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To cite this article: Mr. Samuel Clegg (1809) LIX. Description of a rotative steam engine, the piston of which makes a complete revolution at a distance from the revolving axis , Philosophical Magazine Series 1, 34:140, 401-405, DOI: [10.1080/14786440908562992](https://doi.org/10.1080/14786440908562992)

To link to this article: <http://dx.doi.org/10.1080/14786440908562992>



Published online: 18 May 2009.



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LIX. Description of a Rotative Steam Engine, the Piston of which makes a complete Revolution at a Distance from the revolving Axis. Invented by Mr. SAMUEL CLEGG, of Manchester.

MANY attempts have been made to produce a rotative motion by means of steam, without deriving it from, or making use of, the rectilinear motion of the piston in the common or reciprocating engine. For this end steam wheels and other contrivances have been resorted to, but hitherto with little effect, owing to loss of steam, or to an increase of friction produced by the means employed to prevent this waste. Still a rotative steam engine appeared to promise so many advantages, could it be well accomplished, that some engineers continued to apply their thoughts to the subject, and Mr. Clegg announces that he has succeeded in producing a simple and effective engine of this kind, for which he has obtained a patent. This engine has no outward movements except the revolving shaft, which occupies the centre and works through a stuffing box in a cistern of water M; and which being the only opening into the engine prevents the entrance of all air excepting what is contained in the water used for injection. The steam pipe is at P, and the air pump is within the condensing vessel. The following is a description of the engine: See plates XIII and XIV.

Fig. 1 is the underside of a circular piece of cast iron, and of a diameter and thickness proportioned to the size of the engine. I is the common centre of the different circles shown on this piece. With any convenient radius less than that of AA describe the circle CC, and within the latter the circles DD and EE—the radius of the latter being the least of those now named. From the uses of these parts, which will be immediately described, an idea of their relative dimensions will readily be inferred.

Let that part of the surface AB, AB which is contained between the circles A and C be plain. Between the circles C and D sink a circular groove CD of any given depth; and between the circles D and E let another circular groove be cut of the breadth DE, and of any given depth less than that of the groove CD. Let the remaining part of the surface AB, namely, that included between E and B, be cut down to any depth less than the depth of the groove DE.

Into the groove CD let such a number of segments of a
Vol. 34. No. 140. Dec. 1809. C c circle

circle be fitted as shall form a complete circle, excepting the space LL, which is occupied by adjusting screws, or springs to keep the segments close together. The segments are the breadth (or nearly) of the groove CD, and of a depth less than the depth of the groove CD. Those sides of them which apply to each other are to be ground together plain, and air-tight if possible. Their under surfaces, which are shown in fig. 1., are to be flat, so that the whole may form one complete plain surface, excepting the space before mentioned, which is taken up by adjusting screws or springs LL, which screws or springs are placed so far below the surface as to let a roller pass by them, which will be mentioned hereafter.

Figs. 2 and 5 represent vertical sections of the plate and grooves of fig. 1, resting upon a circular chamber or hollow space YY, to which chamber the said plate forms a light covering, excepting that space occupied by the springs or screws LL as before mentioned.

I, the centre of all the grooves and circles before described, is also the centre of the shaft. On the shaft I is fastened a plate or coupling ZZ, in which is inserted a bar F. This bar may be of any given breadth, but in depth must be less than the depth to which the circle EB was cut down below the surface AB. To this bar is attached a wheel or roller G, shown in fig. 3 upon a larger scale. The manner in which it is attached to the bar F is also there seen, and it is so attached to it that the top of the wheel or roller G shall always be higher than the top of the bar F. The wheel G being attached to the bar F will, when the bar is made to revolve, describe a circular path HHH along the plain surface of the segments before described. Let that portion of the plain surface of each segment which answers to the path of the roller G be rounded off, in such a manner as to make that portion of the surface an arc of a circle, the convex circumference of which is presented to the roller G. In fig. 3, at H is shown a perpendicular view of one of the segments, rounded off in the manner described, and presenting its convex circumference to the roller G. There may likewise be another roller attached to the bar behind it, to lower down the segments in the same manner in which they are raised by the first roller. Now it is obvious, all the said segments being in their places in the groove CD fig. 1, that the roller G, in performing a revolution round the centre I, must travel along a series of convex arcs of circles equal in number to the number of segments in the groove CD. The groove DE

is

is in fact a recess in the deeper groove C D, and may, if necessary, be filled with hemp and tallow, or any other material which may answer the purpose intended.

It must be remembered that fig. 1 is a view of the underside of this machinery. Figs. 2 and 5 are sections of it, supposed to be in its proper position resting as a cover to the circular chamber Y Y, and the segments resting upon a flat facing O O. Each segment projects over the facing O O on both sides; their projection on one side completes the cover over the hollow chamber, and the other is the rounded surface for the roller to lift them.

The facing O O is exactly, or as nearly as can be, level with the underside of the plate A B, A B, when the plate is on its place, as represented in fig. 2; so that, when the segments are all in their places, they complete the semi-circular chamber, and fit so close on their seats and in the groove, that were the chamber to be filled with any elastic fluid, they would prevent its escape (or nearly), excepting where the space is left for the springs or adjusting screws.

The use of these segments, which are what the patentee claims as his invention, is as follows: Conceive a door or valve to be fitted in the hollow chamber at Q, and a piston R, likewise fitted in the chamber so as to move round in it, and the bar F made fast to the piston, on the side and in the manner represented in fig. 1: then, if an elastic fluid, of sufficient strength, enters the chamber at N, it will press equally against the door or valve and the piston; but the door or valve being immovable, and the piston moveable, the piston will be propelled forward in the circular chamber by the elastic fluid. The bar F being fastened to the piston, and the roller G to the bar F in the manner represented in fig. 3, and the roller being in motion with the bar and piston, the roller will lift the segments in succession, as it comes in contact with them. The segments before the bar, being by this means lifted, allow the bar to pass, and the operation being the same in all, the bar and piston make a complete revolution. Each segment, as soon as the bar leaves it, falls down by its own gravity, or by springs, or any other contrivance, so that the opening which has been made for the bar to pass is closed before the elastic fluid reaches it; the elastic fluid being kept from the opening by the inner breadth of the piston exceeding the outer diameter of each segment. The door or valve is lifted out of the way of the piston, when the piston comes in contact with it, into the opening in the plate at N, a re-

cess being made in that segment which is opposite the door for that purpose; during which time the elastic fluid is shut out; but it enters again when the door returns to its seat, and thus the operation continues.

The preceding particulars are drawn from Mr. Clegg's specification of his invention. For the following, by which we are enabled to make our readers acquainted with all the parts of a steam engine on this construction, but which being, in some respects, common to all steam engines, were not specified, we are indebted to the patentee, who, on being asked, communicated them with the greatest readiness, and also the drawings from which the engravings have been made.

The exterior of the engine may have the appearance of a low pillar, a altar, a vase, or any suitable form that fancy may direct.

" In fig. 2, *c* is the condensing vessel, *a* the air pump, *b* the air pump bucket, *d* the hot water cistern, *e* the clack. *ff*, the inclined plane for working the air-pump bucket, is fastened on the shaft, and consequently revolves with it. To the air-pump bucket is attached a hollow tube through which the shaft goes. To this tube is fastened a cross bar, at each end of which is a roller *r*, resting upon the inclined plane: of course when the plane revolves the bucket rises and falls. The plane is divided into two different angles so as to make it more acute where the bucket rises, but nearly an angle of 45° where the bucket descends, as represented in the drawing.

" Fig. 4 is a view of the engine complete when at work.

" Fig. 5, a section of the principal part of the engine upon a larger scale, where the same letters employed in describing the smaller section mark the same parts. The injection enters the groove above the blocks, and keeps about three inches of water upon them. The injection then enters the condenser, out of the groove as seen at X. Each segment or block *K* is of sufficient weight to resist the pressure against that part of their under surface which is over the semi-circular chamber, and will generally be about 5-eighths of an inch. The blocks may likewise be lifted exactly in their centre of gravity by means of a lever in the upper part of the groove, and worked by a roller or small inclined plane fastened to the shaft, as represented by the dotted lines in fig. 5; and as it is not necessary for the blocks to rise more than half an inch or 5-eighths, the motion will be very easy; and whatever descending power the blocks have,

have, they will propel the bar forwards proportioned to their weight and the space through which they move, so that there is only the friction of the blocks to overcome. Supposing the pressure upon the piston to be 800lb., the weight of all the blocks will be about 500lb. for such a sized piston, and will seldom exceed more for the largest engines, as the space for the bar to pass will be nearly the same in all, the strength of the bar depending upon its breadth, not on its thickness: thus 800lb. will move through the space of 16 feet, whilst 500lb. goes through the space of half an inch: then, if the descending of the blocks is taken into consideration as before described, the friction of the blocks will make no sensible difference to the progress of the piston.

“The lid M being the only opening into the engine and the only stuffing box, and that covered with water, no air can enter but what is contained in the water used for injection.

“A very small fly is requisite, as the momentum is always in one direction, and that may be at any convenient distance, as circumstances may require.”

LX. New analytical Researches on the Nature of certain Bodies, being an Appendix to the Bakerian Lecture for 1808. By HUMPHRY DAVY, Esq. Sec. R. S., Prof. Chem. R. I.

[Concluded from p. 347.]

II. Further Inquiries respecting Sulphur and Phosphorus.

I HAVE stated, in the last Bakerian Lecture, that hydrogen is produced from sulphur and phosphorus in such quantities, by Voltaic electricity, that it cannot well be considered as an accidental ingredient in these bodies. I have likewise stated, that when potassium is made to act upon them, the sulphurets and phosphurets evolve less hydrogen in the form of compound inflammable gas by the action of an acid, than the same quantity of potassium in an uncombined state, and from this circumstance I have ventured to infer, that they may contain oxygen.

On the idea that sulphur and phosphorus are deprived of some of their oxygen by potassium, it would follow, that when the compounds formed in this experiment are decomposed, these substances ought to be found in a new state; deoxygenated, as far as is compatible with their existence in contact with water.