ENGINEERING

FACTS AND FIGURES FOR 1866.

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1867.

“Like the searchers for the philosopher's stone, or the students of perpetual motion, the advocates of rotary engines have pursued their object with untiring diligence from one generation to another” — G.D. Hughes

STEAM ENGINES.] HALL'S ROTARY ENGINE. 164

45. Hall's Rotary Engine. -The attempts to obtain a good working engine of this class, in which the power of steam gives directly a rotary motion, have been so numerous, and the failures so complete and disheartening, that they may almost come under the category of hopeless inventions. Yet there are those who believe

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that we shall yet see a really good engine of this class. The following paper, read before the "British Association," by Mr. G. D. Hughes, is explanatory of another attempt to realize this hope.

"Like the searchers for the philosopher's stone, or the students of perpetual motion, the advocates of rotary engines have pursued their object with untiring diligence from one generation to another, with this advantage, however, over the two former, that whilst they are impossible, the inventors of rotary motion have to a considerable extent been successful in their endeavours, and there seems to be no substantial reason why they should not ultimately attain their end. The vast improvements made in the construction of our engines and machines by the invention and perfection of new and improved tools, the great strides made in cur knowledge of kindred sciences, and the constitution of the material world, have rendered easy of accomplishment what was before considered impossible; and in the mechanical world we have numerous instances of this fact; for instance, what kind of work would the Armstrong or Whitworth guns and rifles or the delicate and complicated lace machine of the present day have

been, made with the tools and appliances in use forty years ago. Taking these circumstances into consideration, our enlarged know ledge, and increased facilities for producing improved constructions, I am strongly inclined to believe the difficulties hitherto presented will eventually be overcome, and that a good, durable, and efficient rotary engine will be an accomplished fact sooner or later. With these few remarks, I now beg to draw your at tention to a rotary engine recently invented by Mr. W. Hall, of Nottingham, who, however, does not claim the whole as being original; yet there appear to be some new features introduced, which have not been previously adopted, and, on the whole, it seems to promise a more successful result than any of its prede- cessors. This invention has not been the result of accident, or hit upon unexpectedly, but is the offspring of patient and laborious study and perseverance in pursuit of the object in view. The inventor has spent a large portion of his life in investigating the subject and in the making of numerous plans and models to accomplish his purpose, and so far has he succeeded in the present instance that, as far as the writer has had opportunities of judging, and from an experience of twenty-five years in occasional reading

and studying this matter, he believes it to be the best arrangement which has yet come under his notice, and one which fully deserves the careful attention of the scientific world.

"The inventor has now tested the arrangement for several years in various ways, and so far it has answered the best expectations formed of its efficiency, and he now only requires the opportunity to test it on a more extended scale. He believes fully to ensure its success from its occupying such a small compass and its general compactness of construction. He believes it would be peculiarly adapted for the propulsion of steam ships, for which from its form it seems specially adapted. The consumption of fuel during the various trials was most moderate, and the indicator diagrams taken under varying circumstances of load and speed compare favourably with any of our best engines on the reciprocating plan, whilst the great regularity with which it runs with quickly varying loads is very remarkable, but this may be

accounted for by the manner devised for the admission and cut ting off the steam so close to the cylinder. The engine was started last Saturday week and is now working very well, mak ing 150 revolutions per minute with a boiler pressure of 60 lb. This engine has a cylinder 24 in. diameter and 30 in. long, the piston measures 18 in. diameter, being also the same length as the cylinder. Estimating the average pressure in the cylinder at 30 lb. per square inch during the whole of the revolutions, the engine drives about 65 indicator horse power. The cylinder is truly bored and faced at each end, with suitable covers for same also faced, through which the main driving shaft works, and which shaft is supported in each cover by a taper brass bush at each end, acting as journals, and capable of being adjusted to allow of wear. The piston is of the eccentric kind, and is made perfectly steamtight in contact with the circumference of the cylinder at the extreme of the throw by means of a metallic pack ing, kept tight to the face by steel springs similar to those used in the piston of the reciprocating engine. The ends of this piston are also made steamtight against the covers by means of an an nular ring at each end, kept up to the face by the same means as the packing at the outer circumference. On the inlet steam pipe is an equilibrium cut off valve, arranged so as to be worked by means of the graduated cam connected to the governor which

controls the admission of steam at each revolution in proportion to the load on the engine. This arrangement regulates the speed of the engine with the greatest accuracy under the most variable loads and with the least possible amount of steam required to do the work.

"The governor is placed horizontally on the main shaft, and by means of the spiral spring and a stop-collar at one end can be adjusted so as to vary the speed of the engine almost to any extent. An abutment slide follows the piston during its revolution in the cylinder, and it is through the opening or port in this slide that the steam is admitted into the cylinder. Another peculi arity in this abutment slide is an arrangement whereby the steam

acting on the top forces this slide down, and keeps it in contact with the piston during the first half of the revolution, rising, however, again into the chamber as the piston approaches the end of its revolution ready for the re- admission of steam for the next stroke. The main shaft is of Bessemer steel, and the equilibrium valve spindle of the same material, whilst the cam is of chilled iron, so as to ensure durability in the working parts. The shaft can be made any length, and will give out the power of the engine, either at one or both ends, as may be required.
The engine can either be used as a condensing or non-condensing one, and this principle can be applied equally well for air pumps to condensing engines or pumps for general purposes, and the engines and pumps may be arranged to work either way with equal facility and efficiency. If on farther trial the engine answers the expectations formed of it, the inventor believes the following advantages will be the result of its adoption: -First, saving in first cost over reciprocating engines under similar circumstances and of similar power of upwards of 30 per cent. Second, saving of power required to work and change the motion of the parts of the reciprocating engine. Third, compactness and portability, saving room, and expensive foundations and special adaptation for purposes of propulsion in steam vessels. Fourth, less work ing parts, and consequently less friction and wear, with less liability to get out of order and easy facility to get at and repair or replace any part which may become deranged. Fifth, steady and regular turning at high speeds, and consequent saving of intermediate gearing for high speed machinery and economy of

working equal to the best engines on any other principle. Sixth, saving of steam contained in the ports usually let out with the exhaust steam in most engines at the end of each stroke. These engines can be arranged so as to work backward or forward with equal facility, and can be fixed to drive end- way as in driving a screw propeller, or cross- way to drive the paddle- wheels of steam vessels, or for any other purpose."

from Engineering Facts and Figures edited by Andrew Betts Brown 1866

HALL'S ROTARY ENGINE.

CONSTR UCTED BY MR. GEORGE ROBERT COWEN, ENGINEER, NOTTINGHAM.

FIG.1.

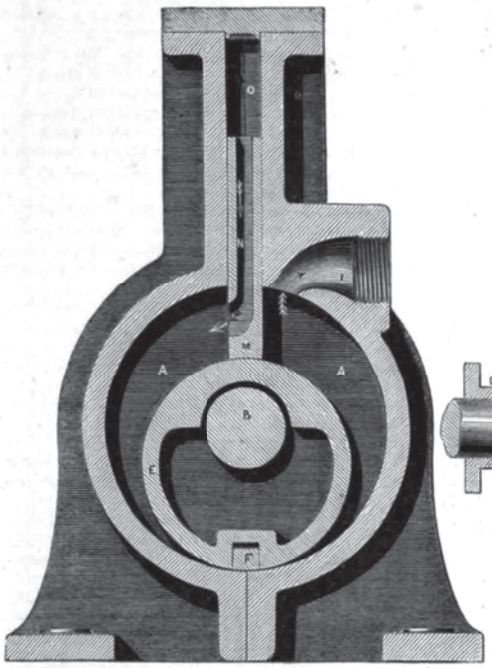
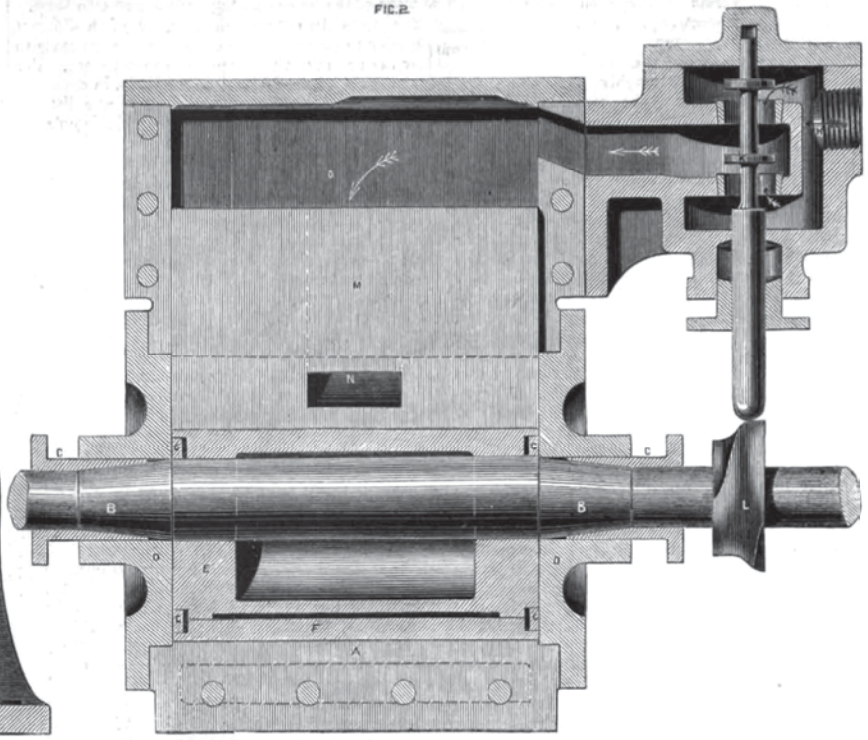


FIG.2.

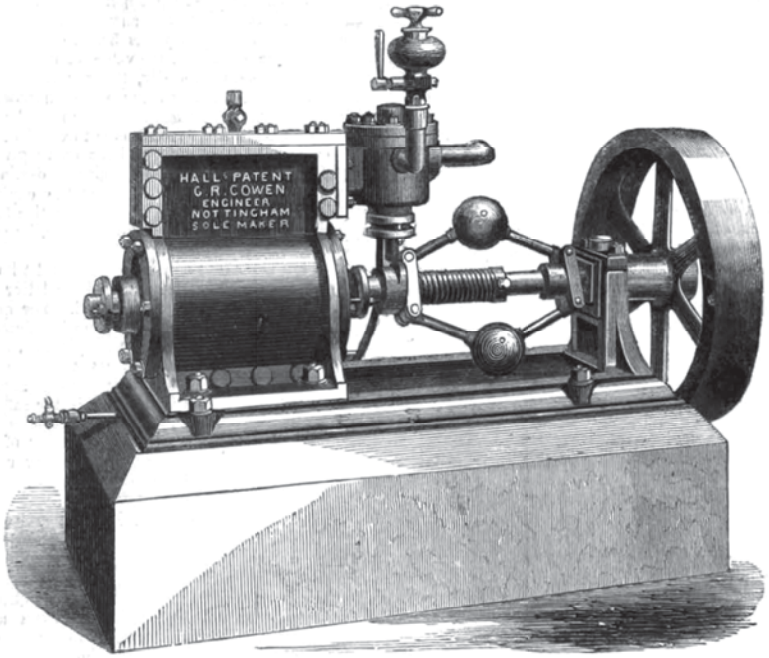


AMONGST the machinery shown in motion at the show of the Royal Agricultural Society, now being held at Leicester, is Hall's rotary engine, which is exhibited by the manufacturer, Mr. George Robert Cowen, of the Beck Works, Nottingham. This engine is of very simple construction, as the engravings of it, which we publish above, will show. Referring to these engravings, A is the cylinder, truly bored, faced, and fitted with covers, D, which are also faced, and through which the main shaft, B, works. This shaft is supported at each end in the conical bearings, C C, which are arranged so that they can be adjusted for wear. The revolving eccentric piston, E, is keyed on the shaft, B, and is kept in perfectly steam-tight contact with the circumference of the cylinder by means of the metallic packing, F, held out by springs as in an ordinary piston; whilst it is kept tight endways by means of the metallic rings, G G, also held up by springs against the faced surface of the covers, D D. H is the steam inlet, and I the exhaust outlet, whilst K is an equilibrium cut-off valve worked direct from the cam, L, which slides on the shaft, B, as controlled by the patent horizontal governor, as shown in the elevation. The admission of steam is thus regulated by this valve in direct proportion to the load on the engine, thus maintaining an uniform speed under variable loads; M is the abutment slide, which follows the piston during its revolution in the cylinder.

The steam in the steam chest, O, pressing on the top of the slide, M, tends to keep it in contact with the piston during the first half of the revolution, after which the bottom edge of the slide is exposed on the up stroke to the same pressure as the top, this counter pressure being maintained until it reaches its highest position, when the pressure of steam on the top forces the slide against the piston again for the next revolution.

We have by us diagrams taken by a Richards indicator from one of these engines; these diagrams showing a very good distribution of the steam. Two pairs of the diagrams are off the same engine, and show the action of the cut-off valve under varying loads. The engine in question has a cylinder 18 in. long by 14 in. diameter, and a piston 14 in. in diameter. The boiler pressure was 42 lb., and the diagrams were taken when the engine was running at 150 revolutions per minute. We have also in our possession diagrams taken from a larger engine, which has been indicated up to 37 horse power.

The engines we have described are arranged to run, if required, at great speeds, and the speed can be easily altered by tightening up the governor spring on the main shaft. A surface speed of the piston of 900 ft. per minute is the regular working speed, and small engines have been run with ease up to 1500 revolutions per minute.



MUSEUM OF MECHANICAL SCIENCE.

TO THE EDITOR OF ENGINEERING.

SIR,—Sufficient interest has been developed by a couple of meetings, and the comments of the press, in the expansion and concentration of the Patent Office, museum, and library, to ensure that the vote to complete the sum charged for expenses for the ensuing year under the Patent Law Amendment Act should pass unchallenged only in a thin House of Commons, and the last hours of an expiring Parliament.

Everybody has been asking that all due facilities shall be given to enable our workmen, by the increase of their knowledge, to hold their own in the competition with Continental industry. Before the "cry" for better education was raised, a museum of mechanical science and a free public library of scientific books were established in anticipation of it by the Commissioners of Patents. From end to end of the metropolis there can be found to exist no similar institutions capable of being made to be of equal use to the people.

Here are an industrial museum and a modern scientific library of the kind London may be presumed to need. Bring them together in a central, easily accessible situation, and give them full play, charging the cost upon the accumulated nett surplus of more than half a million sterling derived from Patent Office fees in fifteen past years, and one of the greatest wants of the metropolis will have been supplied.

Thanks mainly to the press for the ventilation of the subject, the matter is in a fair way for getting attention in the incoming legislature; although the stereotyped official answer of one of the half dozen Government departments, under which the Patent Office and its belongings have the ill-fortune to be placed, displays profound misinformation upon the theme of more than a dozen statements to Parliament, the Treasury Commissioners, and a Select Committee.

Austria, Baden, Bavaria, Belgium, British Guiana, Canada, Cuba, France, Italy, Jamaica, the Netherlands, Portugal, Prussia, Russia, Saxony, Spain, Sweden, Switzerland, the United States, and Wurtemburg, all have their polytechnic museums and libraries properly combined under the same roof. Great Britain alone suffers her institutions of the same kind to be unnaturally divorced, the Museum to be placed where the people it was designed to teach cannot get to it, and both Museum and Library in the desperately plethoric condition best described by the proverb, "One cannot see the wood for the trees."

I am, Sir, yours faithfully,

J. T. DEXTER.

Public Museums and Free Libraries Association,
150, Strand, W.C., July 15, 1868.

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Amongst the machinery shown in motion at the show of the Royal Agricultural Society, now being held at Leicester, is Hall's rotary engine, which is cxhib1tcd by the manufacturer, Mr. George Robert Cowen, of the Beck Works, Nottingham. This engine is of very simple construction, as the engravings of it, which we publish above, will show. Refering to these engravings, A is the cylinder, truly bored, faced, and fitted with covers, D, which are also faced, and through which the main shaft, B, works. This shaft is supported at each end in the conical bearings, CC, which are arranged so that they can be adjusted for wear. The revolving eccentric piston, E, is keyed on the shaft, B, and is kept in perfectly steam-tight contact with the circumference of the cylinder by means of the metallic packing, F, held out by springs as m an ordinary piston; whilst it kept tight endways by means of the metallic rings, G G, also held up by springs against the faced surface of tho covers, DD. H is the steam inlet, and I the exhaust outlet, whilst K is an equilibrium cut-off valve worked direct from the cam, L, which slides on the shaft, B, as controlled by the patent horizontal governor, as shown in the elevation. The admission of steam is thus regulated by this valve in direct proportion to the load on the engine, thus maintaining an uniform speed under variable loads,; M is the abutment slide, which follows the piston during its revolution in the cylinder.

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from Engineering 17 July 1868