Specification of George Tomlinson Bousfield : dental engines, &c.;

A.D. 1874, 4th AUGUST. N° 2696.

SPECIFICATION

OF

GEORGE TOMLINSON BOUSFIELD.

DENTAL ENGINES, &c.

LONDON:
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1875.

A.D. 1874, *4th Augst.* N° 2696.

Dental Engines, &c.

LETTERS PATENT George Tomlinson Bousfield, of Sutton, in the County of Surrey, for the Invention of "IMPROVEMENTS IN DENTAL ENGINES, PARTS OF WHICH IMPROVEMENTS ARE APPLICABLE TO OTHER PURPOSES."—A communication from abroad by Nelson Stow, of Binghamton, in the County of Broome, and State of New York, United States of America.

Sealed the 2nd October 1874, and dated the 4th August 1874.

PROVISIONAL SPECIFICATION left by the said George Tomlinson Bousfield at the Office of the Commissioners of Patents, with his Petition, on the 4th August 1874.

I, GEORGE TOMLINSON BOUSFIELD, of Sutton, in the County of Surrey, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN DENTAL ENGINES, PARTS OF WHICH IMPROVEMENTS ARE APPLICABLE TO OTHER PURPOSES," to be as follows :—

The accompanying Drawings shew all the improvements as embodied in the best way now known to the Inventor; obviously however some of

these improvements may be used without the others, and in machines differing in construction and adaptation from the one therein represented.

Figure 1 represents a view in perspective of one form of the entire apparatus organized as a dental drill with the pulley bracket suspended from the ceiling.

Figure 2, a view of the engine with the pulley bracket suspended from a crane post or overhanging arm thereon.

Figure 3 is a vertical section through the top of the post or arm shewn in Figure 4, which is a view of the engine with the pulley bracket mounted directly on the rigid upright arm of the base.

Figure 5, a view in elevation of a modified form of the engine; and Figure 6, a similar view of the same at a right angle to Figure 5.

Figure 7, a side elevation of the base or stand shewing the spring pitman.

Figure 8, a detail view of the tool holder on an enlarged scale.

Figure 9, a transverse section through the tool holder and hand piece on an enlarged scale.

Figure 10, an axial section on an enlarged scale through the hand piece and its flexible connections with the engine.

Figure 11, a view of a burr drill adapted to the hand piece of the engine.

Figure 12, a side elevation of the swinging pulley bracket and flexible connections, partly in section on an enlarged scale.

The first branch of the Invention relates to the treadle power; its object is to enable the dentist to operate with equal efficiency from either side of his chair, to which end the Invention consists,—

1. In combining with a treadle power vibrating levers pivoted together, and operated by separate treadles from either end of the levers.

2. In mounting the vibrating levers on a stand movable around the base of the treadle power.

3. In combining the vibrating levers with a stand composed of sections adjustable at an angle relatively to each other, to accommodate chairs having a central support or screw.

The next branch of the Invention relates to the pitman connection between the treadle and the crank of the driving wheel. Its objects are to prevent the crank from resting on the dead centre to ensure its always starting in the right direction, and to give it a "live motion" in passing the dead centres, to which ends the improvement consists,—

4. In connecting a treadle rigidly with a spring pitman acting directly on the crank of the driving wheel.

The next branch of the Invention relates to the connection between the driving power and the driven mechanism. Its objects are to obtain freedom of movement of such mechanism in a simple and effective manner without deranging its connections while dispensing with the vibrating arms, pulleys, and long belts heretofore employed, to which ends the improvements consist,—

5. In combining the driving power directly with the driven mechanism by an endless belt passing over a pulley suspended flexibly and capable of being turned in all directions.

6. In mounting the driven mechanism in a bracket suspended by an elastic connection so as always to maintain the tension on the driving belt while leaving the bracket free to turn in its supports.

7. The improvement further consists in mounting a pulley bracket directly on the top of the post or arm of the base or stand in such manner that it may swing freely thereon in a horizontal plane.

8. The improvement further consists in combining a stand or base for the driven mechanism, a rocking arm mounted thereon and controlled by a spring, a bracket frame capable of turning freely in a horizontal plane on the rocking arm and a driven pulley, a flexible shaft, and a tool holder mounted on or combined with said bracket frame.

9. The improvement further consists in combining a pulley driven directly from the driving wheel and mounted in a bracket frame turning freely in its supports in a horizontal plane, a flexible sheath connecting the bracket frame and hand piece, and a wire coil connecting the pulley and tool holder whereby the tool may be freely turned in all directions.

The next part of the Invention relates to the flexible connection for driving the drill. Its object is to render removable the rotating wire coil to oil the various parts of the mechanism; to this end the improvement consists, —

10. In passing the wire coil through a clamp mandril on which the belt pulley is mounted, a nut on the mandril serving to clamp the wire coil as required, whereby it may readily be inserted in and securely held by the clamp, or it may readily be released therefrom.

The next part of the Invention relates to the hand piece, its object is to hold the tool firmly therein while allowing it readily to be removed or inserted, to which end the improvement consists,—

11. In slotting the tool holder longitudinally near its middle to give it a slight spring, the end of the tool being flattened, so that when inserted in the tubular socket its flattened end will act as a wedge to force apart the slotted sides of the holder, thus securely holding the tool.

12. The improvement further consists in combining with the flexible shaft a sliding clevis so suspended and counterbalanced as to slide freely on the shaft so as to counterpoise the weight of the hand piece and shaft to prevent them from dropping into an inconvenient position when released by the dentist, or to hold them in any desired position. An upright arm, post, or frame A is firmly secured upon a suitable base, stand, or tripod A^1. A driving wheel B turns with a shaft b mounted in suitable bearings in the frame and is rotated by a crank and pitman. A foot treadle C pivoted at one end on one foot of the tripod has a spring pitman D firmly secured to its other end. This pitman slips on a crank pin on the crank b^1 of the driving wheel axle, and is held there by the resilience of the spring only, so that in case of any obstruction getting between the pitman and frame the pitman would be thrown off the crank pin, by which means serious accidents to the operator and others may sometimes be prevented. By using a spring pitman several advantages are attained over the pitman ordinarily used in foot powers; among such advantages may be mentioned those of the crank being always stopped off the dead centre, of its being always compelled to start in the right direction, and of the crank being thrown past the dead centre on the upper part of its traverse by the spring with a "live motion," the slight retarding action of the spring in passing the lower

dead centre being more than compensated by the capacity of the operator to exert his full force on the down stroke of the treadle.

In order to enable the dentist to operate the driving wheel from either side of the chair in which the patient sits, two rocking levers E, E^1, are mounted on fulcrum pins e, e^1 so as to vibrate freely in a vertical plane. These levers are arranged end to end, the outer end of the lever E being linked to the treadle C, while the inner end is linked to the adjacent end of the other lever E^1, which in turn is pivoted at its outer end loosely to a treadle C^1 on the opposite side of the chair. This treadle it will be noted can be swung round into any desired position relatively to the rocking levers, and still operate them with equal efficiency. The two levers it will be observed are necessary in order that both treadles may work together, that is, that both may always be started on the down stroke; thus not only ensuring the starting of the crank in the right direction but enabling the power of two operators to be applied if deemed requisite. This however will rarely be required in dental operations, but will be found very useful in heavier work.

In order to render these levers and the loose treadle movable around the base, they are mounted on a frame F which is pivoted to the floor near the base, say at f^2, Figure 1, so that the outer end of the frame may be moved around this pivot to any position most convenient to the operator.

In order to allow the levers to work without interference from the central support, or the adjusting screw common in dentists' chairs, said levers are mounted in a stand or frame made in sections F, F^1, adjustable round a pivot f. These sections may be locked in any desired relation to each other by means of a pin f^1 passing into holes in the overlapping parts of the two sections, or other equivalent detents may be used.

In order to obtain freedom of movement for the driven mechanism, said mechanism is mounted in a bracket frame G suspended by a cord H from a crane post on the stand A^1 (see Figure 2), or from the ceiling, walls, or gas fixtures of the room (see Figure 1), and drive it by a belt J running directly from the driving wheel B to the driven pulley I, by which means the bracket frame can be swung around into any desired position without interfering with the working of the driving belt.

In order to permit of a lateral movement of the bracket frame, and to compensate the shortening of the belt or the radial movement of the

bracket frame around the driving shaft, the suspending cord H is made of rubber, coiled wire, or other yielding material which will admit of the necessary play.

The driven pulley I is fixed on a tubular mandril *i* turning and moving freely endwise in bearings in the bracket frame G. A flexible tube or sheath K connects the bracket frame with a hand piece N. This sheath is composed of an envelope of leather or other flexible material covering a body made of spirally coiled wire. A wire coil *l* passes through the tubular mandril *i*, the outer projecting end of which is split and provided with a screw nut i^1, thus forming a clamp to grasp the wire coil firmly while allowing it readily to be removed or replaced. This wire coil is made by twisting together several strands of steel wire which ensures its strength and elasticity, thus forming a central cord which is enclosed in a layer or envelope of wire wound at the same pitch, and with its spirals running in the same direction as those of the central cord, which gives additional strength to the wire coil without diminishing its flexibility. The wire coil unites with a tool holder *m* turning in bearings in the hand piece N. The front portion of this tool holder is made tubular, and it is slotted longitudinally near its centre. The tool m^1 is made with a round shank flattened at its rear end, and having a projecting shoulder on each side of this flattened central portion (see Figure 11), so that when the tool is inserted in the holder its flattened part enters the slot and wedges itself therein, being tightly held by the springing of the walls of the slotted portion of the holder. The shoulders regulate the depth to which the tool is inserted in the holder. It can be removed simply by pulling it out of the holder, and inserted simply by pushing it in. The advantages of thus dispensing with fastenings, screws, locking pins, or springs, separate from the holder, are obvious. A clevis O capable of sliding freely on the flexible sheath or hand piece is suspended by a cord *o* passing over a pulley and provided with a counterbalance O^1, so that the hand piece instead of falling into an inconvenient position when released by the operator may be retained in or moved to any desired position where it can most conveniently be reached.

Figures 3 and 4 shew another way of applying the improvements. The bracket frame in which the pulley is mounted consists in this instance of a horizontal tube G^1 carrying a vertical tube or spindle *g* which is inserted in a socket in the post or arm A of the engine, or a

tubular spindle fitting over the post (as shewn in Figures 5 and 6) may be employed, the object being to allow this horizontal tube to swing freely around its pivot. The pulley I is mounted on a tubular shaft I^1 rotating in the bracket tube G^1, and the wire coil passes through this tube.

Figures 5 and 6 shew a rocking arm A^2 made of two interlocking sections by preference. The arm rocks on a pivot formed by the band wheel shaft *b*. A spring *d* connects the lower end of this rocking arm with the base A^1. A bracket frame G^1 is mounted on the upper end of the rocking arm. A spindle on the bracket fits in a socket on the arm so as to turn freely horizontally thereon. The flexible sheath K is connected at one end with the horizontal tube of the bracket frame.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said George Tomlinson Bousfield in the Great Seal Patent Office on the 3rd February 1875.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, GEORGE TOMLINSON BOUSFIELD, of Sutton, in the County of Surrey, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Fourth day of August, in the year of our Lord One thousand eight hundred and seventy-four, in the thirty-seventh year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said George Tomlinson Bousfield, Her special license that I, the said George Tomlinson Bousfield, my executors, administrators, and assigns, or such others as I, the said George Tomlinson Bousfield, my executors, administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN DENTAL ENGINES, PARTS OF WHICH IMPROVEMENTS ARE APPLICABLE TO OTHER PURPOSES."—A communication to me from abroad by Nelson Stow, of Binghamton, in the County of Broome, and State of New York, United States of America, upon the condition (amongst

others) that I, the said George Tomlinson Bousfield, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said George Tomlinson Bousfield, do hereby declare the nature of the said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, that is to say :—

The accompanying Drawings shew all the improvements as embodied in the best way now known to the Inventor; obviously however some of these improvements may be used without the others, and in machines differing in construction and adaptation from the one therein represented.

Figure 1 represents a view in perspective of one form of the entire apparatus, organized as a dental drill, with the pulley bracket suspended from the ceiling.

Figure 2, a view of the engine with the pulley bracket suspended from a crane post or everhanging arm thereon.

Figure 3 is a vertical section through the top of the post or arm shewn in Figure 4, which is a view of the engine with the pulley bracket mounted directly on the rigid upright arm of the base.

Figure 5, a view in elevation of a modified form of the engine; and Figure 6, a similar view of the same at a right angle to Figure 5.

Figure 7, a side elevation of the base or stand, shewing the spring pitman.

Figure 8, a detail view of the tool holder on an enlarged scale.

Figure 9, a transverse section through the tool holder and hand piece on an enlarged scale.

Figure 10, an axial section on an enlarged scale through the the hand piece and its flexible connections with the engine.

Figure 11, a view of a burr drill adapted to the hand piece of the engine.

Figure 12, a side elevation of the swinging pulley bracket and flexible connections, partly in section, on an enlarged scale.

The first branch of the Invention relates to the treadle power; its object is to enable the dentist to operate with equal efficiency from either side of his chair, to which end the Invention consists,—

1. In combining with a treadle power vibrating levers pivotted together, and operated by separate treadles from either end of the levers.

2. In mounting the vibrating levers on a stand movable around the base of the treadle power.

3. In combining the vibrating levers with a stand composed of sections adjustable at an angle relatively to each other, to accommodate chairs having a central support or screw.

The next branch of the Invention relates to the pitman connection between the treadle and the crank of the driving wheel. Its objects are to prevent the crank from resting on the dead centre, to ensure its always starting in the right direction, and to give it a "live motion" in passing the dead centres, to which ends the improvement consists,—

4. In connecting a treadle rigidly with a spring pitman acting directly on the crank of the driving wheel.

The next branch of the Invention relates to the connection between the driving power and the driven mechanism. Its objects are to obtain freedom of movement of such mechanism in a simple and effective manner, without deranging its connections, while dispensing with the vibrating arms, pulleys, and long belts heretofore employed, to which ends the improvements consist,—

5. In combining the driving power directly with the driven mechanism by an endless belt passing over a pulley suspended flexibly, and capable of being turned in all directions.

6. In mounting the driven mechanism in a bracket suspended by an elastic connection, so as always to maintain the tension on the driving belt, while leaving the bracket free to turn in its supports.

7. The improvement further consists in mounting a pulley bracket directly on the top of the post or arm of the base or stand, in such manner that it may swing freely thereon in a horizontal plane.

8. The improvement further consists in combining a stand or base for the driven mechanism, a rocking arm mounted thereon and controlled by a spring, a bracket frame capable of turning freely in a horizontal plane on the rocking arm, and a driven pulley, a flexible shaft, and a tool holder mounted on or combined with said bracket frame.

9. The improvement further consists in combining a pulley driven directly from the driving wheel, and mounted in a bracket frame turning freely in its supports in a horizontal plane, a flexible sheath connecting the bracket frame and hand piece, and a wire coil connecting the pulley and tool holder, whereby the tool may be freely turned in all directions.

The next part of the Invention relates to the flexible connection for driving the drill. Its object is to render removable the rotating wire coil to oil the various parts of the mechanism; to this end the improvement consists,—

10. In passing the wire coil through a clamp mandril on which the belt pulley is mounted, a nut on the mandril serving to clamp the wire coil as required, whereby it may readily be inserted in and securely held by the clamp, or it may readily be released therefrom.

The next part of the Invention relates to the hand piece. Its object is to hold the tool firmly therein, while allowing it readily to be removed or inserted, to which end the improvement consists,—

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12. The improvement further consists in combining with the flexible shaft a sliding clevis, so suspended and counterbalanced as to slide freely on the shaft so as to counterpoise the weight of the hand piece and shaft to prevent them from dropping into an inconvenient position when released by the dentist, or to hold them in any desired position. An upright arm, post, or frame A is firmly secured upon a suitable base, stand, or tripod A^1. A driving wheel B turns with a shaft *b* mounted in suitable bearings in the frame, and is rotated by a crank and pitman. A foot treadle C, pivotted at one end on one foot of the tripod, has a spring pitman D firmly secured to its other end. This pitman slips on

a crank pin on the crank b^1 of the driving wheel axle, and is held there by the resilience of the spring only, so that in case of any obstruction getting between the pitman and frame the pitman would be thrown off the crank pin, by which means serious accidents to the operator and others may sometimes be prevented. By using a spring pitman several advantages are attained over the pitman ordinarily used in foot powers; among such advantages may be mentioned those of the crank being always stopped off the dead centre, of its being always compelled to start in the right direction, and of the crank being thrown past the dead centre on the upper part of its traverse by the spring with a "live motion," the slight retarding action of the spring in passing the lower dead centre being more than compensated by the capacity of the operator to exert his full force on the down stroke of the treadle.

In order to enable the dentist to operate the driving wheel from either side of the chair in which the patient sits two rocking levers E, E^1, are mounted on fulcrum pins e, e^1, so as to vibrate freely in a vertical plane. These levers are arranged end to end, the outer end of the lever E being linked to the treadle C, while the inner end is linked to the adjacent end of the other lever E^1, which in turn is pivotted at its outer end loosely to a treadle C^1 on the opposite side of the chair. This treadle, it will be noted, can be swung round into any desired position relatively to the rocking levers, and still operate them with equal efficiency. The two levers, it will be observed, are necessary in order that both treadles may work together, that is, that both may always be started on the down stroke; thus not only ensuring the starting of the crank in the right direction, but enabling the power of two operators to be applied if deemed requisite. This however will rarely be required in dental operations, but will be found very useful in heavier work.

In order to render these levers and the loose treadle movable around the base they are mounted on a frame F, which is pivotted to the floor near the base, say at f^2, Figure 1, so that the outer end of the frame may be moved around this pivot to any position most convenient to the operator.

In order to allow the levers to work without interference from the central support or the adjusting screw common in dentists' chairs, said levers are mounted in a stand or frame made in sections F, F^1, adjust-

able round a pivot *f*. These sections may be locked in any desired relation to each other by means of a pin f^1 passing into holes in the overlapping parts of the two sections, or other equivalent detents may be used.

In order to obtain freedom of movement for the driven mechanism, said mechanism is mounted in a bracket frame G suspended by a cord H from a crane post on the stand A^1 (see Figure 2) or from the ceiling, walls, or gas fixtures of the room (see Figure 1), and drive it by a belt J running directly from the driving wheel B to the driven pulley I, by which means the bracket frame can be swung around into any desired position without interfering with the working of the driving belt.

In order to permit of a lateral movement of the bracket frame, and to compensate the shortening of the belt or the radial movement of the bracket frame around the driving shaft, the suspending cord H is made of rubber, coiled wire, or other yielding material which will admit of the necessary play.

The driven pulley I is fixed on a tubular mandril *i* turning and moving freely endwise in bearings in the bracket frame G. A flexible tube or sheath K connects the bracket frame with a hand piece N. This sheath is composed of an envelope of leather or other flexible material covering a body made of spirally coiled wire. A wire coil *l* passes through the tubular mandril *i*, the outer projecting end of which is split and provided with a screw nut i^1, thus forming a clamp to grasp the wire coil firmly while allowing it readily to be removed or replaced. This wire coil is made by twisting together several strands of steel wire, which ensures its strength and elasticity, thus forming a central cord which is enclosed in a layer or envelope of wire wound at the same pitch, and with its spirals running in the same direction as those of the central cord, which gives additional strength to the wire coil without diminishing its flexibility. The wire coil unites with a tool holder *m* turning in bearings in the hand piece N. The front portion of this tool holder is made tubular, and it is slotted longitudinally near its centre. The tool m^1 is made with a round shank flattened at its rear end, and having a projecting shoulder on each side of this flattened central portion (see Figure 11), so that when the tool is inserted in the holder its flattened part enters the slot and wedges itself therein, being

tightly held by the springing of the walls of the slotted portion of the holder. The shoulders regulate the depth to which the tool is inserted in the holder. It can be removed simply by pulling it out of the holder, and inserted simply by pushing it in. The advantages of thus dispensing with fastenings, screws, locking pins, or springs separate from the holder are obvious. A clevis O, capable of sliding freely on the flexible sheath or hand piece is suspended by a cord *o* passing over a pulley and provided with a counterbalance O^1, so that the hand piece, instead of falling into an inconvenient position when released by the operator, may be retained in or moved to any desired position where it can most conveniently be reached.

Figures 3 and 4 shew another way of applying the improvements. The bracket frame in which the pulley is mounted consists in this instance of a horizontal tube G^1 carrying a vertical tube or spindle *g* which is inserted in a socket in the post or arm A of the engine; or a tubular spindle fitting over the post (as shewn in Figures 5 and 6) may be employed, the object being to allow this horizontal tube to swing freely around its pivot. The pulley I is mounted on a tubular shaft I^1 rotating in the bracket tube G^1 and the wire coil passes through this tube.

Figures 5 and 6 shew a rocking arm A^2, made of two interlocking sections by preference. The arm rocks on a pivot formed by the band wheel shaft *b*. A spring *d* connects the lower end of this rocking arm with the base A^1. A bracket frame G^1 is mounted on the upper end of the rocking arm. A spindle on the bracket fits in a socket on the arm so as to turn freely horizontally thereon. The flexible sheath K is connected at one end with the horizontal tube of the bracket frame.

What is claimed as the Invention is,—

1. The combination in a treadle power of two treadles and interposed pivotted levers, co-operating substantially as set forth, whereby both treadles move simultaneously in the same direction.

2. The combination, substantially as herein-before set forth, in a treadle power of a base or stand, two treadles, and interposed pivotted connecting levers mounted on a bed plate adjustable around the base or stand.

3. The combination, substantially as herein-before set forth, in a treadle power of the treadles and pivotted connecting levers mounted upon a bed plate composed of hinged sections, for the purpose specified.

4. The combination in a treadle power of a treadle with a spring pitman rigidly attached to it at one end, whilst its other end is pivotted on the crank axle.

5. The combination, substantially as herein-before set forth, of a bracket frame in which the driven mechanism is mounted, suspended by cords or equivalent flexible connection, the driving wheel and the belt passing directly from the driving wheel to the driven pulley on the bracket frame.

6. The combination, substantially as herein-before set forth, of the driving wheel, the bracket frame, the driving belt passing directly from the driving wheel to the driven pulley on the frame, and an elastic suspending cord H which permits the lateral movement of the bracket frame.

7. The combination, substantially as herein-before set forth, of the base, its rigid upright arm, the pulley bracket suspended to swing freely thereon in a horizontal plane, the pulley, and the flexible shaft.

8. The combination, substantially as herein-before set forth, of the suspended bracket frame, the pulley therein driven directly from the driving wheel, the hand piece, the flexible sheath connecting the bracket frame and hand piece, and the wire coil connection between the driven pulley and the tool holder.

9. The combination of the wire coil, flexible shaft, and hollow clamp mandril carrying a belt pulley by which the flexible shaft is to be driven.

10. The combination, substantially as herein-before set forth, of the tubular-ended slotted tool holder having elastic walls and the flattened tool shank.

11. The combination, substantially as herein-before set forth, of the flexible sheath, the hand piece, and the counterbalancing suspended traversing clevis.

12. The combined arrangement of dental engines, substantially as herein described and shewn at Figures 1, 2, 3, 4, 5, 6, and 7 of the Drawings hereunto annexed.

In witness whereof, I, the said George Tomlinson Bousfield, have hereunto set my hand and seal, this Sixteenth day of November, in the year of our Lord, One thousand eight hundred and seventy-four.

GEO. T. BOUSFIELD. (L.S.)

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1875.

A.D. 1874. Aug. 4. Nº 2696.
BOUSFIELD'S Provisional Specification.

(2 SHEETS)
SHEET 1

FIG. 1.

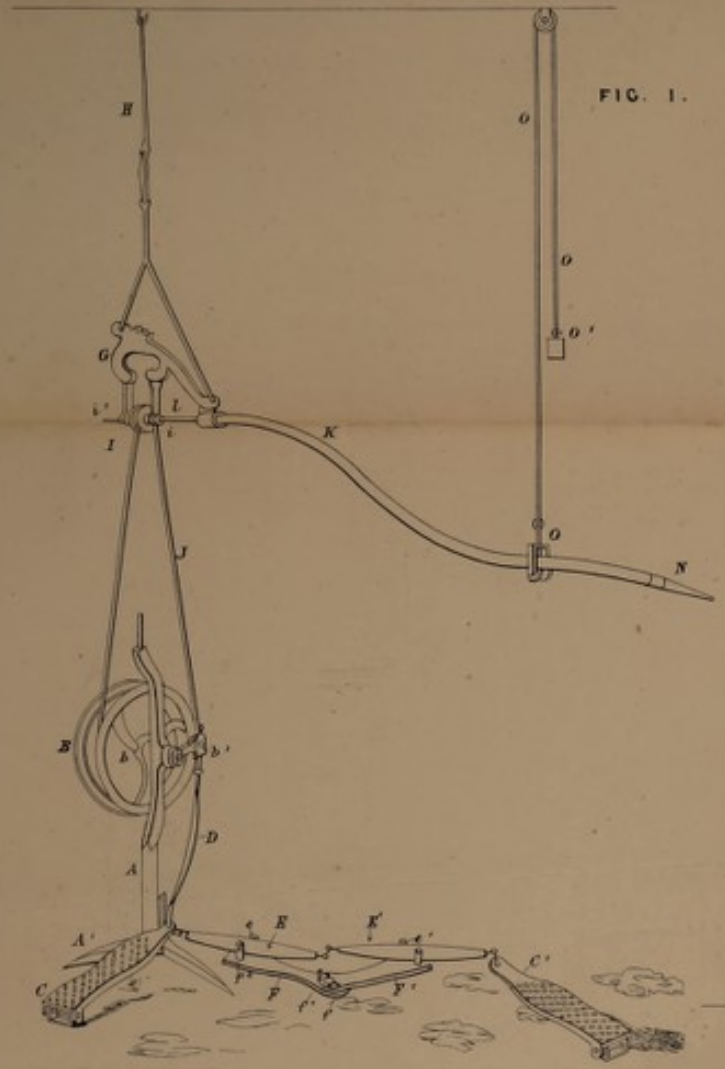


FIG. 2.

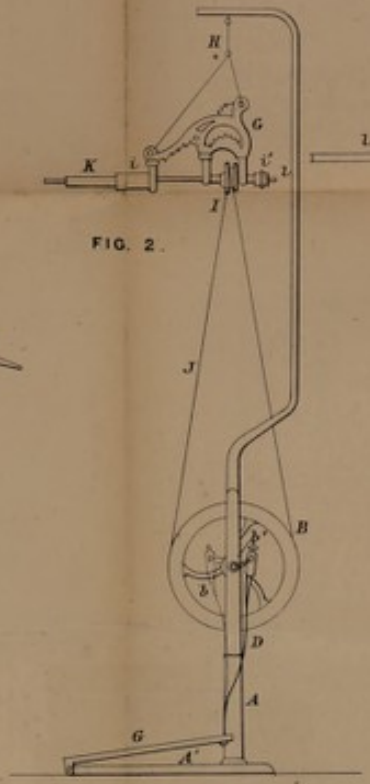


FIG. 3.

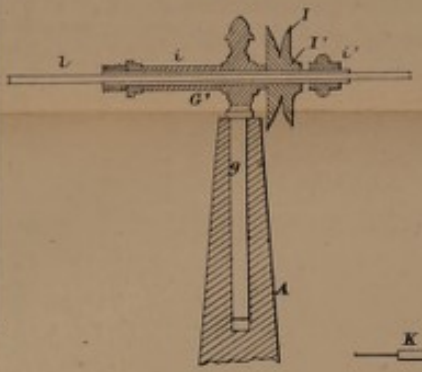
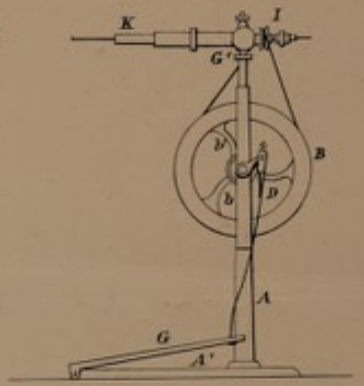


FIG. 4.



The drawing left with Provisional Specification is not colored.

Drawn on Stone by Malby & Sons

London Printed by George Edward Eyre and William Spottiswoode
Printers to the Queen's most Excellent Majesty 1875

A.D. 1874. Aug. 4. N° 2636.
BOUSFIELD'S PROVISIONAL SPECIFICATION.

FIG. 5.

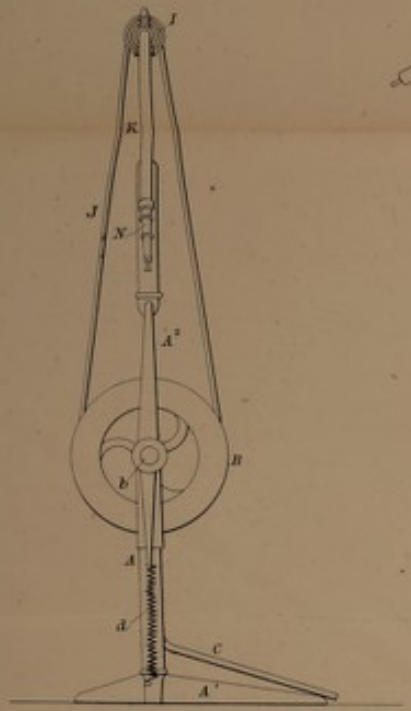


FIG. 6.

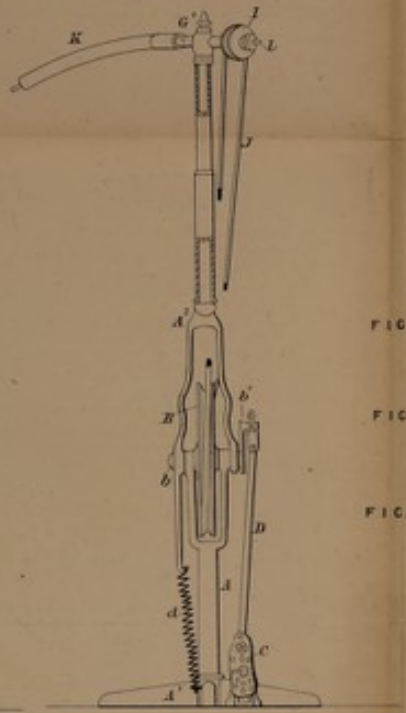


FIG. 7.

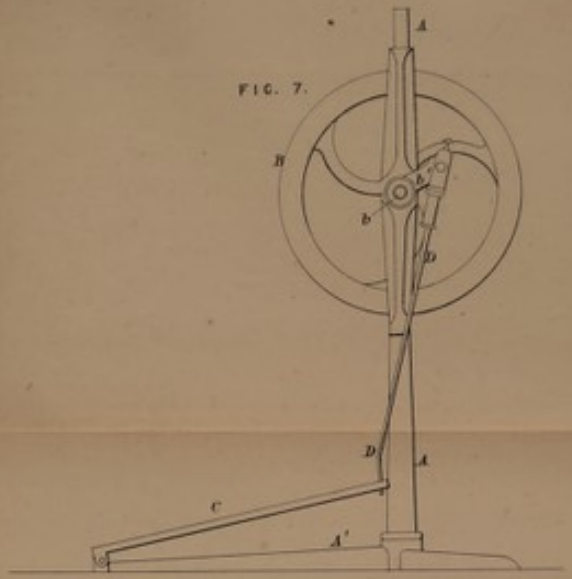


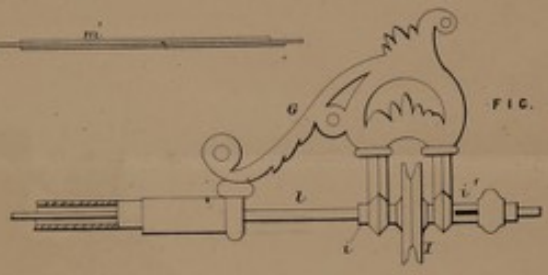
FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.



The drawing left with Provisional Specification is not colored.

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LONDON Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE
Printers to the Queen's most Excellent Majesty 1875

FIG. 1.

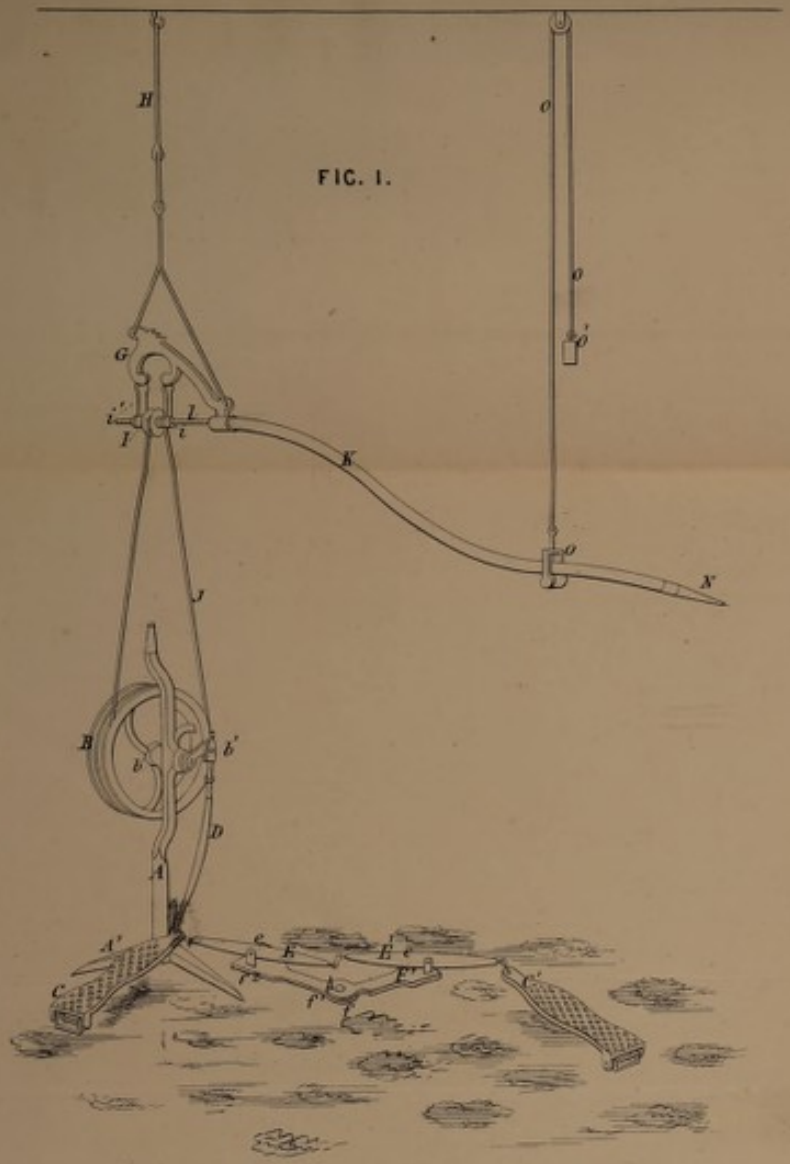


FIG. 2.

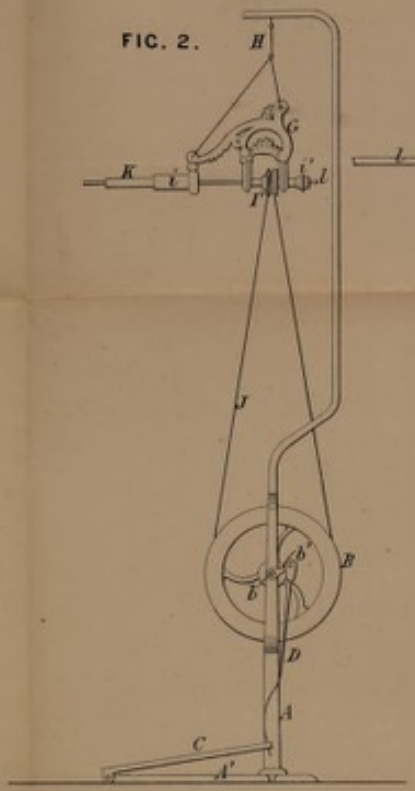


FIG. 3.

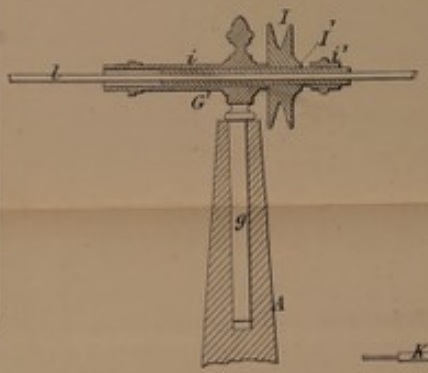
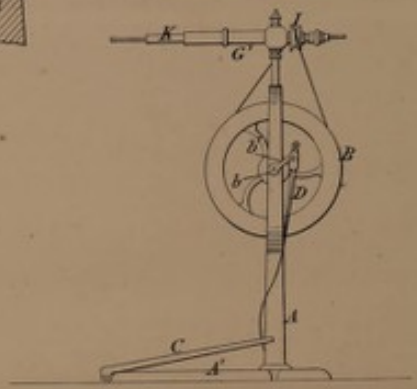


FIG. 4.



The filed drawing is not colored.

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PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY. 1875

A.D. 1874. Aug. 4. N°2696.
BOUSFIELD'S Specification.

(2 SHEETS)
SHEET 2

FIG. 5.

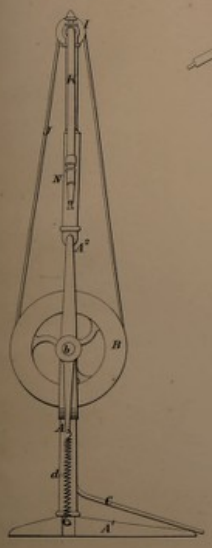


FIG. 6.

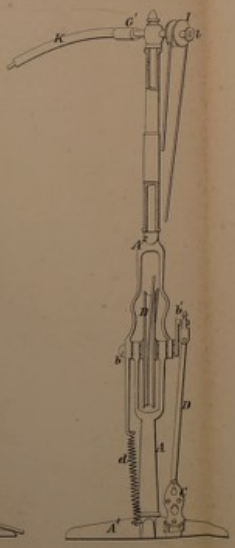


FIG. 7.

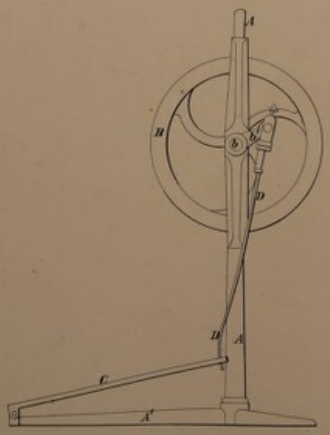


FIG. 8.

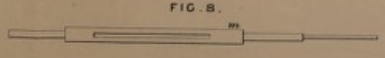
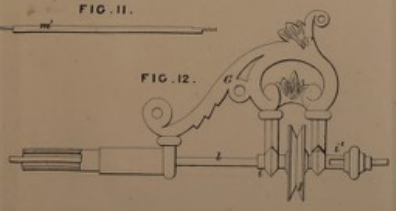


FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.



The filed drawing is not colored.

Drawn on Stone by Mosley & Sons.

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Printers to the Queen's most Excellent Majesty. 1875