SCIENCE

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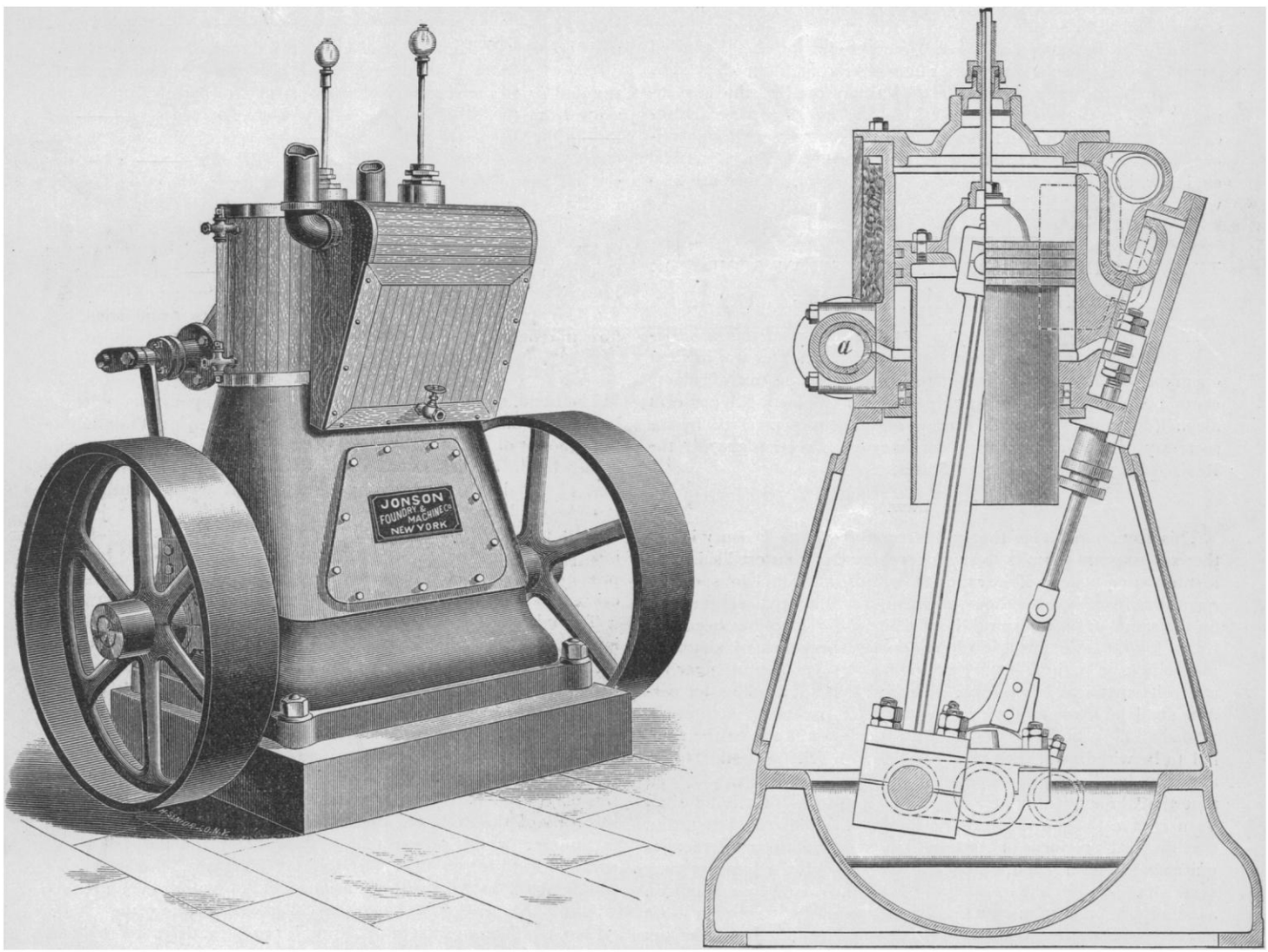
THE JONSON BALANCED COMPOUND ENGINE.

THE illustrations show a new type of balanced compound high-speed steam-engine now being introduced to the notice of steam-users by the Jonson Foundry and Machine Company of this city. In this engine there are two steam-cylinders, placed side by side, cylinder having the full area of the piston above the trunk. In the engine here illustrated the diameter of the steam-cylinder is twelve and a half inches, and the diameter of the trunk is eight and five-eighths inches, the stroke being ten inches; so that the engine has two high-pressure cylinders, each about eight inches in diameter.

In the operation of the engine, steam is admitted to the high-



THE JONSON BALANCED COMPOUND ENGINE.

the connecting-rods working in trunks, and the cranks being set at an angle of a hundred and eighty degrees with each other. All the working parts are enclosed as shown.

It will be seen that the arrangement forms a pair of half-trunk engines, the high-pressure cylinder being the annular space between the trunk and the steam-cylinder, and the low-pressure pressure cylinder for the upward stroke of the piston, and, being exhausted into the low-pressure cylinder, actuates the piston on the return stroke. For small engines, the valves of the high and the low pressure cylinders form one casting, and the steam from the high-pressure cylinder is exhausted through ports in the valve to the low-pressure cylinder. When an automatic cut-off is fitted,

an independent steam-valve for the high-pressure cylinder, shown at *a*, is added, so as to avoid damaging the action of the low-pressure valve and the high-pressure exhaust.

As an example of this practice, in an engine of 275 horse-power of this type, now being constructed for a United States steam-tender, a piston-valve is used for the steam-valve of the high-pressure cylinder, and a slide-valve for admitting the steam into the low-pressure cylinder and exhausting it therefrom. For small engines an ordinary governor, not shown in the cuts, is usually attached.

The special advantages claimed for this engine are compactness, a low centre of gravity, and particularly the fact that all the moving parts are in pairs, equal, and acting in opposite directions, thus securing a perfect mechanical balance, and adapting the engine to high rates of speed without sensible vibration.

As evidence of the adaptability of this engine for electric-lighting purposes, it may be stated that it has been attached to a thousand-light dynamo, which it ran at the rate of seven hundred and fifty revolutions per minute; and so steady was its performance, and so well was it governed, that, when the entire load was thrown off by means of a switch, it made no perceptible change in its running. The throwing on and off of such a load is a very severe test for an engine.

The following extract is taken from the report of a board of government engineers who had examined this engine with a view to determining its adaptability for the various uses of the government: "The engines are compact, and the working parts are reduced to a minimum; and they have the advantage of long connecting rods, and a reduction of height over the ordinary vertical engine with the same length of connecting rod. They are also well-balanced engines."

THE WITHDRAWAL OF ALCOHOL FROM BOND FOR SCIENTIFIC PURPOSES, FREE OF TAX.[1]

IT may not be generally known to the members of this association that they can obtain their supplies of alcohol for use in their chemical laboratories free of the internal revenue tax of ninety cents per proof gallon, or $1.70 per gallon of ninety-five per cent alcohol, by complying with certain regulations prescribed by the secretary of the treasury, in accordance with section 3297 of the Revised Statutes of the United States.

The Law.

This section provides that "the secretary of the treasury is authorized to grant permits to any incorporated or chartered scientific institution or college of learning to withdraw alcohol in specified quantities from bond without payment of the internal revenue tax on the same, or on the spirits from which the alcohol has been distilled, for the sole purpose of preserving specimens of anatomy, physiology, or natural history belonging to such institution, or for use in its chemical laboratory; *provided*, that applications for permits shall be made by the president or curator of such institution, who shall file a bond for double the amount of the tax on the alcohol to be withdrawn, with two good and sufficient sureties, to be approved by the commissioner of internal revenue, and conditioned that the whole quantity of alcohol so withdrawn from bond shall be used for the purposes above specified, and for no other, and that the said president or curator shall comply with such other requirements and regulations as the secretary of the treasury may prescribe. And if any alcohol so obtained is used by any officer, as aforesaid, of such institution, for any purposes other than those above specified, then the said officer or sureties shall pay the tax on the whole amount of alcohol withdrawn from bond, together with a like amount as a penalty in addition thereto."

The above provisions are further extended by the act, approved May 3, 1878 (20 *U. S. Stat.* 48), which provides: —

"That the secretary of the treasury is authorized to grant permits, as provided for in section thirty-two hundred and ninety-seven of the Revised Statutes of the United States passed at the first session of the Forty-third Congress, to any scientific university, or college of learning created or constituted such by any State or Territory under its laws, though not incorporated or chartered, upon the same terms and subject to the same restrictions and penalties, already provided by said section thirty-two hundred and ninety-seven: *provided further*, that the bond required thereby may be executed by any officer of such university or college, or by any other person for it, and on its behalf, with two good and sufficient sureties, upon like conditions, and to be approved as by said section is provided."

Documentary Evidence required from a Scientific Institution before it can enjoy this Privilege.

To obtain this privilege for its chemical laboratory, an incorporated or chartered, or not incorporated or not chartered, scientific institution, university, or college of learning must, at the time of its original application, clearly show, by a copy of its charter, articles of incorporation, or other documentary evidence, that it is an institution duly entitled to such permit by possessing a suitably equipped chemical laboratory and otherwise.

Form of Application.

Its application is made by the president, curator, or duly authorized agent, "through the collector of internal revenue in whose district the institution for which the withdrawal is to be made is situated," "to the secretary of the treasury for permit" "to withdraw from the distillery bonded warehouse, owned by ———, at ———, in the ——— district of ———, the alcohol which was stored in said warehouse on the ——— day of ———, 18—, described as follows: viz., number of packages; marks and serial numbers of packages; numbers of warehouse-stamps; wine-gallons; degree of proof; proof-gallons; taxable gallons; and amount of tax; for the *sole purpose* of use in the chemical laboratory of the institution, located at ———, in the State of ———, of which institution" the signer is one of the persons above mentioned.

"The application in all cases must be sworn to, or affirmed, before an officer authorized to administer oaths."

Character of the Bond.

The bond, required to be filed with the first application, must be in a penal sum of "not less than $200, and never less than double the amount of tax on the alcohol withdrawn at any one time," is signed by the applicant "as principal, and with two or more sureties, who shall not be officers of the institution in which the alcohol is to be used, but shall be residents of the United States judicial district in which such institution is located." In the case of "an incorporated institution, its name should be signed to the bond as principal, and its corporate seal affixed by its duly authorized officer, who should also sign his own name as such officer."

The bond is conditioned that "the entire quantity of alcohol" intended to be withdrawn "from distillery warehouse, without payment of tax," by the said principal, will be "for the sole purpose of use in the chemical laboratory of the" said institution, "in the city or town of ———, of the county or parish of ———, and State of ———," "and for no other purpose."

The bond is known as a "continuing bond;" i.e., "withdrawals may be made from time to time," "by the said principal," "until this bond shall have been revoked or cancelled by direction of the secretary of the treasury," of certain alcohol for use "by the said institution, or the proper officer thereof, for the purpose above specified, and for no other purpose." "The principal of said institution shall, as to each lot of alcohol so withdrawn, produce within" the time "fixed by the collector accepting the bond," "from the date of such withdrawal," "proof satisfactory to" the collector of internal revenue of that district, "and to the commissioner of internal revenue, that the said alcohol has been so used for the purpose above specified, and for no other purpose." He shall also "comply with such other requirements and regulations as the secretary of the treasury may prescribe;" and according to the last paragraph of section 3297, Revised Statutes, "the said officer or sureties" are bound by this bond to pay to the collector "the tax on the whole amount of alcohol withdrawn from bond, together with a like amount as a penalty in addition thereto," "in case said

[1] Paper read before the Association of Official Agricultural Chemists at Washington, D C., Sept. 11, 1889.