Specification of James Neville : obtaining motive power by various applications of steam.

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OF

JAMES NEVILLE.

OBTAINING MOTIVE POWER BY VARIOUS APPLICATIONS OF STEAM.

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Obtaining Motive Power by various Applications of Steam.

NEVILLE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JAMES NEVILLE, of Wellington Street, Northampton Square, in the County of Middlesex, Gentleman, send greeting.

WHEREAS His most Excellent Majesty George the Third, King, by His Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Fourteenth day of August now last, did, for Himself, His heirs and successors, give and grant unto me, the said James Neville, my executors, administrators, and assigns, His especial licence that I and they, by myself and themselves, or by my and their deputy and deputies, servants, and agents, or such others as I and they should at any time agree with, and no others, from time to time, and at all times thereafter, during the term of fourteen years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and Town of Berwick upon Tweed, and also in all His Majesty's Colonies and Plantations abroad, my Invention of "CERTAIN NEW AND IMPROVED METHODS OF GENERATING AND CREATING OR APPLYING POWER BY MEANS OF STEAM OR OTHER FLUIDS, ELASTIC OR NON-ELASTIC, FOR DRIVING OR WORKING ALL KINDS OF MACHINERY, (INCLUDING THE STEAM ENGINES NOW IN USE,) AND WHICH ARE APPLICABLE ALSO TO THE CONDENSING OF STEAM AND OTHER AQUEOUS VAPOURS IN DISTILLATION OR EVAPORATION, AND ARE USEFUL IN VARIOUS MANUFACTORIES AND OPERATIONS WHERE HEAT IS EMPLOYED AS AN AGENT, OR WHERE THE SAVING OF FUEL IS DESIREABLE," in such manner as to me, my executors, administrators, and assigns,

should seem meet, to hold the said licence to me, my executors, administrators, and assigns, for the term of fourteen years from the date of the said Letters Patent immediately ensuing; and in which said Letters Patent is contained a proviso, obliging me, the said James Neville, particularly to describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, to be inrolled in His Majesty's High Court of Chancery within two calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that in compliance with the said proviso, I, the said James Neville, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, is particularly described and ascertained in the explanation thereof now next following (that is to say):—

I declare the first part of my Invention to consist in simple methods of employing the expansive properties of steam or other elastic fluids to a greater extent than hitherto practiced, instead of condensing or allowing them to escape whilst they still retain any useful degree of power, and for applying them to communicate motion to every description of machinery, or for any other purposes where motion or power may be required. This I effect by causing elastic fluids to ascend through mediums of those denser fluids which are commonly termed non-elastic, and which will bear a higher temperature without being converted into vapour, so that the steam or other elastic fluid thus applied may not be condensed therein. Of the application of this principle I shall here give one general example. In Fig. one 1 in the Drawings annexed to this Specification let A, B, C, D, represent a vessel closed in all parts except at D, H, and suppose the space C, D, E, F, to be filled with any of those fluids which are commonly termed non-elastic, and which will bear and is heated to a higher temperature than that of the fluid to be admitted at the time of its admission in the manner after stated, without being decomposed or converted into vapour. Then let the space A, B, E, F, be a vacuum or filled with any very light or expanded fluid, and suppose the altitude of the fluid C, D, E, F, if A, B, E, F, be a vacuum, or the altitude of the fluid C, D, E, F, added to the elasticity of any light or expanded fluid in A, B, E, F, to cause a pressure on the base at D, H, equal to fifteen pounds on the square inch, or any other given pressure, being less than the elasticity of the fluid to be introduced. Then suppose a quantity of steam or other elastic fluid to be admitted by the pipe G, through D, H; it will instantly ascend in the perpendicular line D, E, and it will continue to expand according to the different altitudes or densities of the medium through which it passes, the ratio of which expansion is represented by the hyperbola H, T. D, H, expresses the original quantity of the elastic fluid

admitted, and E, F, the final expansion; and the area E, F, I, H, D, multiplied by the relative specific gravities of the elastic fluid and the medium through which it passes, will be the sum of the power thus created. It is evident from this position that the more the steam or other elastic fluid during its ascent expands, the greater power will it communicate to any system to which it may be applied. By this action of steam or other elastic fluid on any of those fluids which are generally termed non-elastic, I produce a direct rotary motion, if such motion be required, in the following manner:—Fig. 2 represents a section view of my cylindrical rotary engine. A, B, C, D, shews the outside cylinder, which is closed at both ends, as represented in Fig. 3, to which cylinder are attached the steam pipe E, E, and the eduction pipe F, F. In the interior of this cylinder is placed another cylinder G, H, I, K, formed with projecting rims or flanches at each end of it, and extending completely round the same, similar to the shrouds of over-shot water wheels, and marked in Fig. 2, G, N, H, O, I, P, K, Q, leaving sufficient space between the projecting rims or flanches G, N, H, O, I, P, K, Q, of the cylinder G, H, I, K, and the internal periphery of the cylinder A, B, C, D, to permit the internal cylinder, together with its rims or flanches, to revolve freely within the external one on its axis L, which passes through the centre of both cylinders. Round the periphery of the cylinder G, H, I, K, I form a number of buckets similar to those used in over-shot water wheels, by fixing curved plates *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, *m*, at equal distances between the said projecting rims or flanches of the said cylinder G, H, I, K, the ends of which plates are to be closely joined to the sides of the said rims or flanches, and the bottoms of the said plates to the periphery of the said cylinder G, H, I, K. The space between the two cylinders is to be in part filled with any dense fluid body capable of bearing a high temperature without being decomposed or being converted into vapour, as before stated in Fig. 1. To the eduction pipe F, F, is to be affixed a condensing vessel and air pump similar to those attached to the steam engines now in use, and which are too well known to require any description. Then, if the dense fluid body with which the space between the two cylinders is in part filled, as aforesaid, be heated so as not to condense the steam to be afterwards admitted, and the usual vacuum be formed in the condensing vessel and the steam be admitted through the steam pipe E, E, into one of the lower buckets, it will ascend and fill such bucket, displacing the denser fluid which was therein, and by that means raise the altitude of such denser fluid; it will then fill the next higher bucket, and so on, until motion be communicated to the system. The light shade in the buckets is intended to shew the expansion of the steam or other elastic fluid in each bucket as they ascend when the engine is at work,

and the darker shades the position of the denser fluid. Fig. 3 represents a perspective view of the exterior of the above engine, and the axle L comes out of the cylinder A, B, C, D, through the stuffing box R, R. I shall next describe my method of applying the above principle to an elliptical rotary engine. The principles of its action are similar to those already described in the cylindrical rotary engine, Figures 2 and 3, viz., by the ascent or expansion of steam or other elastic fluids through a denser medium capable of bearing a higher temperature than such steam or elastic fluid employed at the time of its employment, without being decomposed or being converted into vapour and heated to such higher temperature. Figure 4 represents a perspective view of the exterior of my elliptical rotary engine, which may be formed by the six distinct castings A, B, C, D, E, F, the metal of which must be of sufficient thickness to resist the intended pressure; those in Figure 4 are represented as bolted together by their flanches G, H, I, K, L, and *m*, and leave a space inside, which is represented in the section Figure 5. To the semicircular bottom is joined the steam pipe N, N, and to the semicircular top is affixed the eduction pipe O, O, for the admission and discharge of the steam or other elastic fluid employed. In the cavities or spaces at the top and bottom of the engine are placed two axles or shafts P, P, on each of which two wheels or one cylinder Q, Q, revolve. In each of these wheels or cylinders are notches *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, *r*, and round these wheels or cylinders revolve the double chains S, S, which are made similar to the chains now used in working chain pumps, and are formed by plates or joints, joined at equal distances by the bolts *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, *t*, which bolts correspond to the said notches of the wheels or cylinders into which they act, and when moved communicate motion to the system. To each joint of the chains S, S, is attached a bucket of sheet iron, copper, or any other metal or substance capable of bearing the temperature and pressure of the fluids to be employed. These buckets may be of any convenient shape, and are severally marked out by the letters U in Figures 5 & 6, so that these chains, with the system of buckets thereon, as represented by Figure 6, may revolve on the aforesaid wheels or cylinders in the direction from V to W, without any obstruction. These buckets ascend from V to W, with their bottoms reversed or mouths downwards, and descend in the opposite column of the engine from X to Y, in the contrary position; in the bottom of each bucket is inserted a small pipe *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, Figure 5, and *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, Figure 6, which pipe comes nearly to the top of each bucket, and is open at both ends, so that if more steam or other elastic fluid be admitted than the bucket will contain, it will pass through the said

pipe into the bucket which is above it, and so on until any number of buckets are filled, but which process of the steam passing through the pipes is only necessary to start the engine in the first instance; these buckets are made of such a size as to revolve freely within the internal space of the said castings A, B, C, D, E, F, Figures 4 and 5, and which space is to be filled to any required height (corresponding to the intended quantity and elasticity of the steam or other fluid which is to be admitted therein) with any dense fluid that will bear a greater or higher temperature than that of the steam or other elastic fluid to be employed in the said engine, without being decomposed or converted into vapour; then if such dense fluid be heated to the required temperature, and steam or any elastic fluid whose pressure is greater than the weight of the dense fluid in the engine, be admitted through the steam pipe N, N, the said elastic fluid will instantly ascend therein and occupy one of the lower buckets, and will displace the denser fluid therein, which will increase the altitude of the same in the engine, and the elastic fluid will successively continue to occupy each bucket by passing through the pipes *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, *z*, Figure 5, until the pressure of the steam or other elastic fluid is equal to the resistance or load to be overcome by the engine, and it will then commence its motion in the direction above described; as each bucket passes the pipe N, N, in succession, it will receive the necessary quantity of steam or other elastic fluid. This quantity will depend on the elasticity or pressure of such fluid, and its admission through a cock or valve at *a* is regulated by a centrifugal governor, or other of the well-known contrivances to regulate the motion of the engine. The power of this engine is communicated from both or either of the shafts or axles P, P, which are turned true, and pass air-tight through the stuffing boxes *b*, *b*, *b*, *b*, Figure 4, and *b*, *b*, *b*, *b*, Figure 12. The effect of this engine will be similar to the first described, and produces a rotary motion. I have introduced these two examples, which are sufficient to elucidate the first part of my said Invention, namely, the application of steam or other elastic fluids by their ascent in those denser fluid mediums which are commonly termed non-elastic, and of employing their expansive properties in any proportion which may be considered desireable; and I reserve to myself the sole right and adoption of this part of my Invention, without confining myself to the various and different modes of mechanical application of which it is capable. I declare the second part of my said Invention to consist in increasing the quantity or volume of steam or other elastic fluid employed by means of heat, without augmenting its elasticity or rendering the same dangerous. This I effect by causing the steam or other elastic fluid to pass or ascend, either by means of pipes or otherwise, through any fluid or other medium

which will bear a higher temperature than that existing in the steam or other elastic fluid whose volume I wish to increase, or thro' any other medium or system whereby I can communicate heat to the said steam or other elastic fluid, or any other of those which are commonly termed non-elastic; but as their sudden increased elasticity, temperature, or expansion might be dangerous, one of the means I employ to effect this without danger is an expanding boiler, receiver, or rarifier, which is represented by Figure 7. Let A, B, C, D, be a cylinder or other shaped receiver, of cast iron or any other suitable substance, open at the bottom, which is connected to the square base E, F, G, H, by flanches or otherwise, and thro' which base the square case I, K, L, M, passes, forming a furnace and ash-pit therein, whereby the contents of the cylinder A, B, C, D, and of the base E, F, G, H, may be heated to any required temperature; let there be placed in the cylinder A, B, C, D, another cylinder N, O, P, Q, of smaller diameter, formed also of cast iron or any other suitable substance, but of the same height as the cylinder A, B, C, D, so that it may be moved freely up and down without touching the sides of the cylinder A, B, C, D. The cylinder N, O, P, Q, is inverted and closed at the top, and is suspended from the cast iron arch R by the weight and chain S, S, S, S, which passes over the pullies T, T; the gravity of the cylinder N, O, P, Q, is thereby diminished in any degree corresponding to the required elasticity of the steam or other fluid to be contained therein, and it will in this respect resemble a gasometer used for the retention of gases, but it is here applied for a new and different object. In the top of the cylinder N, O, P, Q, I place a common safety valve U, the construction of which is so well known as to require no explanation here. Let the base E, F, G, H, be filled, and the cylinder A, B, C, D, in part filled with oil, or any of the mediums commonly termed non-elastic before described or alluded to, and let the pipe *v*, *v*, *v*, *v*, *v*, be inserted in the base, thro' which pipe the steam or other elastic fluid is to pass, and when the oil or other medium is heated to the required temperature, which will depend on the intended extent to which the steam or other fluid is to be rarified, expanded, or heated, then if the steam or other fluid be admitted thro' the pipe *v*, *v*, *v*, *v*, *v*, from a common steam engine boiler, or elsewhere, it will, by passing thro' the heated oil or other medium, acquire a similar temperature, and consequently an increased elasticity; but the cylinder N, O, P, Q, being loaded to one, two, or three pounds on the square inch, or to any other elasticity required, and being at liberty to rise, then, if the pressure of the steam or other fluid which enters therein becomes greater than required, it will immediately raise the cylinder N, O, P, Q, and expand in the space thereby formed; should the quantity thus expanded be greater than

required, then the cylinder N, O, P, Q, as it ascends, will act on the lever W, W, which is connected by the rod X, X, to the lower lever Y, and will thereby close the valve or cock Z, and shut off or regulate the admission of the steam or other fluid corresponding to the required elasticity and expenditure. The lever W, W, is loaded at *a*, and when the cylinder N, O, P, Q, descends, the valve or cock Z is thereby again re-opened, by which means a regular quantity or supply of steam will be admitted into the receiver; but should the supply or the elasticity of the steam increase beyond the required proportion, it will lift the safety valve U, and escape thereby. The pipe *b*, *b*, *b*, *b*, conveys the fluid thus rarified from the expanding receiver to the engine, or for any other purpose where heated fluids may be required; by this contrivance, one cubic foot of steam or other elastic fluid may, without materially augmenting their sensible heat, be converted into 20 or 30 times their volume, or to any other extent, without increasing or diminishing their original elasticity, unless such should be required.

The quantity or increase of sensible heat necessary to expand the volume or augment the elasticity of steam or other elastic fluids to any given extent is so generally understood or defined, that I consider it unnecessary to specify the ratio of such temperature or expansion; tho' the quantity of heat employed for this purpose may appear small compared with the great result which it is capable of producing, yet it will be found that a very considerable proportion of caloric will be absorbed in a latent state by rarifying or expanding all aeriform fluids. I consequently have adopted the following methods for employing or returning the heat thus absorbed or expended in such operations; this I effect by seperating or abstracting the heat which has been artificially or otherwise combined with any fluid bodies, either for the purpose of rarifying or expanding the same, or for any other object where it may be necessary to apply heat to such bodies. For this purpose I have invented what I denominate a gradual caloric abstractor, which is founded on the established principle, that heat diffuses itself equally in all directions, or is disposed to create an equilibrium in the temperature of all bodies in actual contact with each other; of which part of my Invention the following is a description:— Figure 8 represents a section view of my gradual caloric abstractor, in such position that the whole may be seen. A 1, A 2, A 3, A 4, A 5, A 6, are cylinders made of cast iron or any other convenient substance; A 1 being one foot, A 2 eleven inches, A 3 ten inches, A 4 nine inches, A 5 eight inches, A 6 seven inches in their several and respective internal diameters, and each being four feet long; thro' the center of A 1 pass 29 thin metal tubes; thro' the center of A 2, twenty-three like tubes; thro' the center of A 3, nineteen of like tubes; thro'

the center of A 4, sixteen of like tubes; of A 5, thirteen like tubes; and of A 6, nine of such like tubes; each of such several tubes so passing thro' the said several cylinders being about one inch diameter, and severally marked with the letter *c*. These tubes pass through the circular plates *b b*, *b b*, *b b*, *b b*, *b b*, *b b*, and the communications between these pipes are formed by curved flanched pipes D, D, D, D, D, which together with the circular plates *b b*, *b b*, *b b*, *b b*, *b b*, *b b*, are securely bolted or otherwise secured to the main or outside cylinders A 1, A 2, A 3, A 4, A 5, A 6; and which cylinders have a direct communication with each other by means of the pipes marked E, E, E, E, E; hence there will be a continued passage thro' the cylinders from the pipe F, to the pipe G, and also a seperate and distinct passage thro' the said metal tubes severally marked *c*, by means of the curved flanched pipes marked D, D, D, D, D, from the pipe H to the pipe I; then if any heated fluid be admitted thro' the pipe H, and passed thro' the said metal tubes and curved flanched pipes in direction of the arrows in the said curved flanched pipes, it will discharge itself at the pipe I, and if at the same time a current of any similar or other fluid of less temperature be admitted at the pipe F, and passed through the cylinders A 6, A 5, A 4, A 3, A 2, and A 1, by means of the pipes E, E, E, E, E, to the pipe G, in the direction of the arrows marked in the said pipes E, E, E, E, E, so as to discharge itself at the said pipe G, it will be found that the heated fluid, in moving through the metal tubes, will impart its whole excess of temperature to the colder fluid which is in contact with the outside surfaces of the said metal tubes severally marked *c*, and which continues its motion through the main cylinders A 1, A 2, A 3, A 4, A 5, A 6; hence the fluid in the cylinder A 1 will acquire the temperature of the heated fluid where it first entered the metal tubes at H, and the fluid in each successive cylinder or division of the system will acquire a temperature nearly equal to the temperature which the said fluid retains during its passage through the several tubes marked *c*, that pass through each successive cylinder, or the warmer fluid will in each division impart a certain portion of its heat, which the cooler fluid receives, and the caloric of the warmer fluid will be abstracted by the cooler fluid, till an equilibrium of temperature, or nearly so, between the two fluids is effected in each cylinder. For example, suppose the temperature of the fluid which enters the metal tubes at H to be 180 degrees, and that of the fluid which enters the system at F to be 30 degrees, the fluid entering the system at H will, when discharged at I, be reduced to 30 degrees, or thereabouts, and the cooler fluid which enters the system at F will, when discharged at G, be raised to 180 degrees, or thereabouts. I claim the right of thus applying any fluids, either elastic or such as are commonly termed non-elastic, in the

manner before described, or in any other manner whereby such proposed effects can be produced at any degree or degrees of temperature which may be found necessary or convenient in practice in the various operations where heated elastic fluids, or those fluids commonly termed non-elastic, may be applied or required. Figure 9 shews a perspective view of the exterior of one system of tubes with the circular plates, to which the curved flanched pipes D, D, D, D, D, in Figure 8 are fastened, and the several tubes are severally marked with the letter *c*, and the circular plates *b b*, as in Figure 8, and such tubes severally marked *c*, are fastened in the circular plates *b b*, either by stuffing boxes or otherwise, so as to allow for any expansion or contraction either of the tubes severally marked *c*, or of the several cylinders A 1, A 2, A 3, A 4, A 5, A 6. Figure 10 represents a perspective view of a rarifier, and the gradual caloric abstractor. F, F, represent a pipe to convey the steam or other elastic fluid from the common steam boiler where the steam is formed, or, in cases of other fluids being used, from the place where the same is or are formed or collected, and pass into the cylinder A 6, at 1, which is connected with A 5, A 4, A 3, A 2, and A 1, in the manner described in Figure 8, and is conveyed through the said cylinders A 5, A 4, A 3, A 2, and A 1, as in Figure 8, to the pipe G, Figure 10, and is thence conveyed by the said last-mentioned pipe G into the expanding boiler, receiver, or rarifier K, K, which is similar to the base E, F, G, H, in Figure 7, and which has also a furnace and ash-pit T, T, similar to the one marked I, K, L, M, in Figure 7. To the said boiler, receiver, or rarifier K, K, is connected by the pipe M, the cylinder or vessel L; the pipe M being open at both ends, and having one end introduced into the boiler, receiver, or rarifier K, K, and the other end introduced into the vessel L, which said boiler, receiver, or rarifier K, K, and the said cylinder or vessel L, I use for another mode of heating, rarifying and expanding steam or other elastic fluids, instead of the apparatus in Fig. 7; and I effect this in the following manner:—Suppose the base K, K, to be in part filled with oil, or other dense medium, which will bear a higher temperature than that of the steam or other elastic fluid introduced into the said boiler, receiver, or rarifier, without being decomposed or converted into vapor, and which will by passing through the pipe M rise to its level in the cylinder L; in this cylinder is placed the float N, which is connected by the rod O, O, to the lever P, P, and which is counterbalanced in any required proportion by the weight Q; the lever P, P, is further connected by the rod R, to the throttle valve or cock S, which is placed in the pipe F, F, so that the quantity of steam or other elastic fluid to be admitted through the said pipe F, F, may be thereby regulated in manner hereafter described; then, if the oil or other fluid medium contained in

the said case K, K, be heated by means of the fire contained in the grate or furnace T, T, Figures 10 and 11, to any degree required, and if steam or other elastic fluid be admitted through the pipe F, F, and conveyed through the cylinders A 6, A 5, A 4, A 3, A 2, and A 1, as already described, into the upper part of the case K, K, which is not occupied by the heated oil or other dense medium, it will, by coming in contact with the surface of the said heated medium, acquire a similar temperature, and consequently an increased elasticity, and will thereby press on the surface of the aforesaid heated medium, and cause the same to ascend in the cylinder L, by flowing through the pipe M. The surface of the medium thus raised in the cylinder L will act on the float N, and thereby cause it to ascend and close the throttle valve or cock S, whereby the further admission of the steam or other elastic fluid through the pipe F, F, will be checked or regulated so that the elasticity or quantity of the fluid thus admitted shall never exceed the desired extent; and as a further precaution, and to guard against high pressure of the steam or other elastic fluid, if suddenly expanded, I place a common safety valve of sufficient capacity in the top of the cylinder A 1, and marked *a*, Figure 10, whereby such elastic or expanded fluid may escape if necessary. When the steam or other elastic fluid thus admitted has been heated and expanded to the extent proposed or desired, it is to be conveyed through the pipe U, U, to the engine or other system or apparatus where such heated or expanded fluid may be applied, and after it has produced the effect there required, it is to be returned or conveyed therefrom by the pipe H through the system of thin metal tubes severally marked *c*, and the curved flanched pipes D, D, D, D, D, described in Figure 8, in the direction of the arrows in the said curved flanched pipes D, D, D, D, D, Figure 10, to the pipe I, from whence it issues to a condenser, or any other receiver, or open space, having in its passage through the said tubes, severally marked *c*, yielded up so much of its caloric as to reduce its temperature to the temperature of the fluid or medium passing in the opposite direction through the cylinders A 6, A 5, A 4, A 3, A 2, A 1, at the time it was originally introduced at the pipe F, F. The case marked *v*, *v*, *v*, *v*, in Figures 10 and 11, with its use, will be described hereafter. Figure 12 represents my rarifier and gradual caloric abstractor, connected to one of my elliptical rotary engines; letter A represents a common steam boiler, such as is now used for the purpose of generating steam for the common steam engine, which is furnished with the usual apparatus, such as a feeding pipe, a safety valve, gage pipes and cocks, reverse safety valve, man-hole, pipe, &c., and supplied with water in the usual manner, and heated either in the manner now employed by a fire under the boiler, or in the manner here-

after mentioned. After sufficient steam has been produced in the boiler A, it is introduced through the pipe F 2, F 2, into the cylinder A 6, at A 1, and passes through the several cylinders A 5, A 4, A 3, A 2, and A 1, into the pipe G 2, G 2, as already described in Figures 8 and 10; from the pipe G 2, G 2, Figure 12, it passes into the rarifier and expander, described in Figure 10, and marked in Figure 12, K 2, K 2, from whence it issues through the pipe U, U, U, U, into the lower part of the engine, as represented in Figures 4 and 5, where the pipe U, U, U, U, in Figure 12, is represented by N, N. Before I proceed further, it will be convenient to describe another operation of my apparatus which is applied to heating the water in the common steam boiler, and also heating the oil, or other dense medium contained in my engine. In the furnace T, T, Figures 10, 11, & 12, is a fire with the flame of which, conducted under the said steam boiler A, I heat, if necessary, the water in such boiler till steam is produced. To the furnace T, T, is affixed a metal or other case V, V, as shewn in Figures 10, 11, and 12, which must be constructed with perfectly tight joints, into which are inserted the pipes W, W, W, and X, X, X, in Figures 10, 11, and 12, and which pipes pass out of the sides of the rarifier or expander K 2, K 2, in Figure 12. The pipe W, W, W, is inserted into the bottom of the engine through the casting F, Figure 12, and the pipe X, X, X, Figure 12, is introduced into the engine through the casting C, so as to be below the surface of the dense medium contained in the said engine when the same is at rest. The purpose for which the case V, V, and pipes W, W, W, and X, X, X, in Figures 10, 11, and 12, are formed, and for which they are used, is to communicate sufficient heat to the oil or other dense medium contained in the said engine, so that the said oil or other dense medium contained in the said engine may not condense the steam or other elastic fluid when introduced into the said engine, as before described, through the pipe U, U, U, U. In the pipe U, U, U, U, is fixed a cock or throttle valve Y, Fig. 12, to which is affixed a centrifugal governor Z, Z, and which is driven from any convenient part of the revolving machinery, the object of which is to regulate the admission of steam, or other elastic fluid into the lower part of the engine, and thereby produce an uniform and regular motion; the use and construction of such governor and valve is so generally known, and so usually affixed to the steam engines now in use, as not to require here any further description. When the steam is introduced into the engine through the pipe U, U, U, U. its operation and effect is described in the section view of my elliptical rotary engine, Figure 5, and the explanation referring to that Figure, and Figures 4 and 6. When the steam has passed the system of buckets into the eduction

pipe H 2, H 2, H 2, H 2, in Figure 12, it passes into the tubes contained in cylinder A 1, and from thence through the tubes severally marked *c*, in Figure 8, and the curved flanched pipes D, D, D, D, D, in Figures 8, 10, and 12, till it issues into and through the pipe I, I, into a common condenser marked 𝔅; to this condenser is attached the usual air pump ℭ, both of which are immersed in a cold water cistern 𝔇, and which cistern is supplied with cold water by a pump 𝔈, which condenser, air pump, cold water cistern, and cold water pump are formed in the usual manner, and worked from any convenient part of the machinery, as is now practised with other engines. The letters L 2, M 2, N 2, O, O, P 2, P 2, Q 2, R 2, and S 2, in Fig. 12, denote the regulating cistern or vessel attached to the rarifier and expander K 2, K 2, and are fully described in Figures 10 and 11. The letter *a* in Figure 12 represents the safety valve shewn and described in Figures 10 and 11. I apply the second and third parts of my Invention, jointly or separately, in the form herein-before described, or in any other convenient form, to the steam engines now in use, or to any other engine propelled by steam or elastic fluids; and I reserve to myself the sole right of such application. In order to prevent the dissipation and loss of heat from the system, I surround my boiler, gradual caloric abstractor, rarifier, and the engine with the connecting pipes, as far as I conveniently can without obstructing the operation of the machinery, with any material which receives and transmits heat slowly. And I further declare that I vary the shape and situation of all these arrangements according to convenience and circumstances, and that I make my engines, gradual caloric abstractors, and rarifying apparatus, of any material, forms, and dimensions which may be best suited for the various objects and purposes to which the Invention herein defined or described may be applicable; and I use the several parts of it either connected or separated, as circumstances may require.

In witness whereof, I, the said James Neville, have hereunto set my hand and seal, this Twelfth day of October, in the year of our Lord One thousand eight hundred and sixteen.

JAMES (L.S.) NEVILLE.

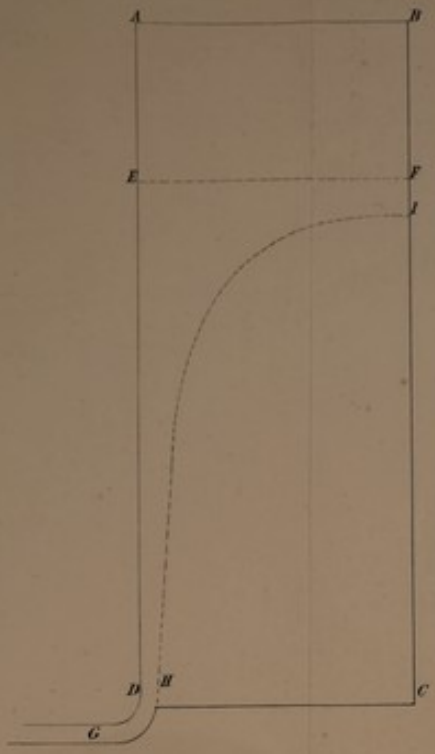
Signed, sealed, and delivered (being first duly stamped) in the presence of

C. M. Hawke,
26, Princes S^{t}, Bank.

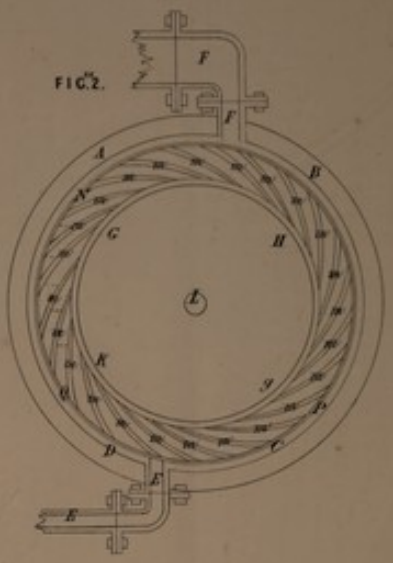
Tho^{s} B. Eaton,
same place.

A.D. 1816 August 13 N° 4058
NEVILLE'S Specification

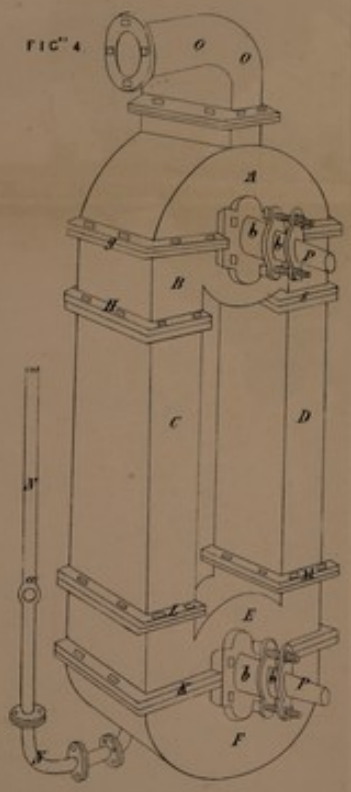
FIG^re. 1.



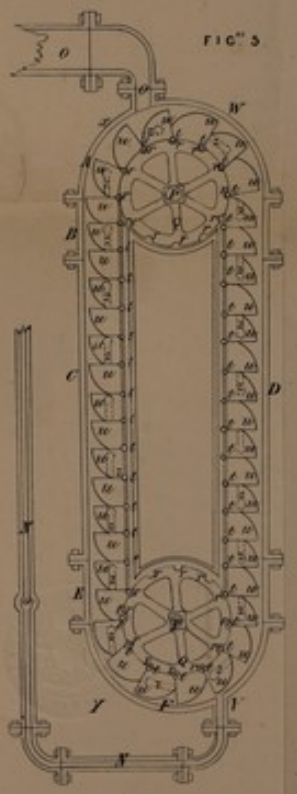
FIG^re. 2.



FIG^re. 4



FIG^re. 5

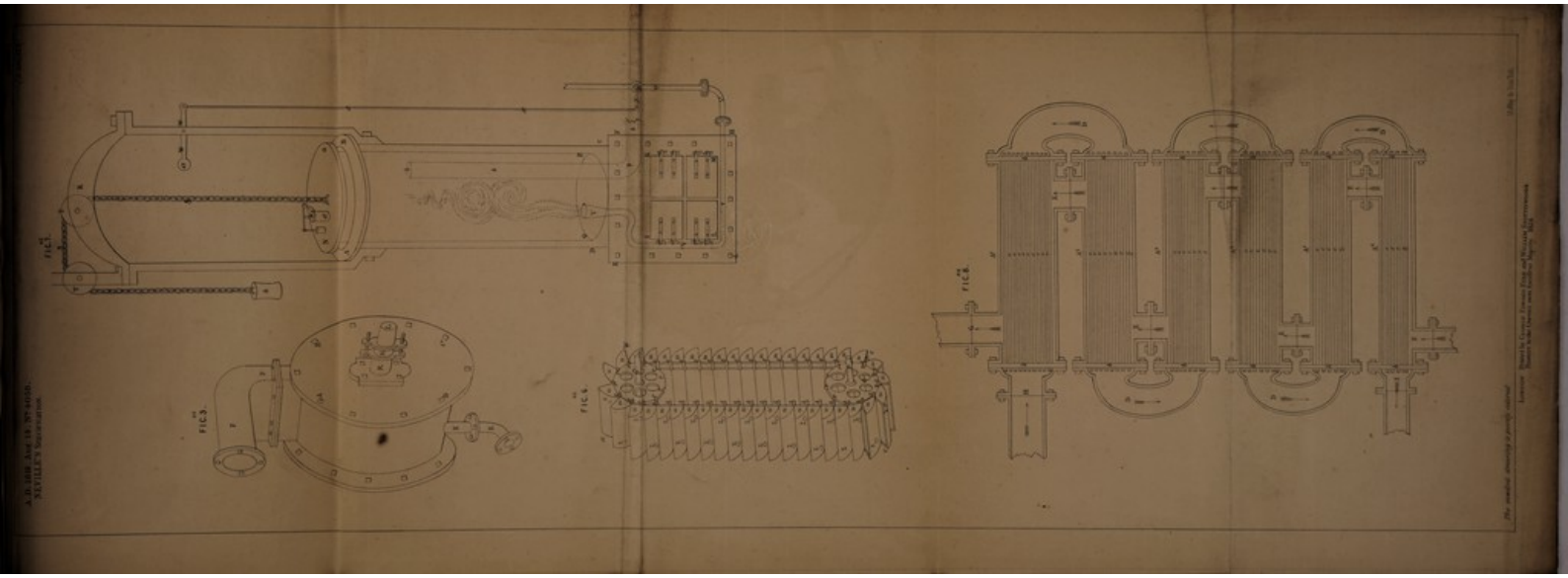


FIG^re. 9.

The enrolled drawing is partly colored.

Malby & Sons, Lith.

London: Printed by George Edward Eyre and William Spottiswoode
Printers to the Queens most Excellent Majesty. 1854.



A. D. 1916. Aug. 14. N° 4058.
NEVILLE'S Specification.

SHEET 2
(3 SHEETS)

FIG. 10.

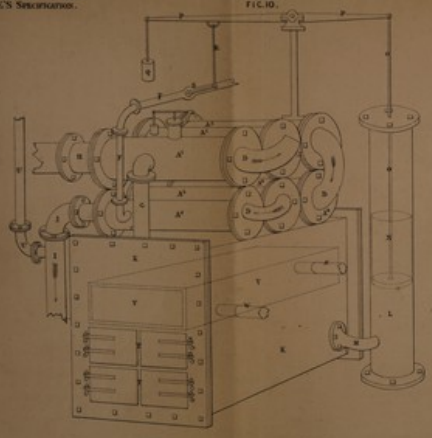


FIG. 11.

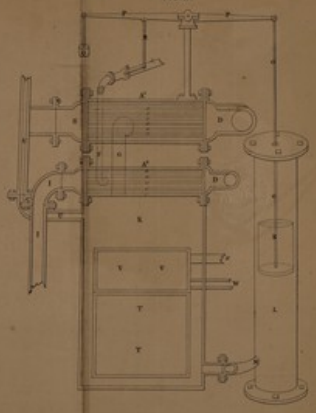
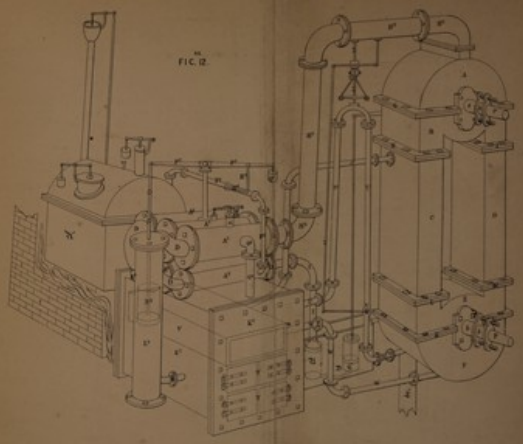


FIG. 12



The enrolled drawing is not altered.

London: Printed by Harrison Sons and Sons, Printers in Ordinary to His Majesty.
Printers to the Queen and Royal Family.

AND BE IT REMEMBERED, that on the same Twelfth day of October, in the year above mentioned, the aforesaid James Neville came before our Lord the King in His Chancery, and acknowledged the Specification aforesaid, and all and everything therein contained in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute in that case made and provided.

J. JEKYLL.

Inrolled the same Twelfth day of October, in the year above written.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1854.