

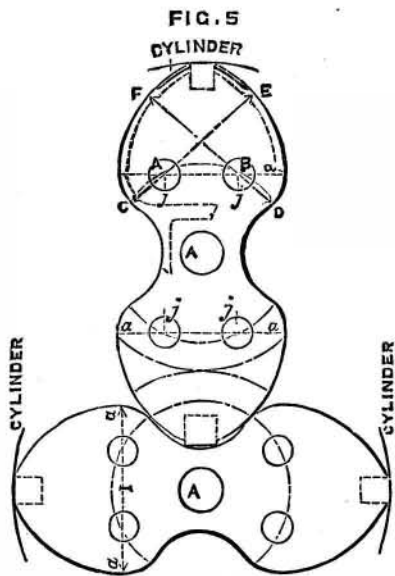
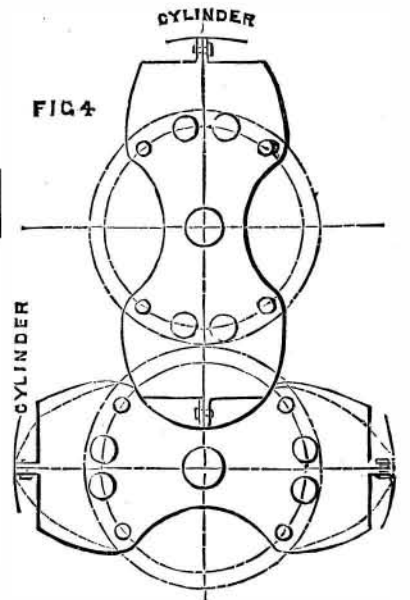
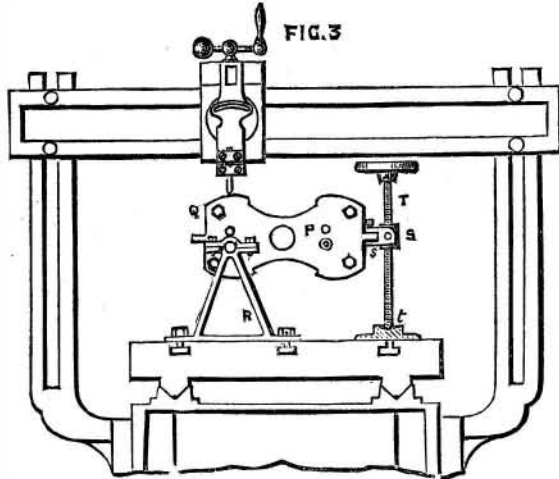
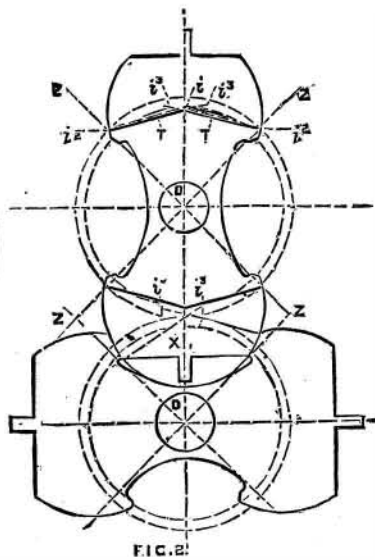
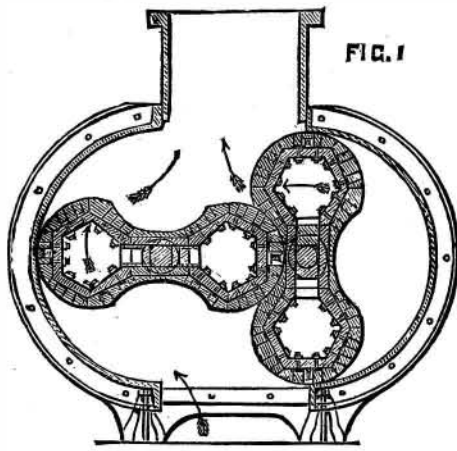
[THE ENGINEER, LONDON.]

ROOTS' IMPROVEMENTS IN BLOWERS AND PUMPS.

The Roots blower now being a well known machine in this country, though of American origin, some account of its career may be interesting to our readers. It consists of two revolving vanes or abutments geared together so as to keep up constant contact with each other, and with the internal periphery

of a pair of half cylinders. Its success is well known—so much so, that the Roots blower is as much an article of commerce in the machinery world as is a portable engine or a screw cutting lathe. The blower as originally constructed consisted of two vanes or abutments of a form not unlike the figure eight, revolving around each other, their relative positions being determined by wheel gearing. This form, though not scientifically correct, was sufficiently so to insure an approximate contact when made of wood, and hence it formed an efficient machine for a cold blast; but when used, as is now frequently the case, for exhausting hot gases, it became necessary that the revolvers be formed of iron. Then a difficulty arose as to the form of revolvers, as, if made accurately to a semicircle, they would not pass round each other, the curves not being of the correct form, and besides that, it necessitated that the whole of the surfaces of both revolvers should be swept over by a tool, rendering the formation a very expensive process.

enough for the free passage of the wire. This vessel is provided near the bottom with a tube fitted with a stopcock. The balloon is accurately balanced, while the vessel containing it is filled with air; and then, if another gas of different specific gravity is allowed to enter and displace the air, the balloon will rise or fall according as the gas is heavier or lighter than air. Equilibrium is to be restored by adding weights to one



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and small curves are struck from one common center, thus reducing the construction to the utmost simplicity. By reference to Fig. 5, it will be seen that each half of the vane consists—on each side—of two large and two small curves, and that to produce these four curves only two centers and two radii are employed. The centers are represented by the points A B, and radii A C—A E, B D—B F. Thus the two smaller curves are struck with radii A C and B D, and the larger with radii A E—B F from the centers A and B, which are found by exceedingly simple means, and also the radii. These being fully described in patent No. 10,323, 1885, it will be unnecessary to describe them more fully here. An exterior view of the blower is given in Fig. 6.

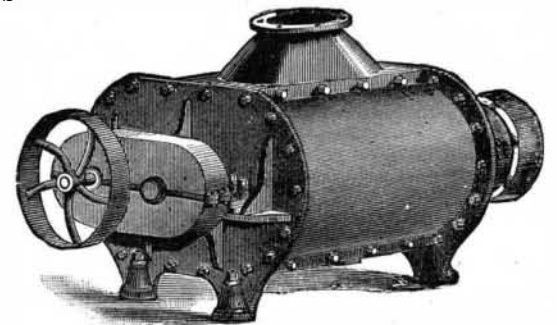


Fig. 6.—ROOTS' BLOWER.

This want of scientific accuracy in the original form led Mr. Roots to improvements, and fresh patents were taken out in 1881 and 1882, and again in 1885. We will now shortly notice the four patents, which will possibly be the simplest way of pointing out the various improvements which have led to the 1885 patent. This last seems to have reduced the difficulties of construction and manufacture so much, and is of so simple a nature, that it is difficult to see how it is that the present form should not have been the one originally adopted. That years of labor and numerous experiments have been expended is another illustration of the fact that even in the design of mechanical tools perfection is only attainable by perseverance and thought. Our illustrations clearly show the various stages which have been passed through, and we think the improvements will at once be appreciated.

Fig. 1 represents the original Roots blower as constructed by Messrs. Thwaites & Carbutt, of Bradford, and now by others. It is not an accurate form—that is to say, if the curves are true semicircles, and closely geared, the revolvers will not pass round each other. Fig. 2 is an illustration of the patent of 1881. The curves in this instance are more accurate, and only the convex surfaces are tooled over. In their formation, however, they require the use of several different centers and radii, which involves a dif-

As a pump, Messrs. Mather & Platt, of Salford, have taken a license to manufacture, and, we believe, have supplied several to her Majesty's government, the contractors of the Tay Bridge, and others. A very neat design of a combined engine and pump, shown in Fig. 7, is being brought out by Mr. Okes, of Queen Victoria Street, the engine being by Mr. A. C. Mumford, of Colchester, who is acting as Mr. Roots' agent in England. Fig. 7 is a perspective view of the combined rotary pump and engine.

A Specific Gravity Balance for Gases.

Professor Lommel has recently described in *Wiedemann's Annalen* an ærostatic balance for determining the specific gravity of gases, which is claimed to be specially useful for lecture room demonstrations. A closed glass balloon is hung by a wire underneath one arm of a balance, and, thus suspended, is inclosed in a glass vessel, in the cover of which is a hole just large

scale or the other, which thus indicate the difference in weight between a volume of gas equal to that of the balloon and an equal volume of air at the same temperature and pressure. The apparatus may be constructed of any desired delicacy, and might easily be made into a handy and inexpensive specific gravity apparatus for coal gas analysis.

Inoculation as a Preservative against Consumption.

M. Verneuil has lately published a letter to the editor of the *Gazette Hebdomadaire*, M. Lereboullet, in which he proposes to set on foot an experimental inquiry into the possibility of finding some method of "attenuating" the presumed virus of tubercle, so as to make inoculation therewith practically useful against consumption, either as a prophylactic measure, like vaccination against smallpox, or as a means of cure, like Pasteur's inoculations in hydrophobia.

Three thousand francs have already been subscribed, and the respectable names of Cornil, Bouchard, Damaschino, and Potain are mentioned among those who approve of the investigation.

It must, however, be remembered (1) that with the exception of hydrophobia, an exception still on trial, no human disease but smallpox is known which can be prevented by inoculation; (2) that of epizootic disease, anthrax is only in certain cases guarded against by Pasteur's attenuated virus; (3) that the dependence of consumption on Koch's *Bacillus tuberculosis* is far from established; (4) that its fatality is very far below that of smallpox or hydrophobia, and its treatment far more successful.

Consumption is the most important disease of temperate climates, both by its prevalence, its mortality, and its incidence on young adults; so that the sacrifice of a few rabbits or cats for even a remote chance of controlling its ravages is well justified. But the chance is, we fear, remote.—*Nature*.

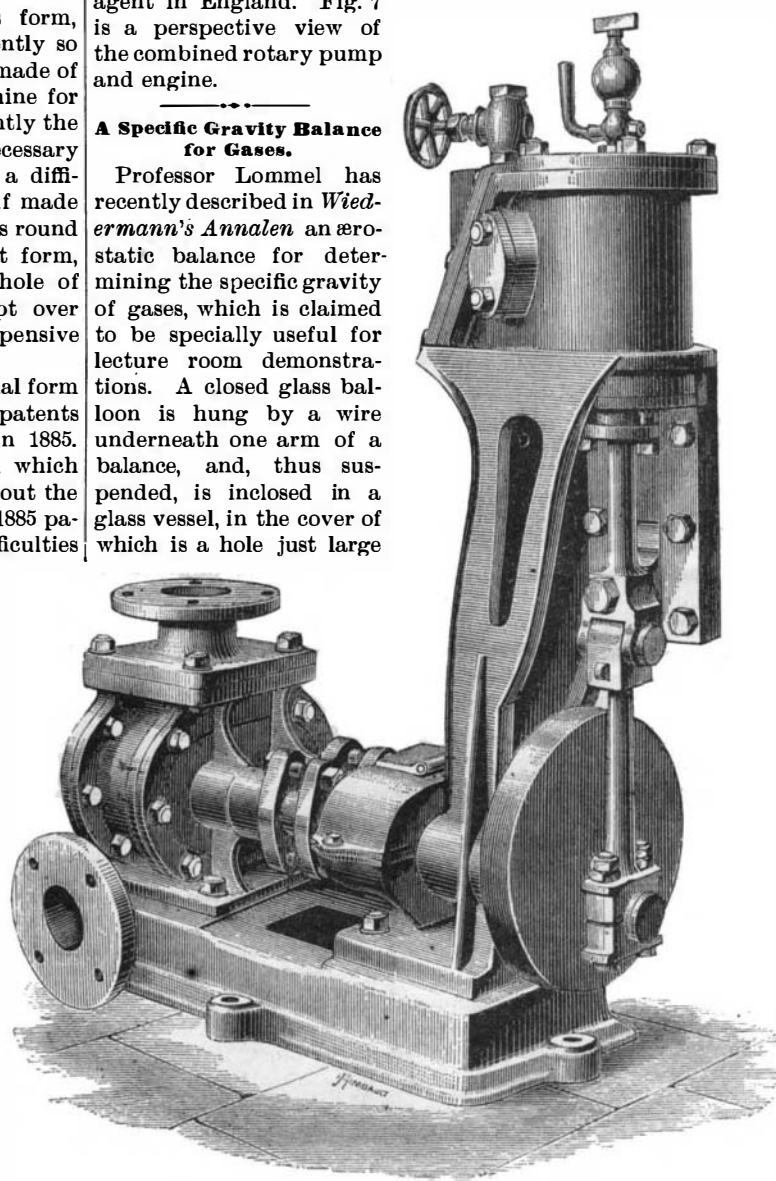


Fig. 7.—ROOTS' COMBINED ROTARY PUMP AND ENGINE.

THE *Chicago Tribune*, referring to the recent marriage of Mr. Edison and his prolific inventions, concludes that his genius will now be directed to electric candles, electric nursing bottles, electric safety pins, electric machines to get up and walk the baby in the middle of the night, electric devices for cutting teeth, and scaring off whooping cough, croup, and measles, and will contrive other articles for mitigating the troubles, trials, and petty annoyances usual in domestic life.