A.D. 1838 . . . . . N° 7615.

Obtaining Motive Power.

BARNETT'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, WILLIAM BARNETT, of Brighton, in the County of Sussex, Iron Founder, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Royal Letters Patent under the Great Seal of Great Britain and Ireland, bearing date the Eighteenth day of April, One thousand eight hundred and thirty-eight, did give and grant unto me, the said William Barnett, my exors, admors, and assigns, Her special licence, full power, sole privilege and authority, that I, the said William Barnett, my exors, admors, and assigns, during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within that part of Her said United Kingdom called England, Her Principality of Wales, and Town of Berwick-upon-Tweed, my Invention of "CERTAIN IMPROVEMENTS IN THE PRODUCTION OF MOTIVE POWER;" in which said Letters Patent there is contained a proviso obliging me, the said William Barnett, particularly to describe 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 enrolled in Her Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said Letters Patent, as in and by the same Letters Patent, relation being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said William Barnett, do hereby declare that the nature of my said Invention of "Certain Improvements in the Production of Motive Power," and the manner in which the same is to be performed, is ascertained and described in and by

these Presents and the Drawings hereunto annexed, and herein referred to by way of explanation, illustration, and example.

My said Invention consists in certain methods of producing and employing, as a prime mover of machinery, the explosive or expansive force of certain inflammable gasses, as hydrogen or carburetted hydrogen gas, mixed with oxygen or atmospheric air in such proportions as to form an explosive mixture, the various proportions and explosive force of which are well known to chemists generally; and I shall now proceed to describe my said Invention, and to shew, by the assistance of the Drawings, in what manner it is to be performed, first observing that the form, arrangements, and construction of the several parts of the apparatus may be varied and modified according to the size of the apparatus, the situation in which it is placed, and other circumstances governing the same, without at all deviating from my Invention, as the same is defined in and by these Presents.

Description of the Drawings.

The Drawings Figures 1 and 2, in the Sheet marked A., represent a single-acting explosive engine on the principle of my Invention, Figure 1 being a longitudinal section, and Figure 2 an end view, of the engine. *a* is the cylinder open at top; *b*, the piston; *c*, a double-acting pump, which serves both to supply atmospheric air (to form one portion of the explosive mixture), and to draw off from the cylinder, during the descent of the piston *b*, the products or any portion of the unconsumed gas which may remain after the explosion of the mixture has taken place. The air enters the lower part of the pump by the valve *d* during the ascent of the piston *f*; and upon the descent of the piston the air is forced through the valve *g* into the receiver *h* situated below the cylinder. *i*, Figure 2, is a pump for supplying the hydrogen or other inflammable gas which forms the other portion of the explosive mixture. The gas enters the pump by the valve *k*, Figure 2, upon the ascent of the piston or plunger of the pump, and by the descent of the same is forced through a delivery valve (not seen in the Drawings) into the receiver *h*; *l* is the slide-valve case, communicating at the bottom with the receiver *h*, at the middle part with the cylinder by the passage *m*, and at the top with the inlet valve *n* of the pump *c*, by means of the eduction pipe *o*; *p* is the delivery valve to the upper part of the pump opening into the waste pipe *r*; *s* is the slide valve, by the motion of which the internal portion of the cylinder, below the under side of the piston *b*, communicates alternately with the receiver *h* and the eduction pipe *o*; *t* is a gas burner, at which a small jet of gas is kept burning during the time the engine is in operation; *v* is the igniting cock for the purpose of

igniting the explosive mixture, the mode of effecting which, and the construction of the cock, will be best understood by a description of Figures 3 and 4, which are drawn to an enlarged scale.

Figure 3 is a transverse section, and Figure 4 a longitudinal section, of the cock. *v* is the shell of the cock. It has two long narrow slits or apertures, one of which *w* applies to a corresponding aperture in the cylinder or in the slide case, and the other aperture *x* is immediately over the gas burner *t*. *y* is the plug of the cock. It is hollow, and has a slit or aperture *z*, which, once in the revolution of the fly wheel, accordingly as the plug is turned, communicates with the slit *w* or the slit *x*; *j* is a gas burner screwed into the end of the cock, and entering within the plug. From this burner a jet of gas issues which, when the slit *z* corresponds with the slit *x*, becomes ignited, and upon the plug being turned quickly, so as to bring the slit *z* to coincide with the slit *w*, the flame within the cock sets fire to the mixture within the cylinder, and causes it to explode. The slide valve *s*, and the igniting cock, are moved by means of a cam or eccentric on the fly-wheel shaft. The motions of both should be rapid, and the cock should not open to the cylinder until the slide valve is fully open, or nearly so. The operation of this engine is as follows:—Let it be supposed that in the position of the engine shewn in the Drawing, the receiver *h* is charged with the explosive mixture. If the fly wheel be turned so as to raise the slide *s*, the gasses in the receiver *h* will flow into the cylinder, and upon the igniting cock being turned so as to fire those gases, the explosion and expansion consequent upon the ignition will impel the piston to the top of its stroke, after which the impetus of the fly wheel will force the piston to the bottom of its stroke. During the ascent of the piston the pumps *c* and *i* have been drawing in air and gas below their pistons respectively, at the valves *d* and *k*, and the pump *c* has also expelled any air or gas above its piston through the valve *p*. On the descent of the piston *b*, the pumps *i* and *c* are respectively forcing air and gas into the receiver *h*, and the latter pump is also drawing off a portion of any gases remaining in the cylinder below the piston *b*, through the eduction pipe *o* and valve *n*. Instead of connecting the eduction pipe to the pump *c*, its end may remain open or closed by a light snift valve, or it may be connected to a separate exhausting pump.

The Drawings, Figures 5 and 6, in the Sheet marked B, represent a double-acting explosive engine. Figure 5 is a longitudinal section of the engine, and Figure 6 is an end elevation of the frame and pumps. *a* is the cylinder; *b*, the slide-valve case connected with the two receiving chambers *c*, *c*, into which

the air and gases are forced by the three pumps *d*, *e*, and *f*; *d* is a double-acting pump, which draws in air at the valves *g* and *h*, and forces it into the receivers through the valves *i* and *k*; *e*, Figure 6, is a pump open at top which draws in hydrogen or carburetted hydrogen at the valve *l*, and delivers it by another valve (not seen in the Drawings) into the same box as the valve *i*, whence it passes into the lower receiver *c*; *f*, Figure 6, is a pump open at bottom, the piston rod of which works through a stuffing box in the top of the pump. This pump draws in hydrogen or carburetted hydrogen at the valve *m*, and delivers it into the upper receiver *c* by the pipe *n*, which is connected to a valve fixed at the aperture *o*. These pumps, by means of the spur wheels *p* and *q* (indicated by red circles in Figure 5), make their ascending and descending strokes simultaneously with the ascending and descending strokes of the piston *r*. *s* is a pipe prodeeding from the slide case to convey the products of the explosion, or any unconsumed portions of the explosive mixture from the cylinder, and having at its extremity a light hanging valve opening outwards; *t*, *t*, are two igniting cocks, the construction of which has been already explained. These cocks are placed over the gas burners *v*, *v*, in the position shewn in the Drawing. The cocks being open to the atmosphere, the gas within them is ignited by the flame from the burners *v*, *v*, and by turning the cock the flame communicates with the interior of the cylinder. *x* is the pipe which supplies the hydrogen or carburetted hydrogen gas to the pumps *e* and *f*. The operation of this engine is as follows:—Let it be supposed that the lower receiver is charged with the explosive mixture, and that the slide valve be then moved so as to open the communication between the lower receiver and the cylinder at the under side of the piston, whilst the cylinder upon the upper side of the piston communicates with the exit pipe S, the mixture in the lower receiver will immediately flow into the cylinder, and upon turning the lower igniting cock the mixture will ignite, and, by exploding, will expand and impel the piston to the top of its stroke, any air which may be above it being expelled through the eduction pipe *s*. During the ascent of the piston the pumps *e* and *d* are drawing in air and gas respectively, and the latter pump and the pump *f* are forcing air and gas respectively into the upper receiver *c*. Upon the piston reaching the top of its stroke the slide is reversed, the explosive mixture is admitted above the piston, and upon the explosion taking place, the piston is driven to the bottom of its stroke. If preferred, the eduction pipe may be connected to a double-acting air pump, so as to exhaust the products of the explosion, or any unconsumed portion of the explosive mixture, from the cylinder on the eduction side of the piston.

The Drawings in the Sheet marked C exhibit an arrangement of a double-acting explosive engine upon the principle of my Invention, in which the explosive mixture is ignited by coming in contact (whilst under pressure) with spongy platina. In this arrangement no receiving vessels are employed, but the gases are forced direct from the pumps into the cylinder. Also all the valves employed are self-acting. Figure 7 is a longitudinal section of the engine. Figure 8, an end view of the same, with a transverse section of the pumps. Figure 9 is a ground plan, with a horizontal section of the pumps taken through their stuffing boxes, and Figure 10 is a vertical section of the pumps through their valve boxes. In all the Figures the same letters of reference indicate the same parts. *a* is the cylinder; *b*, the pump for supplying atmospheric air to the cylinder. During the ascent of the plunger air is drawn into the pump at the valve *c*, which air, on the descent of the plunger, is forced through the valve *d*, and passing along the pipe *e*, enters the cylinder by the upper and lower passages *f*, *f*, alternately. *g*, Figure 8, is a pump which in like manner supplies the hydrogen, or other inflammable gas, to the cylinder, drawing in the gas at the valve *h*, and expelling it at the valve *i*, Figures 9 and 10. *k* is an exhausting air pump to draw off the gases remaining in the cylinder after the explosion. This pump is connected by the eduction pipe *l* to an aperture *m* in the cylinder, situated midway between the passages *f*, *f*. The eduction pipe, at its junction with the pump, is closed by a valve *z*, Figure 10, opening upwards. Upon the ascent of the plunger a portion of such gases as are on the eduction side of the piston is drawn into the pump, and upon the descent of the plunger they are driven through the delivery valve *n* into the waste pipe *o*. The pumps are all attached to one cross head, which is connected by the side rods *p* to the crank *q*, on the shaft of which is fixed a spur wheel *r* (Figures 8 and 9), which is driven by another wheel *s* on the end of the fly-wheel shaft. These two wheels are indicated by the red circles in Figure 7. The diameter of the wheel *s* is equal to twice the diameter of the wheel *r*; the plungers, therefore, make two ascents and two descents for each revolution of the fly wheel, and they are arranged so as to complete their descending stroke by the time the piston has arrived within about two inches of the top or bottom of the cylinder, by which time the cylinder is fully charged with the explosive mixture, which is prevented by the stop valves *t*, *t*, from returning into the pumps upon the ascent of the plungers. *u* is a cavity in the cylinder cover, closed by a cap containing the platina by which the explosion is to be produced; and *v* is another aperture, likewise closed by a cap, at which similar material is introduced at the bottom

of the cylinder. The operation of this engine is as follows:—if the cylinder be considered as charged when the piston is in the position shewn in the Drawing, and that the piston is ascending, by the time the piston has completed its ascent, the contact of the platina with the explosive mixture, aided by the compression of the latter, produced by the ascent of the piston, causes the mixture to ignite and explode, and the sudden and powerful expansion of the gases thus produced impels the piston to the bottom of its stroke. During the first half of the descent of the piston, the exhausting air pump is exhausting the cylinder, at the under side of the piston, of the products of a prior explosion, and the atmospheric and hydrogen pumps are becoming respectively charged with air and gas. During the latter half of the descent of the piston the exhausting air pump is expelling the air or gas it has withdrawn from the cylinder below the piston, whilst the other two pumps are forcing the mixed air and gas into the cylinder below the piston, and at the completion of the stroke the mixture is again exploded, the piston forced upwards, and similar operations and effects are produced and continued. Instead of connecting the eduction pipe *l* with an exhausting air pump, its extremity may be open to the atmosphere, or closed by a light snifting valve. In engines which have between the pumps and the cylinder intermediate chambers to receive the gas from the pumps, as in Figures 1 and 2, Sheet A, and 5 and 6, Sheet B, in lieu of the igniting cocks there shewn, platina may be employed to ignite the explosive mixture in the manner described with reference to the engine represented in Figures 7, 8, 9, and 10, Sheet C; but I consider the action of platina in all its applications to be slow, and occasionally uncertain, and I prefer the other mode, wherever it can without inconvenience be adopted. In such engines, also, instead of the slide valves shewn in the Drawings for the purposes of opening and shutting the communications with the cylinder, three-way cocks may be employed, which must be placed between the receivers and the cylinder, and so constructed as to present at one moment a passage for the transit of the explosive mixture from the receiver to the cylinder, and upon the turn of the cock to shut the communication with the receiver, and open one between the cylinder and the eduction pipe; the pipe for the introduction of the explosive mixture in such case being connected to the shell at the side, and not at the end of the cock. In engines in which no such intermediate chambers or receivers are employed, but the explosive mixture is forced directly into the cylinder, as in Figures 7, 8, 9, and 10, such mixture may also be exploded by means of an igniting cock, instead of platina. The pumps herein-before described are employed for the purpose, not only of

supplying or forcing into the cylinder or receiving vessels the air and gases, by the combination of which the explosive mixture is formed, but also to regulate the due proportions of each. Those proportions, as I have before stated, are familiar to practical chemists; and the pumps should be constructed of such relative proportions to each other as the nature of the gases employed for the purposes of the Invention may require. The proportions of atmospheric air to carburetted hydrogen, which I generally adopt, is as one part in volume of carburetted hydrogen to nine of atmospheric air, but the pumps may be constructed with moveable or adjustable stops or tappets on the rods which connect them with the cross head, so that the length of the stroke, and consequently the capacity of either pump, may be varied at pleasure. When it is desired to reverse the operation of the machinery, the action of the igniting cock and the valve for admitting the explosive mixture into either end of the cylinder (as the occasion may require), may be prevented or suspended until the piston has taken its stroke; or other appropriate means may be adopted by many of the contrivances usually employed in steam engines for effecting the same object. The several parts of the pumps herein-before described, which are colored green, denote water which is introduced and used therein for the purposes of expelling the whole of the gases drawn in at each stroke, and also of sealing the passages at the moment when the explosion takes place. For the purpose of explaining more clearly the construction and action of the igniting cock, I have shewn it as being attached at the sides of the cylinder; but its more appropriate place is at the bottom of the cylinder in single-acting, and at the top and bottom of the cylinder in double-acting engines.

Now whereas, I, the said William Barnett, have, by these Presents and the Drawings hereby referred to, in compliance with the said proviso, described the nature of my said Invention of "Certain Improvements in the Production of Motive Power," and in what manner the same is to be performed, I claim as my Invention,—

First, the employment of a mixture of atmospheric air or oxygen with hydrogen, or carburetted hydrogen, to give motion to machinery by their explosive force within a cylinder, or other close vessel, and whether producing a rectilinear or rotatory motion.

Secondly, I claim the employment of pumps to supply the requisite quantities of air and inflammable gases, and to regulate their several proportions, whether such air and gas be delivered by the pumps directly into the cylinder, or into an intermediate vessel; but I do not claim nor limit myself to the particular construction of pumps shewn in the Drawings.

Thirdly, I claim the construction and application or employment of the igniting cock shewn in Figures 4 and 5, and already described, as having within it a jet of gas which communicates alternately with a flame placed beneath the cock, and with the interior of the cylinder.

And I claim such cock, whether it be applied to engines in which the explosive force of the mixed air and gases constitutes the motive power, or whether it be applied to engines in which inflammable gas is employed to create a partial vacuum, and thereby render the pressure of the atmosphere available as a motive power. I also claim its application as a valve to regulate the passage of steam or fluids for any purpose to which it may easily be adapted.

Lastly, I claim the application, to the purposes of my said Invention, of the mode described of igniting, by platina, the explosive mixture of gases, and the general combination of the several parts, or any equivalent mechanical arrangement of the machinery, for carrying my said Invention into effect, or for the purpose of forming or constituting an engine to be operated upon by the explosive force of inflammable gases; but I do not claim any of the parts separately when applied to other purposes, or the general purposes of motive power produced by different means, except the igniting cock above mentioned.

And I further declare that the mechanical arrangements, herein-before described, are illustrative and explanatory only, and that I do not intend in all cases to limit myself thereto.

Now, such my Invention being, to the best of my knowledge and belief, entirely new and never before used in that part of Her Majesty's United Kingdom of Great Britain and Ireland called England, Her said Dominion of Wales, and Town of Berwick-upon-Tweed, I do hereby declare this to be my Specification of the same, and that I do verily believe this my said Specification doth comply in all respects, fully and without reserve or disguise, with the proviso in the said herein-before in part recited Letters Patent contained, wherefore I do hereby claim to maintain exclusive right and privilege to my said Invention.

And lastly, I declare that I do not claim originality in the use of any of the substances or fluids employed either for the ignition of gases or the construction of the apparatus, save and except and so far as relates to my said Invention; and although I have described many parts of the said apparatus, and shewn the means of connecting them, which are not new, I have done so solely for the purpose of rendering my Invention clearly understood, and to shew the different combination of many of the parts, and not as claiming them; and I

accordingly disclaim the same, and do not confine myself to the particular modes described.

In witness whereof, I, the said William Barnett, have hereunto set my hand and seal, this Sixteenth day of October, One thousand eight hundred and thirty-eight.

WILLIAM (L.S.) BARNETT.

Signed, scaled, and delivered in the presence of

M. T. HUMPHREY,
Clerk to Mr. Scadding,
4, Gordon Street,
Gordon Square.

AND BE IT REMEMBERED, that on the Seventeenth day of October, in the year of our Lord 1838, the aforesaid William Barnett came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the Statute made for that purpose.

LYNCH.

Inrolled the Eighteenth day of October, in the year of our Lord One thousand eight hundred and thirty-eight.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1856.

A.D. 1838. April 18. N° 7615.
BARNETT'S Specification.
(2nd Edition)

(3 SHEETS)
SHEET 1.
A

FIG. 3.

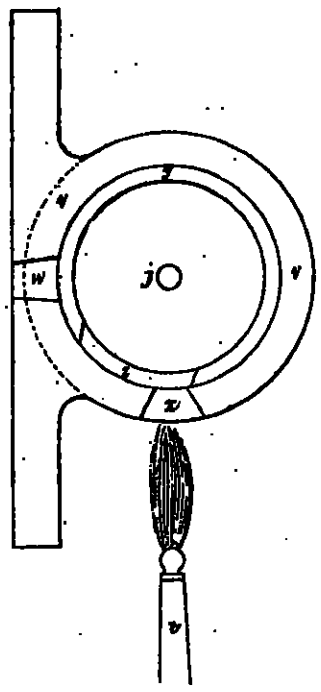


FIG. 4.

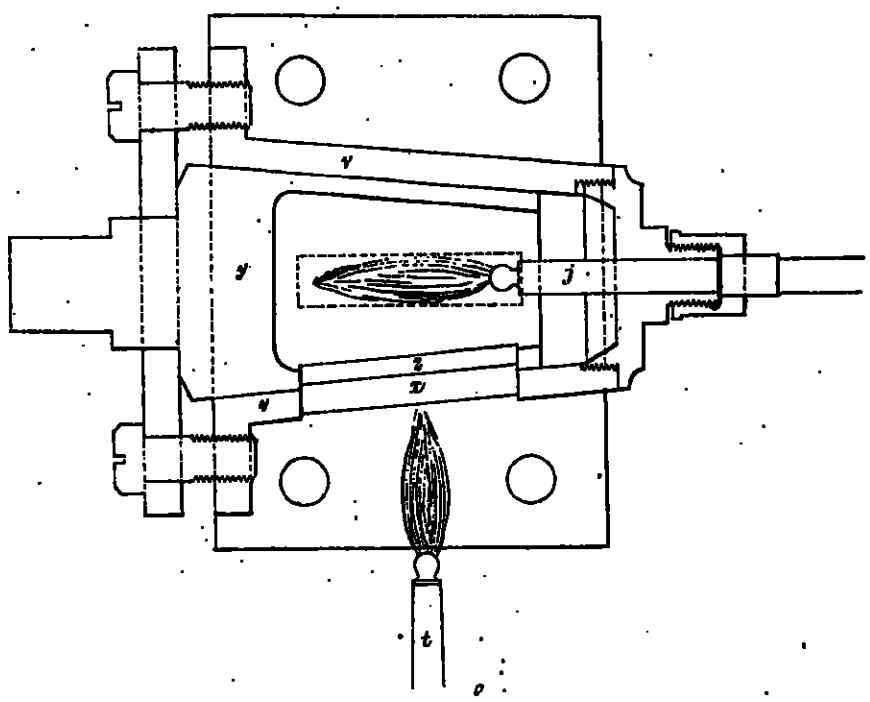


FIG. 1.

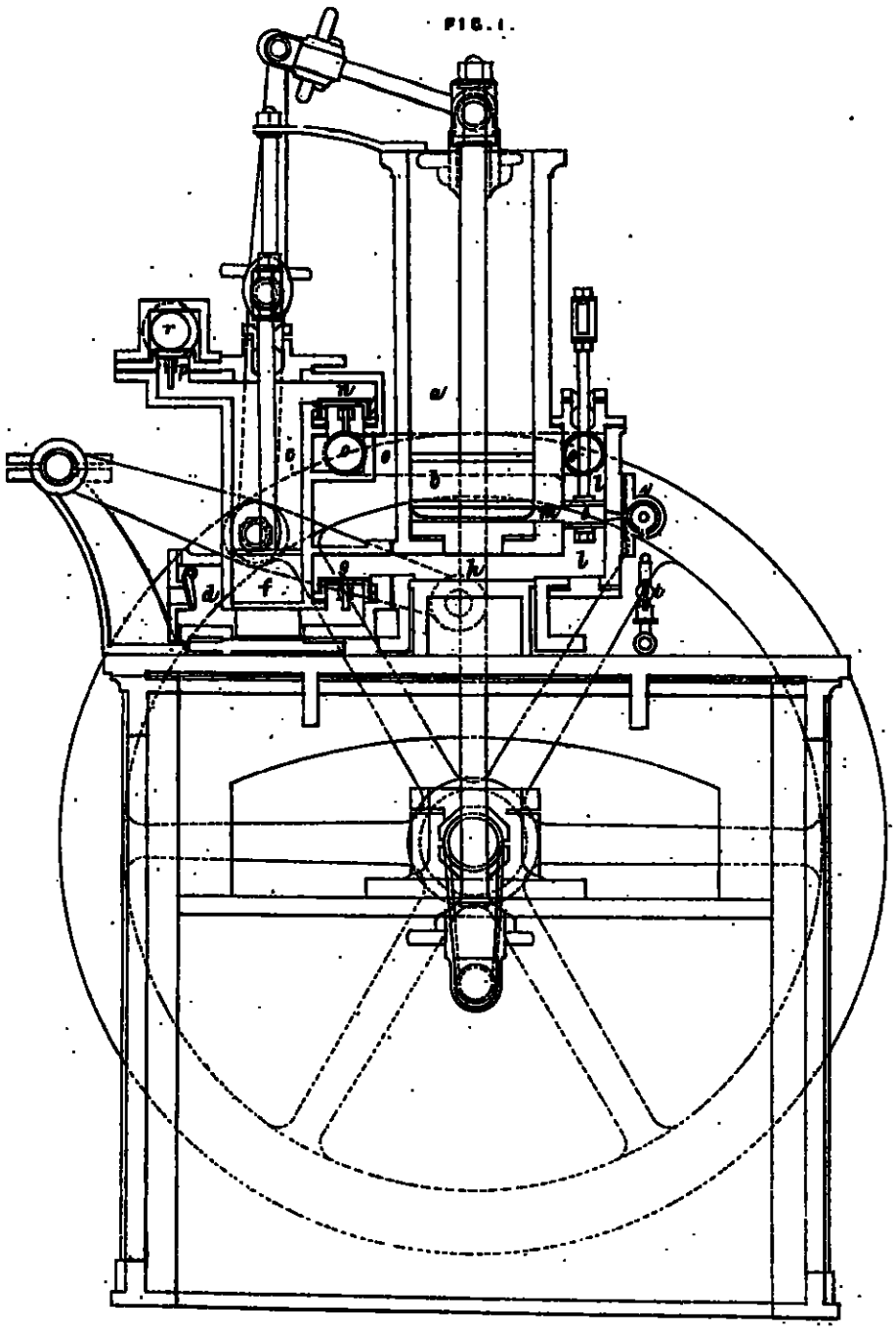
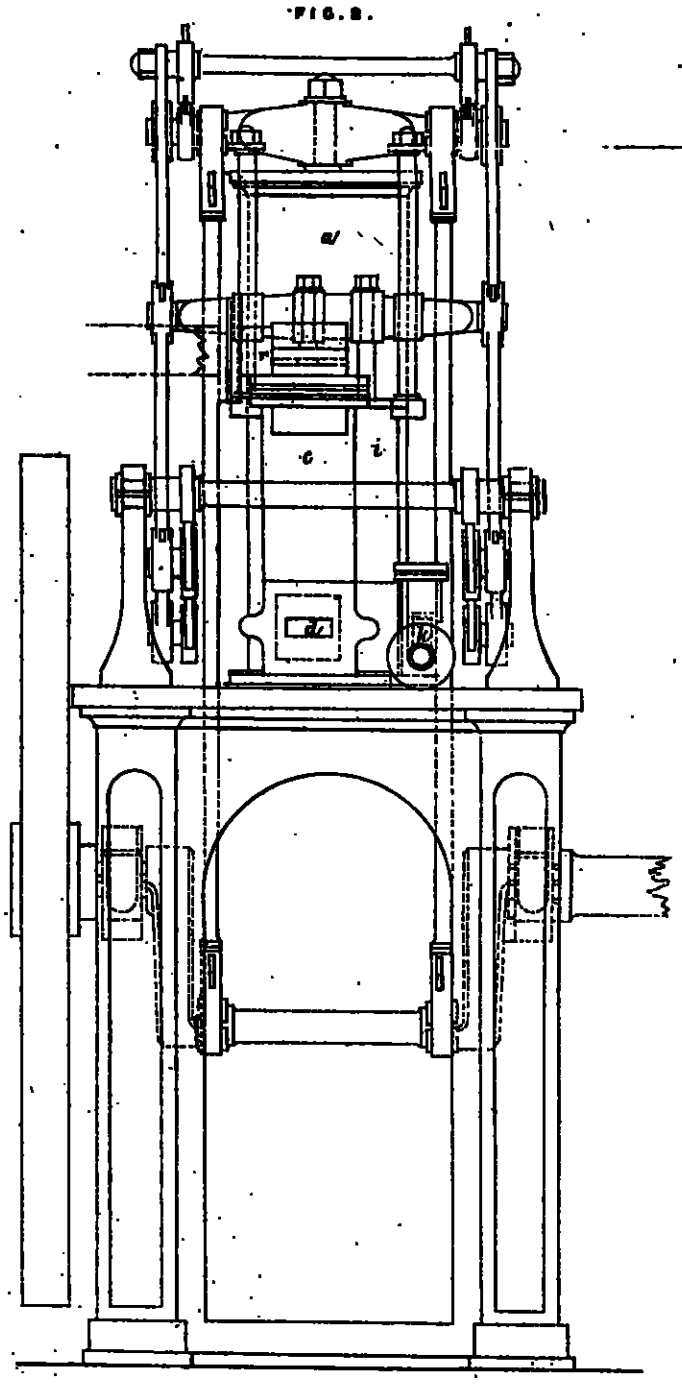


FIG. 2.



The enrolled drawing is partly colored

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(3 SHEETS)
SHEET 2.

FIG. 5.

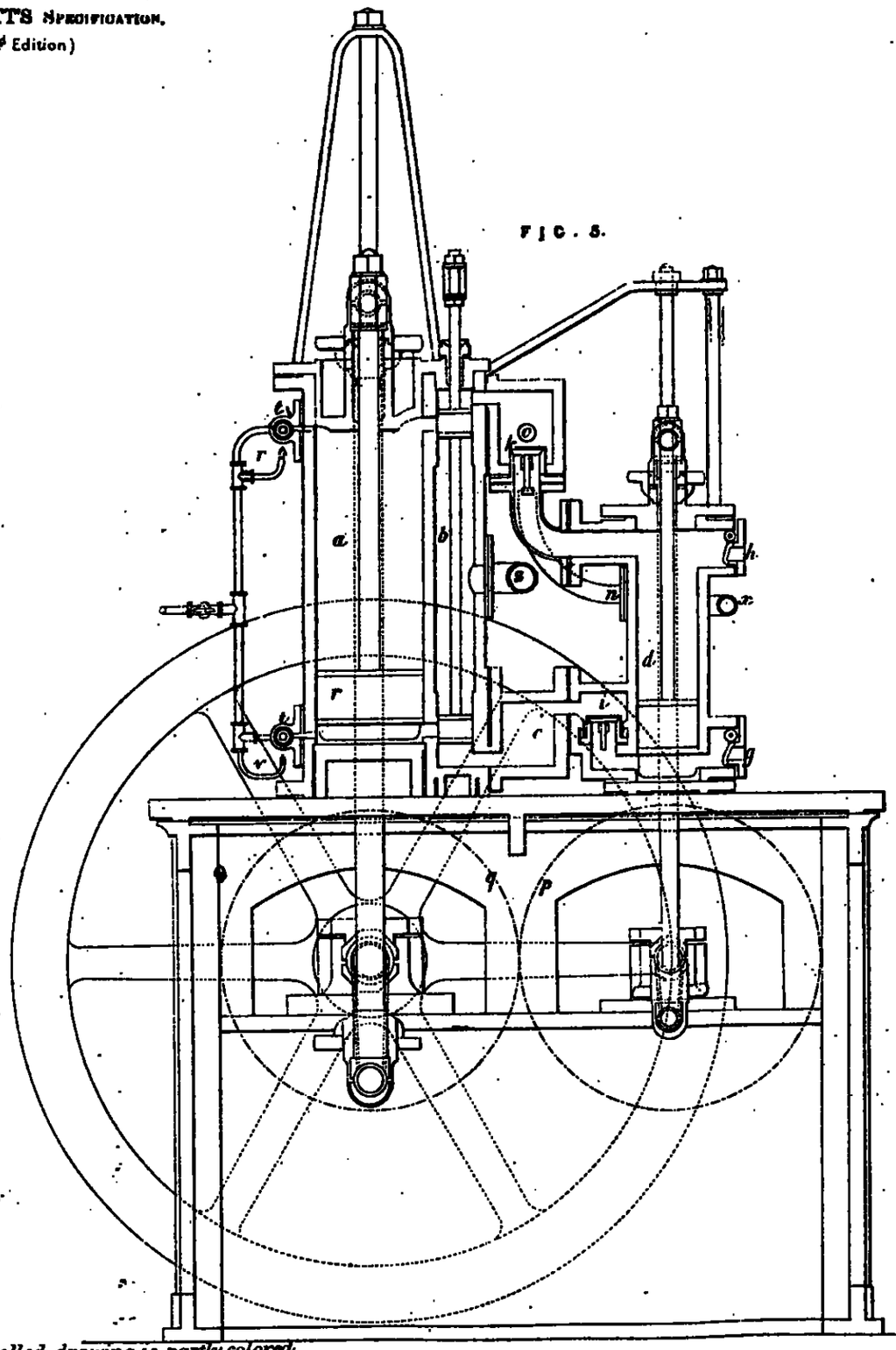
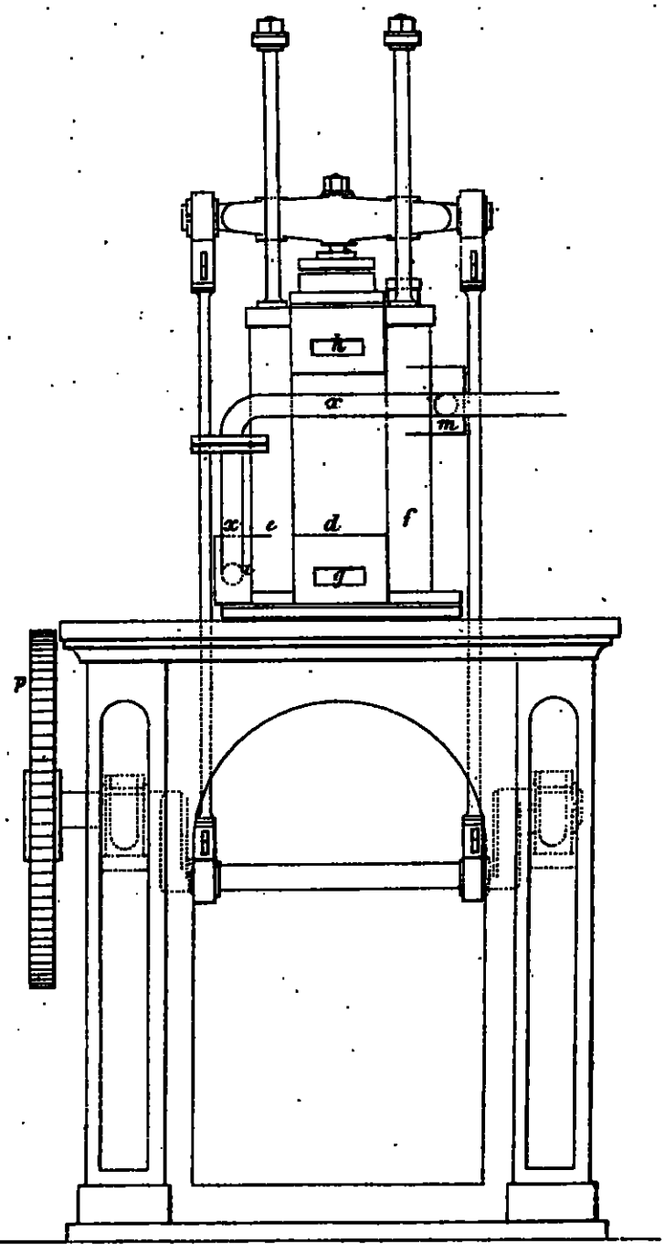


FIG. 6.



The enrolled drawing is partly colored

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(3 SHEETS)
C

FIG. 7.

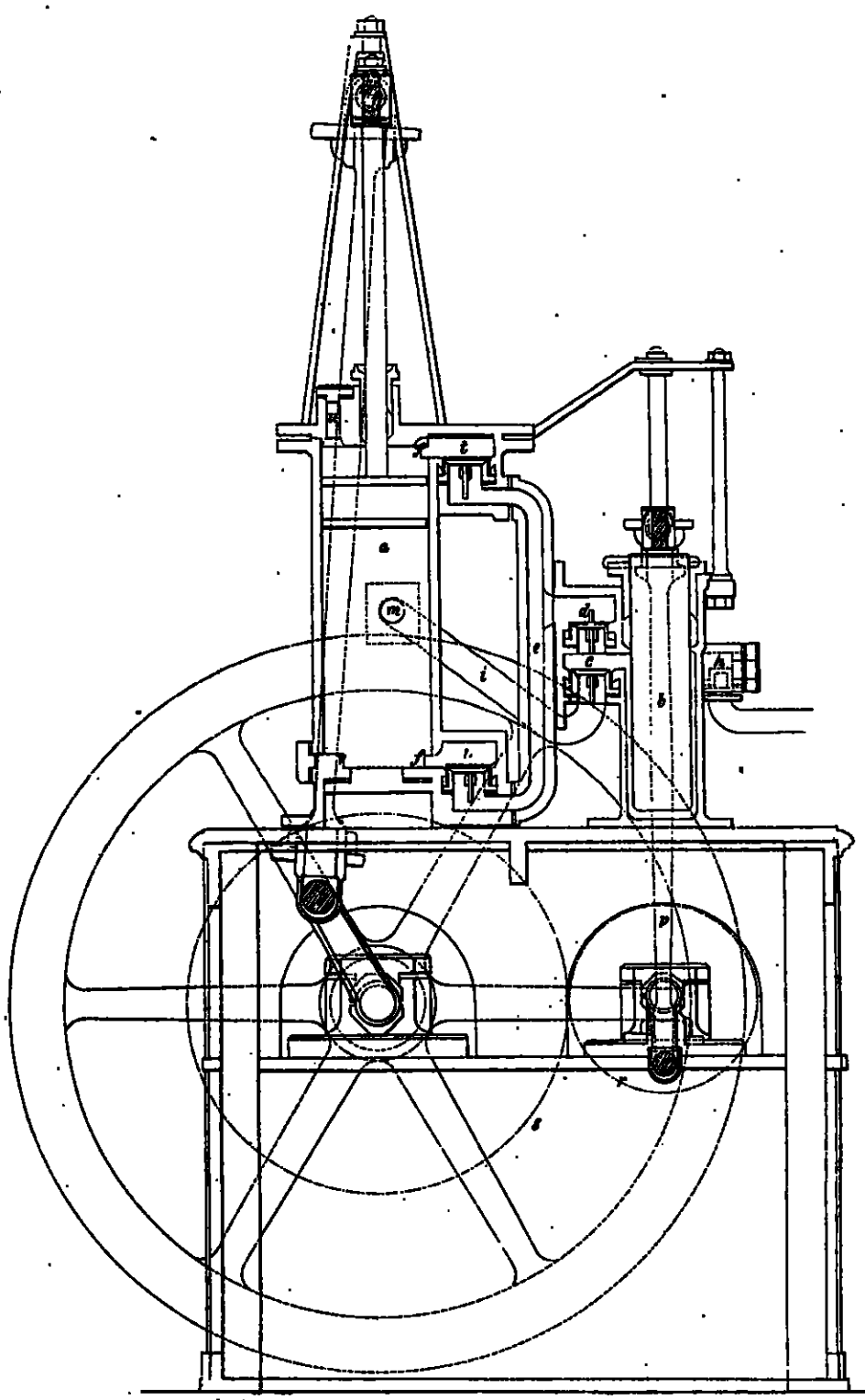


FIG 8.

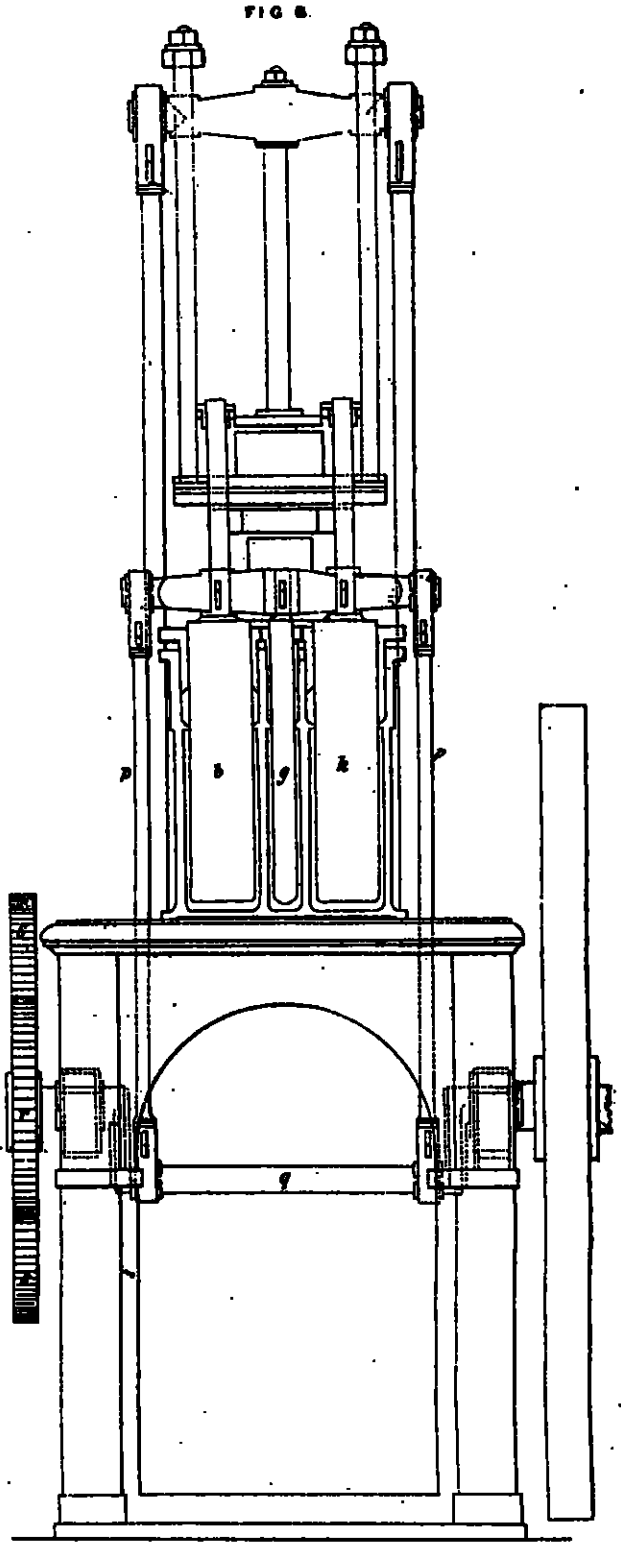


FIG. 9.

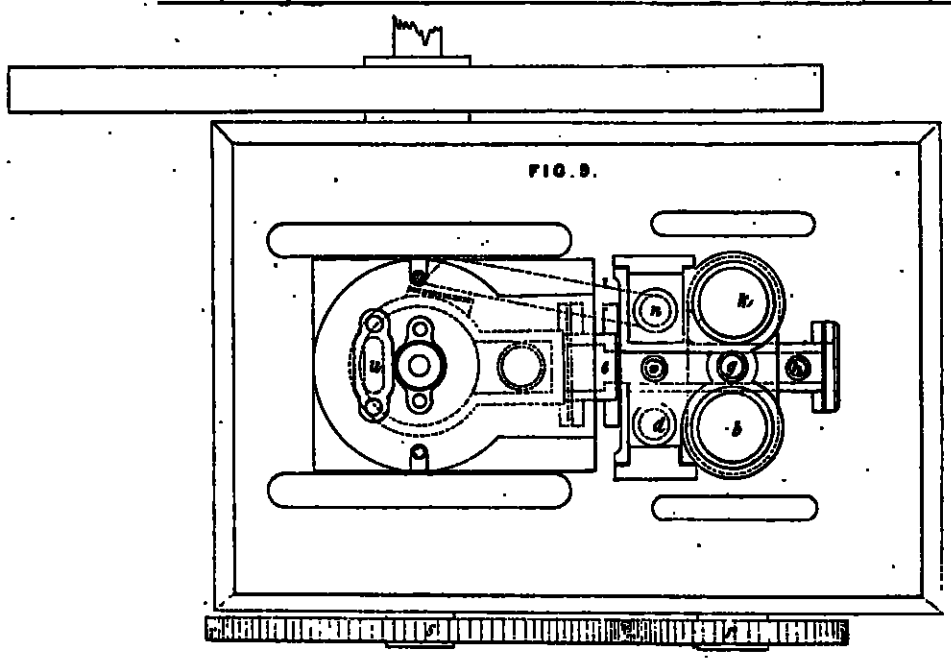
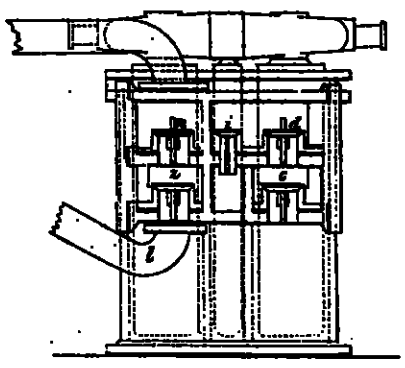


FIG. 10.



The enrolled drawings