but that the practice of overheating in general use at present, so as to compensate for the cooling before getting the object to be shrunk on into its place, works great injury and deterioration to some metals. With steel locomotive-tire it is specially injurious, and has subjected it to undeserved odium. In my mode there is no similar overheating necessary, since there is no heat lost in getting such tire or other object in its place, whatever time it may require to do it in.

I do not claim, broadly, the expansion of parts of machines of metal by means of steam-heat; nor do I claim producing such expansion by admitting steam into tubes or pipes formed or cast in the body of the metal, as this mode of heating has been patented by Henry Mooers, December 3, 1861, for keeping wheel-chills dry and warm in the mold; but

Having fully described the various modes in which steam may be applied to heating metals for the purposes designed by me, what I claim as my invention, and desire to secure by Letters Patent, is—

The formation of temporary steam-channels, cavities, or chambers on the surface of such part or parts of machines to be heated and expanded by attaching thereon belts, casings, or plates C′ C^2, or other equivalent devices, when constructed, applied, and operated substantially in the manner and for the purposes herein specified.

A. S. SWEET, JR.

Witnesses:
JEFFERSON WILEY,
GEORGE JOHNSON.