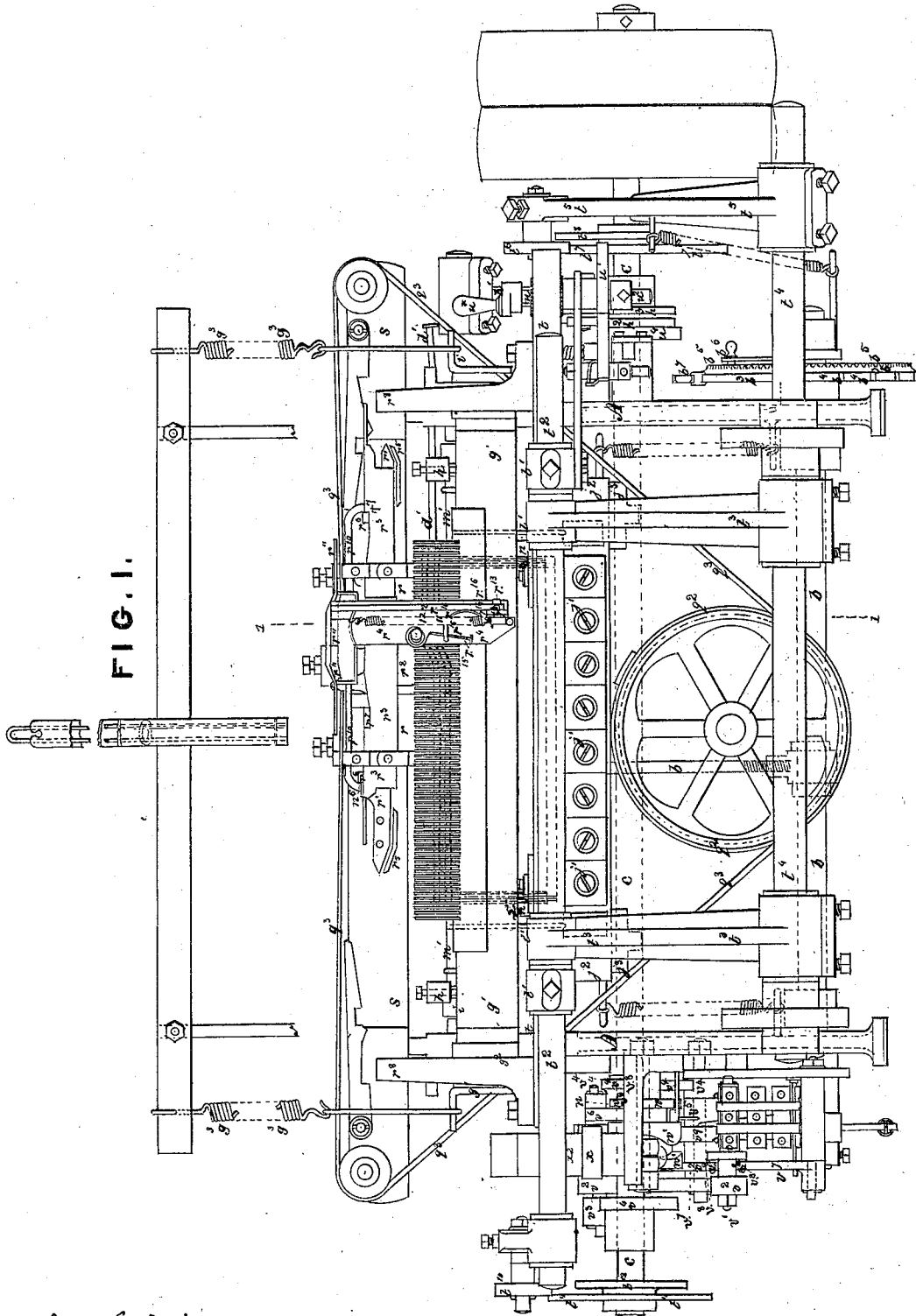


W. CAMPION & W. CAMPION.
Knitting-Machines.

No. 139,114.

Patented May 20, 1873.



Geo. L. Ewin
Walter Allen

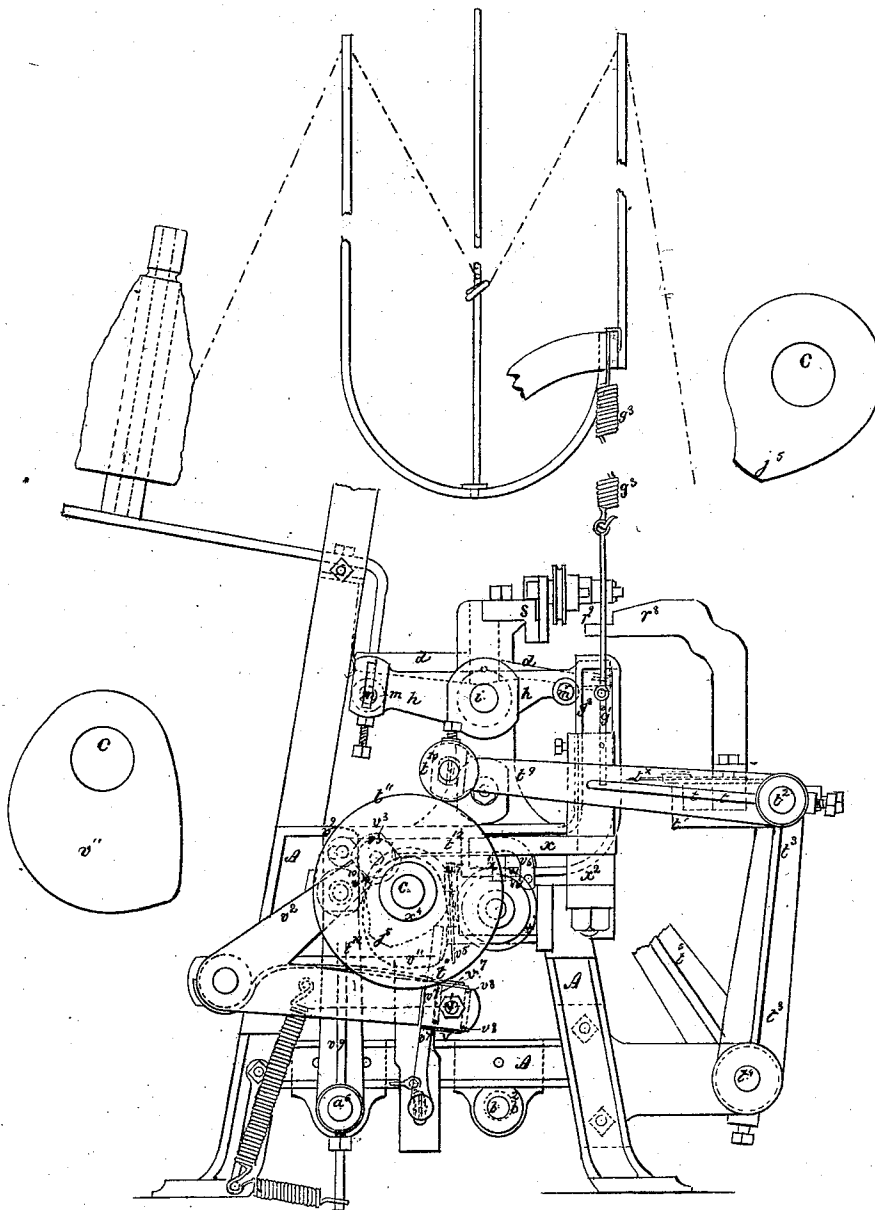
William Campion (of Nottingham)
William Campion (of Worcester)
By Knight & Sons Attys

W. CAMPION & W. CAMPION.
Knitting-Machines.

No. 139,114.

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FIG. 2.



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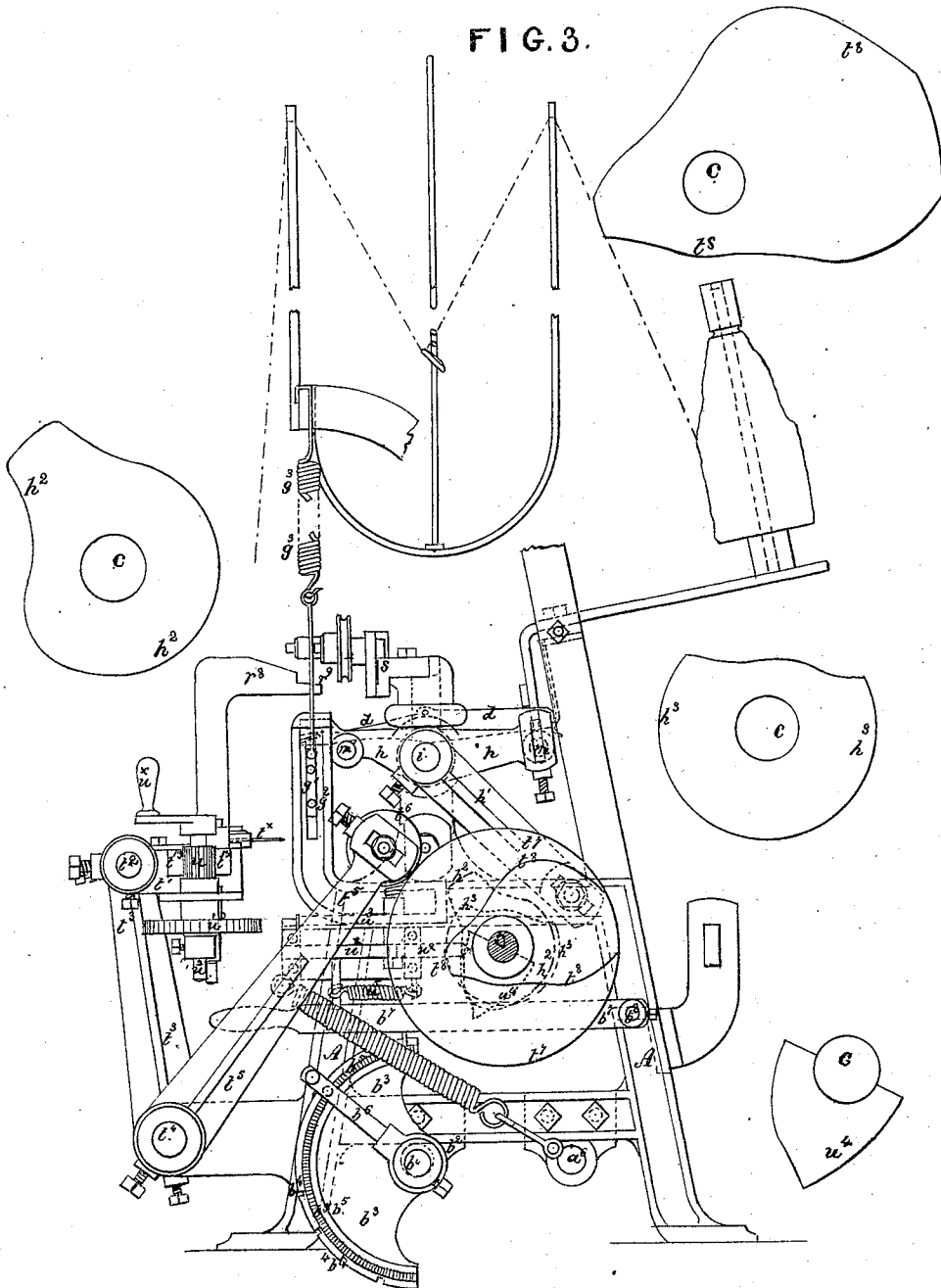
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Wm. Campion
By Knight & Pape
Attys

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Knitting-Machines.

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Patented May 20, 1873.

FIG. 3.



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Walker Allen*

*Wm. Campion
Wm. Campion
By Knickerbocker*

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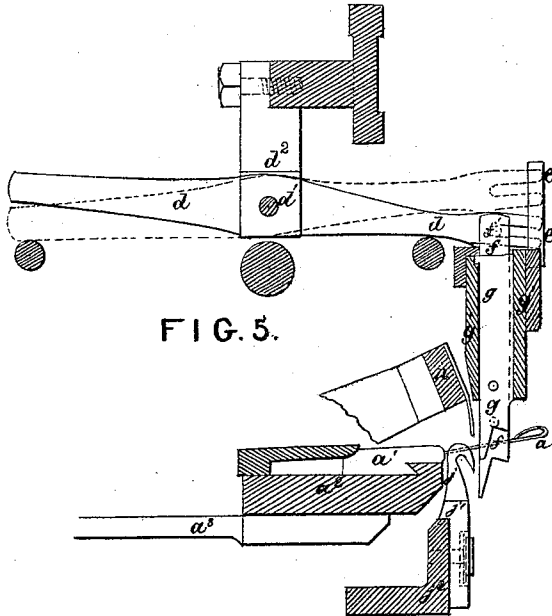


FIG. 5.

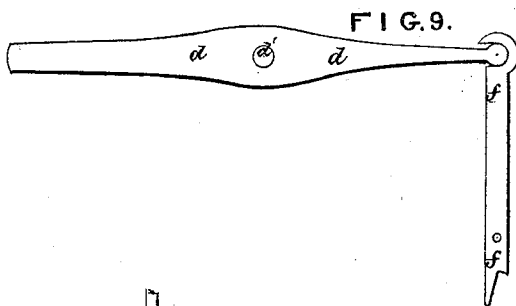


FIG. 9.

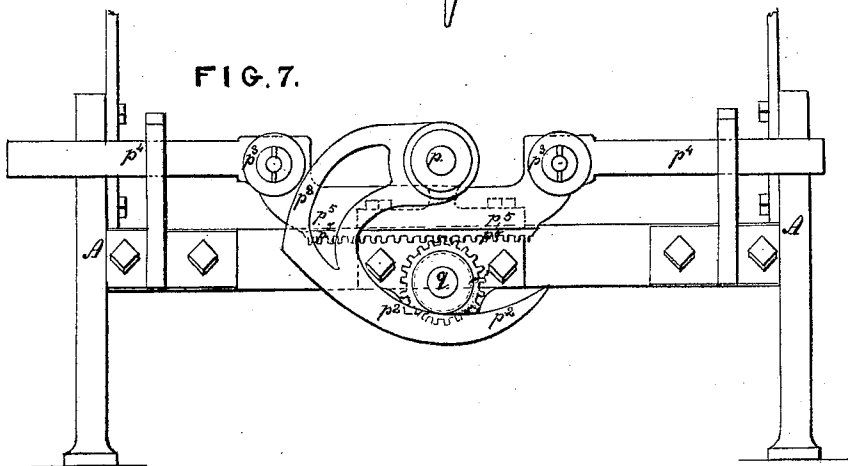
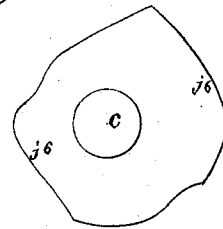
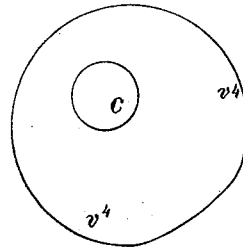
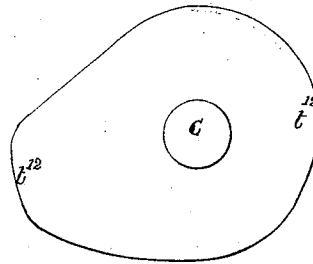


FIG. 7.

Geo. L. Ewins
Walter Allen

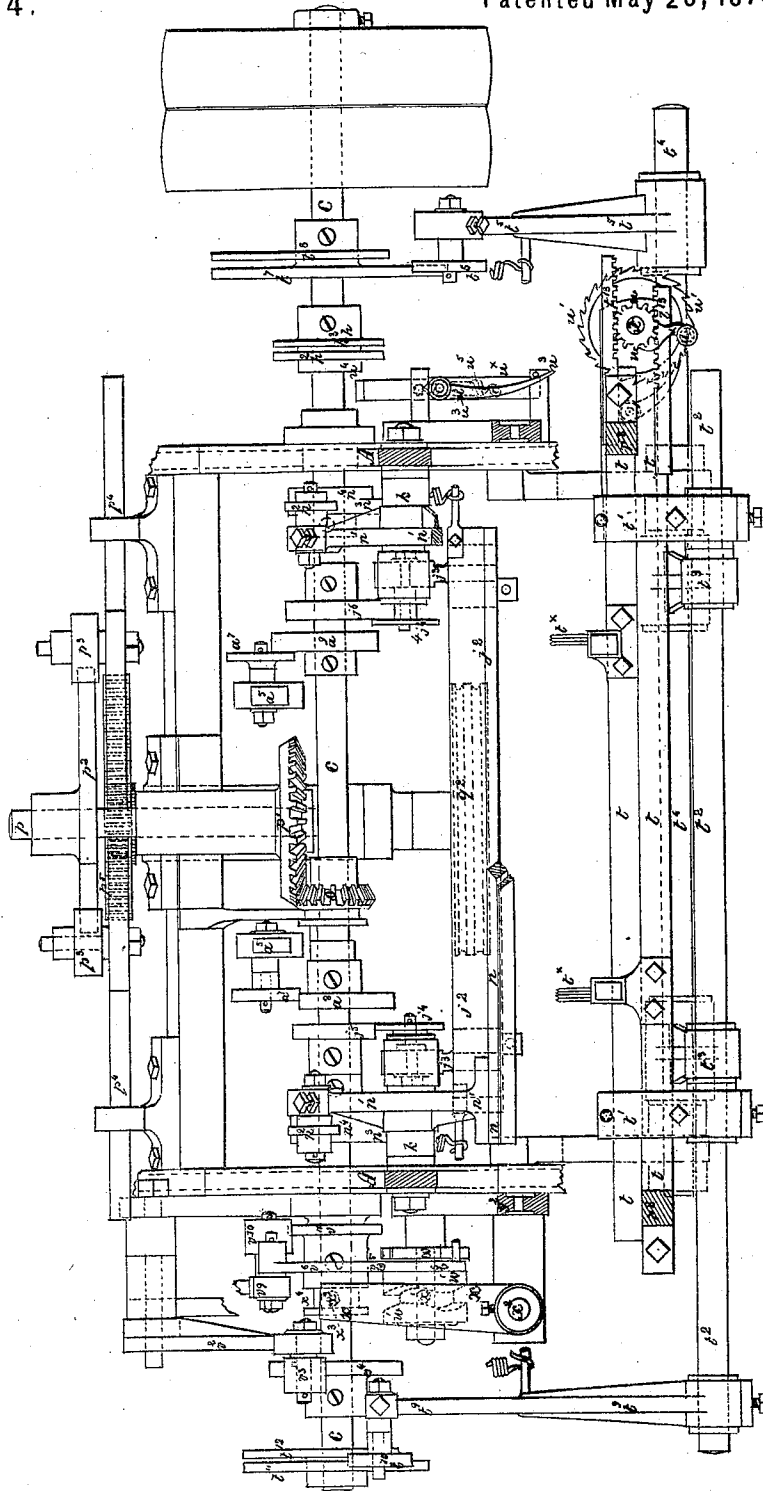
Wm. Campion
Wm. Campion
By Knight & Sons Attys

W. CAMPION & W. CAMPION.
Knitting-Machines.

No. 139,114.

Patented May 20, 1873.

FIG. 6.



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By Knight & Paine Attys.

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Knitting-Machines.

No. 139,114.

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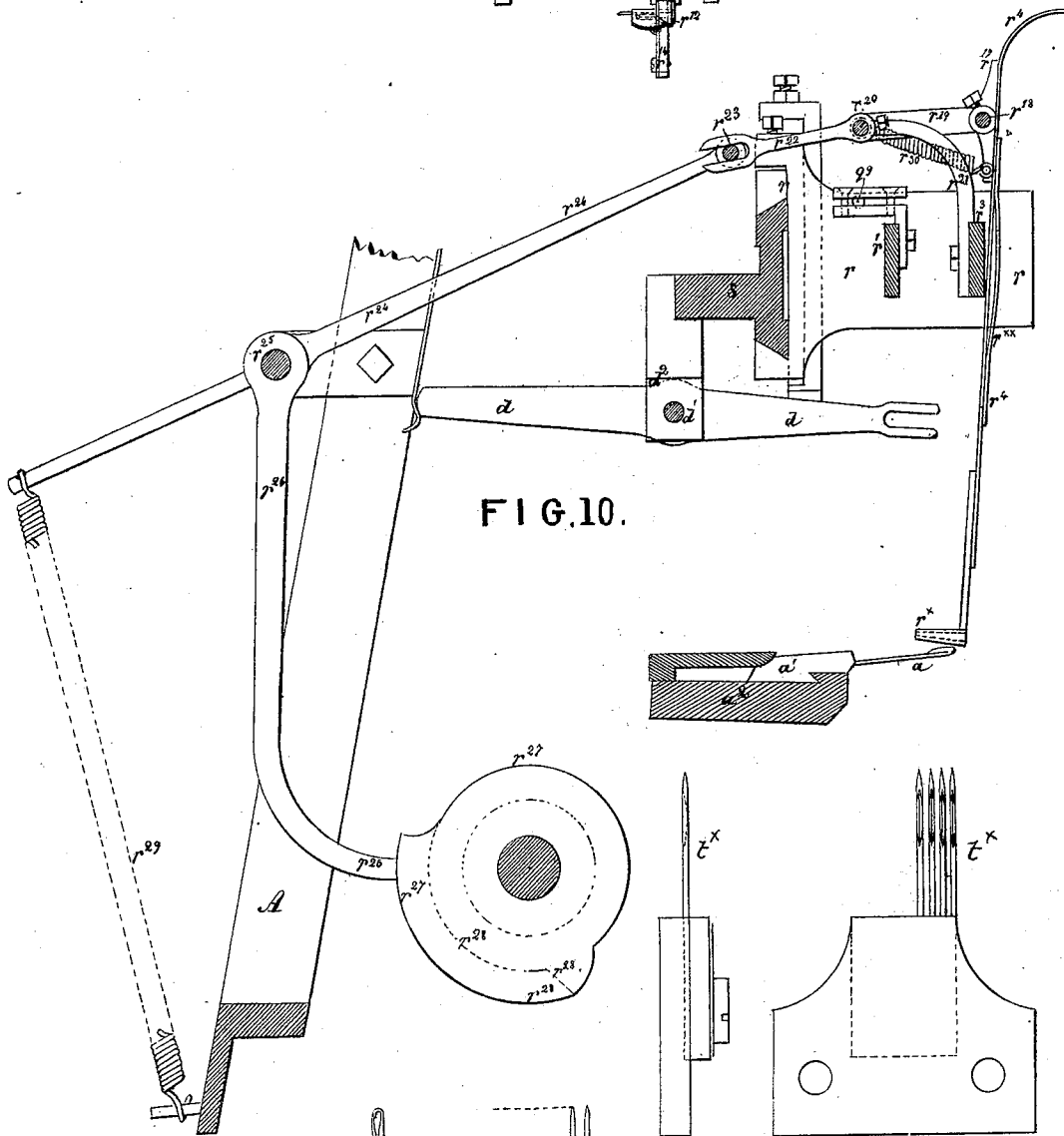
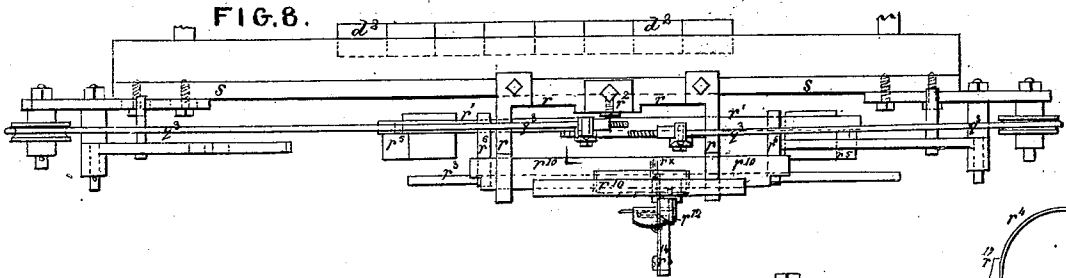


FIG. 11.

FIG. 12.

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Walter Allen

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By Knight & Pugh

UNITED STATES PATENT OFFICE.

WILLIAM CAMPION, OF NOTTINGHAM, AND WILLIAM CAMPION, OF SNEINTON, ENGLAND.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **139,114**, dated May 20, 1873; application filed August 23, 1872.

To all whom it may concern:

Be it known that I, WILLIAM CAMPION, of the town and county of Nottingham, England, sewing-machine manufacturer, and WILLIAM CAMPION, of Sneinton, in the county of Nottingham, England, mechanic, have invented certain Improvements in Knitting-Machinery, of which the following is a specification:

Nature and Object of the Invention.

This invention has for its object a novel arrangement and combination of machinery or apparatus for knitting, whereby great simplicity is obtained, a good quality of work is produced, and facility is afforded for narrowing the work, as required, by self-acting means. Our invention mainly applies to that description of machine in which a combination of needles, hooks, jacks, sinkers, and presser is employed, but is also applicable to other descriptions of knitting-machinery. The hooks are cast in leads, the jacks work in two sleys, one of which is cast in leads, while the other is formed by the upper ends of some of the sinkers. The ends of the jacks are rounded or otherwise formed to work within suitable hollows, formed in alternate sinkers, (which we will, for convenience, call the "jack-sinkers,") which sink a loop on every alternate needle. The sinkers, intermediate of the jack-sinkers, are fixed in a bar which is cut to receive them, and forms a sley to allow the jack-sinkers to work in. When the jack-sinkers have sunk the loops on every alternate needle, the bar-sinkers come down with the bar and divide the loops. This sinker-bar works in guides formed in or fixed to the frame, and is operated by levers fixed on a shaft, on which is fixed another lever or levers, worked by a suitable cam or cams on the main shaft. The hook-bar is carried by the front ends of levers, mounted on necks or axes fixed to the framing, the other ends of these levers being provided with rollers or trucks to work on suitable cams on the main shaft, by which the hook-bar is operated; these levers being held up to the cams by springs. A lifting-bar is attached to the hook-bar to lift the jacks at the same time that the hook-bar rises. The locker-bar is carried by the same levers which operate the sinker-bar. The pres-

ser-bar, which works at the back of the sinkers, is carried by levers, which work on the before-mentioned necks or axes. These levers are also provided with trucks or rollers, and are operated by cams fixed on the main shaft. The needle-bar is carried in the following manner: A shaft running through the frame has levers fixed thereon, one or more of which are provided with trucks or rollers resting against cams. In the ends of these levers is fixed another shaft on which are mounted arms to which the needle-bar is fixed, the said needle bar being supported in front by a rod or bar mounted on a shaft or axis which runs through the frame, and is provided with eccentrics by which the needle-bar is raised or lowered, in the following manner, in order to vary the stiffness of the work as may be required. On the end of this eccentric-shaft is mounted a wheel or segment with teeth on the side and on the periphery. On the same shaft is fixed a spring-catch, which works in the teeth on the side of the wheel or segment, to regulate the stiffness of the work, by turning the shaft, and then by raising or lowering the needle-bar. A stop-lever, fixed on the frame, drops into one or other of the teeth formed on the edge of the wheel or segment. By lifting the said stop-lever out of the teeth, the wheel or segment, and consequently the eccentric-shaft, may be turned around in either direction, and when a slack course is made the segment or wheel is turned back to the same place and there held by the stop-lever. The drawing apparatus is arranged and worked in the following manner: A beveled wheel on the main shaft takes into and gives motion to a bevel-wheel fixed on a cross-shaft working in suitable bearings. On this cross-shaft is fixed a cam, which works a slide or bolt to and fro. On this slide or bolt are formed or fixed teeth which work a pinion fixed on one end of another cross-shaft, on the other end of which is fixed a wheel with two grooves in its periphery. To this wheel, the ends of two cords are attached, the other ends of which are attached to the yarn-carrier and "slurcock," and thereby work them to and fro. The slurcock is fixed to a slide working on a bar which is attached to the frame. The said slide carries two bolts; the cords are attached to one of

the bolts and the yarn-carrier to the other. The bolt to which the cords are attached has inclined ends and is provided with two arms or projections and the bolt to which the yarn-carrier is attached, has two recesses formed therein, in which recesses the arms or projections fall at suitable times. This is effected by stops or projections fixed to the shifter-bars, which act to stop the yarn-carrier bolt and to lift the other bolt to cause one arm or projection to rise out of, and the other to fall into, one or other of the recesses in the carrier-needle bolt. The narrowing apparatus is constructed and operated in the following manner: A shaft, running through the frame, has arms fixed thereon, which arms carry another shaft having other arms attached thereto. These said arms carry two bars, to which the points or shifters are fixed. These shifter or point bars are worked by a toothed pinion, which takes into a rack formed on, or fixed to, each of the shifter-bars, and causes the shifter-bars to move to and fro endwise, so as to expand or close them, to shift the loops off some of the needles onto others. A ratchet-wheel is fixed on the axis of the toothed pinion; and this ratchet-wheel is rotated, for operating the shifter-bars, by a clawker, operated by a cam; which clawker is caused to rotate the ratchet-wheel by means of Jacquard apparatus, which acts upon the main shaft to move it endwise, and thereby to bring another set of cams, as is well understood, into operation, when desired, for narrowing, and take them out of operation when the narrowing is completed; the cam for operating the clawker being also fixed on such shaft; and, in order that our said invention may be more clearly understood and readily carried into effect, we will proceed, aided by the accompanying drawing, more fully to describe the same.

Description of the Drawing.

Figure 1 is a front view. Figs. 2 and 3 are opposite end views. Fig. 4 is a cross section on the line 1 1 of Fig. 1. Fig. 5 is a sectional view, showing the working-instruments to a larger scale. Fig. 6 is a sectional plan. Fig. 7 is a back view of parts, and Fig. 8 is a top view of other parts, of a knitting-machine having our improvements applied thereto; and Fig. 9 is a sectional view to a larger scale, showing our preferred apparatus for giving the dip to the carrier-needle.

a are the needles, which are cast in leads *a*¹, carried by bars *a*², as heretofore. These bars *a*² are supported partly by the rod *b*¹, carried by a shaft, *b*, which is formed with eccentric ends or necks turning in bearings *b*², carried by the main framing A. The needle-bar *a*² is also fixed to arms *a*³, keyed or otherwise fixed upon a shaft or axis, *a*⁴, carried at the upper ends of levers *a*⁵, which, at their lower ends, are keyed or otherwise fixed to a shaft or axis, *a*⁶, turning in bearings carried by the main framing A. One or both of these levers

*a*⁵ are provided with trucks or rollers *a*⁷, which are acted upon by a cam or cams, *a*⁸, fixed on the driving-shaft or axis *c* when the narrowing apparatus is out of action, and by a cam or cams, *a*⁹, when the narrowing apparatus is in action. On one end of the eccentric shaft or axis *b* is loosely mounted a segment, *b*³, (or it may be a wheel,) having teeth or notches *b*⁴ on the periphery thereof, and teeth or notches *b*⁵ on the side thereof. On the shaft *b* is fixed a spring-catch, *b*⁶, which works in the teeth or notches *b*⁵, to regulate the stiffness of the work by turning the shaft *b*, and, thereby, raising and lowering the needle-bar *a*². A stop-lever, *b*⁷, fixed on an axis, *b*⁸, on the main framing, drops into one or other of the teeth or notches *b*⁴. By lifting the said stop-lever *b*⁷ out of the teeth or notches *b*⁴, the segment *b*³ and, consequently, the eccentric shaft, may be turned around in either direction, as may be required; and when a slack course has been made, the segment *b*³ is turned back to the same place at which it formerly stood, and is there held by the stop-lever *b*⁷. *d* are the jacks, which are carried by a rod or wire, *d*¹, and work in a sley, *d*², cast in leads; and their forward ends may be forked, as shown at Fig. 5, to embrace a stud or projection, *f*¹, from one side of each of the intermediate or jack sinkers *f*; but we prefer to form them rounded, as shown at Fig. 9, to take into suitable hollows formed at the top of the jack-sinkers *f*. In this case, the bar-sinkers *g* are lengthened at their upper parts to form a sley for the jacks to work in, as will be well understood. The sinkers *g*, intermediate of the jack-sinkers *f*, are fixed in a bar, *g*¹, which is suitably cut to receive them, and, at the same time, forms a sley to allow the jack-sinkers to work in. When the jack-sinkers *f* have sunk a loop on every alternate needle *a*, the bar-sinkers *g* come down with the bar *g*¹ and divide the loops. This sinker-bar *g*¹ works in guides *g*², formed on or fixed to the framing A, and is lowered by levers *h*, mounted on a shaft or axis *i*, working in bearings formed in or carried by the main framing A. Springs *g*³ act upon the bar *g*¹ to raise it after the levers *h* have acted to lower it. On the axis *i* is fixed another lever or levers *h*¹, worked by a cam *h*² on the main shaft *c* for ordinary work, and by a cam, *h*³, when the narrowing apparatus is in action. *j* are the books which are cast in leads *j*¹, fixed to the hook-bar *j*². The hook-bar *j*² is carried by levers *j*³ mounted on necks or axes *k*, fixed to the main framing A. These levers are provided with trucks or rollers *j*⁴, resting on cams *j*⁵ *j*⁶ on the main shaft *c*, by which the hook-bar *j*² is operated. The hook-bar is operated by the cam *j*⁵ for ordinary work, and by the cam *j*⁶ for narrowing. *l* is a lifting-bar, which, by wires *l*¹, rests on the hook-bar *j*², and acts to lift the jacks at the same time that the hook-bar *j*² rises. *m* is the locker-bar carried by the levers *h*, which operate the sinker-bar *g*¹. *n* is the presser-bar, which works at the back of the sinkers *f* and *g*, and is carried by levers

n^1 mounted loosely on the necks or axes l . These levers n^1 are provided with trucks or rollers n^2 , which rest on cams n^3 , by which the presser-bar is operated for ordinary work, such trucks or rollers n^2 resting on the cylindrical bosses n^4 of the cams n^3 , and communicating no motion to the presser-bar when the narrowing apparatus is at work.

The "drawing" apparatus is arranged and worked in the following manner: A beveled pinion, o , on the main shaft c takes into and gives motion to beveled wheel p^1 fixed on one end of cross-shaft, p , on the other end of which is fixed a cam or wiper, p^2 , which acts against trucks or rollers p^3 , carried by a slide or bolt, p^4 , to work such bolt or slide to and fro. On the under side of this slide or bolt are formed or fixed teeth p^5 which work a pinion, q^1 , fixed on one end of another cross-shaft q , on the other end of which is fixed a wheel, q^2 , with two grooves formed in its periphery. To this wheel q^2 the ends of two cords q^3 are attached, the other ends of which are attached to a bolt, r^1 , carried by the slide r to which the slurcock r^2 is fixed. The cords q^3 thereby work the yarn-carrier r^x and the slurcock to and fro. The slider r works on a bar, s , which is fixed to the main framing. Within guides in this slide work the bolt r^1 , before referred to, and a bolt, r^3 , to which the carrier-plate r^4 is attached. The bolt r^1 has inclined ends r^5 . For carrying and operating the carrier r^x we connect said carrier (see Fig. 10) with plate r^4 by means of piece r^{17} , mounted upon a rod or axis, r^{20} . This rod or axis r^{20} is mounted in arms or brackets r^{21} , fixed to the slide or bolt r^3 , and has fixed upon it other arms or levers, r^{22} , the outer ends of which are forked as shown, to fit freely a rod, r^{23} , thereby enabling the levers r^{22} to slide freely on the rod r^{23} in the to-and-fro motion of the bolt or slide r^3 . This rod r^{23} is carried by arms or levers r^{24} , fixed to a shaft or axis, r^{25} , which is mounted in bearings carried by the main framing of the machine. On this shaft or axis r^{25} is also fixed a lever, r^{26} , which is operated by a cam, r^{27} , when the narrowing apparatus is out of action, and by a cam, r^{28} , when the narrowing apparatus is in action. A spring, r^{29} , acts to keep the lever r^{26} up to the cams r^{27} and r^{28} . That portion of the cam r^{28} non-coincident with cam r^{27} is shown by dotted lines. The thread or yarn passes through a hole in the upper end of the plate r^4 and to the carrier r^x .

By the device above described great facility is afforded for adjusting the dip of the carrier. In order, however, to enable our other devices to be used without our preferred form of carrier, (which form is the only one claimed in this patent,) we have described and represented in Figs. 1, 4, and 8 another form of carrier, which we will now proceed to explain: The bolt r^1 is provided with two arms or projections r^6 , and the bolt r^3 has two recesses, r^7 , formed therein, in which recesses the arms or projections r^6 fall when the slide r arrives to-

ward either end of its course, so as to give the required lead to the carrier r^x in the next traverse of the slide r across the frame. This is effected by a stop or projection, r^8 , fixed at each side of the frame, to bars t , which stops or projections have parts r^9 formed thereon to act against the under side of the inclined ends r^5 of the bolt r^1 , to raise such bolt as it approaches the one end or the other of its course, and thereby liberate one of the arms or projections r^6 from one of the recesses r^7 , which may, for the time being, be acting together. One end of the bolt r^3 coming against a stop or projection r^8 causes such bolt r^3 to stop, while the bolt r^1 continues its motion for a short distance after an arm, r^6 , has been disconnected from a recess, r^7 , and until the other arm r^6 has dropped into the other recess r^7 , in readiness for the next traverse of the carrier r^x . Another bolt or slide, r^{10} , carried by the slide r , and having formed therein a cam-course, r^{11} , with inclined ends thereto, is carried to and fro with the bolt or slide r^1 , by means of the arms or projections r^6 , so as to act on the upper end of a link or connecting-rod, r^{12} . This link r^{12} is connected to a lever, r^{13} , mounted on an axis of motion, r^{14} , to which lever the carrier proper, r^x , is connected. Thus, at each end of the traverse of the carrier r^x , it is caused to dip below the needles a , to carry the thread below on the outside of the outermost needle for the time being in use. The plate r^4 , to which the lever r^{13} is connected, is provided with a spring take-up, r^{15} , having an eye formed at the end thereof. Through this eye, and partly around pins or guides r^{16} , the thread or yarn passes to the carrier r^x .

The narrowing apparatus is constructed and operated in the following manner: The bars t have shifters or points t^x fixed thereto, which have the necessary forward-dipping, sidewise, and rising motions imparted to them for shifting the loops off the outermost needles a , and placing them onto other needles a , when required for narrowing. These bars t are carried by arms t^1 , with capability of sliding endwise therein. The arms t^1 are keyed or otherwise fixed to a shaft, t^2 , carried at the upper ends of levers or arms t^3 , with capability of turning therein. The arms or levers t^3 are fixed on a shaft or axis, t^4 , running from end to end of the machine. On this shaft or axis t^4 is fixed a lever, t^5 , on the end of which is mounted a truck or roller, t^6 , which rests on a concentric disk, t^7 , when the narrowing apparatus is not required to work, and on a cam, t^8 , when the narrowing apparatus is in action, by which the necessary to-and-fro motions are given to the bars t . On the shaft t^2 is fixed a lever, t^9 , on which is mounted a truck or roller, t^{10} , which, when the narrowing apparatus is not required to work, rests on a concentric disk, t^{11} , and when the narrowing apparatus is in action, such truck or roller t^{10} rests on a cam, t^{12} , which gives the necessary up and down or dipping and rising motions to the shifting or point bars t . On the right

hand ends of the bars t , are formed or fixed toothed racks t^3 , which are taken into and operated by a toothed pinion, u , to cause the shifter-bars to move to and fro endwise, so as to expand or contract them when required. A ratchet-wheel, w^1 , is also fixed on the axis u^2 of the pinion u , and this ratchet-wheel w^1 is rotated step by step by a clawker, w^3 , carried by a slide, w^x , working in suitable guides carried by the main framing, such clawker being operated by a cam, w^4 , to move it forward against the ratchet-wheel w^1 , and by a spring, w^5 , to move such clawker w^3 in the contrary direction. The shaft or axis c , is shifted endwise to take the narrowing cams into and out of action by means of Jacquard apparatus in the following manner: v is a Jacquard, which is formed and has cards applied thereto as is now well understood. This Jacquard v , is carried by an axis, v^1 , fixed in a frame, v^2 , which is provided with a truck or roller, v^3 , resting against a cam, v^4 , by which the Jacquard v is raised and lowered; and, in rising, if the card which for the time being is in action has no hole formed therein, it raises a pin, v^5 , working in suitable guides, the head of which pin acts against the under side of a clawker, v^6 , to raise it and prevent its acting on a ratchet-wheel, w , on the axis of which is fixed a cam-wheel w' ; but if a hole is formed in such card opposite the pin v^5 , then the clawker v^6 is allowed to act upon and turn the cam-wheel w' . In the groove of this cam-wheel w' works a stud, x^1 , from a lever x , which is mounted on an axis of motion, x^2 , and has another pin or stud, x^3 , fixed in the end thereof, which stud x^3 passes into a groove formed in a wheel, x^4 , fixed on the cam-shaft c . Thus, as the cam-wheel w' is partially rotated, it causes the lever x to turn on its axis of motion x^2 , and by means of the stud x^3 moves the cam-shaft c in the one or the other direction, whereby the cams required to act upon the various parts for narrowing are taken into or out of position for work, as may be required. In the downward motion of the Jacquard v a clawker, v^7 , acts upon the pins v^8 to give a partial rotary motion to the Jacquard v , so as to bring a fresh card into action. The clawker v^6 is pin-jointed to the upper end of a lever, v^9 , which is mounted loosely upon the axis a^6 , and is provided with a truck or pulley, v^{10} , which rests against a cam, v^{11} , by which it is operated. On the axis u^2 , of the toothed pinion u is fixed a handle, u^* , by which the shifter or point bars t can be moved outward to the full width required after the narrowing has been completed. Fig. 11 is an edge view, and Fig. 12 is a back view

of part of a bar of self-acting hooks for hanging on and turning welts. These hooks are formed with tumblers and with grooves at their backs, as shown, and are used in the following manner: When the needles are empty, draw a slack course, then hang on the hooks and work the machine until the required length of work for forming the welt is produced; then let the work down to the stems of the hooks, and place the groove underneath the hooks upon the head of the needles; the work must then be stroked off the hooks onto the needles, which completes the welt. By these means greater facility is afforded in forming the welts.

Having thus described the nature of our said invention, and the mode of carrying the same into effect, we would have it understood that the following is what we claim as our invention:

1. The combination of the locker-bar m in the rear end of lever h , the shaft i , lifting-arm h^1 , and the cams h^2 and h^3 upon the main shaft, for ordinary and narrowing operations, respectively.

2. The arrangement, substantially as described, whereby the lifting-bar l is connected to the hook-bar j^2 , so as to lift the jacks d at the same time that the hooks j rise.

3. The needle-bar a^2 , supported by rods b^1 , which project upwardly from a shaft, b , provided with eccentrics b^2 , said needle-bar a^2 being also fixed to arms a^3 fastened to a shaft, a^4 , carried at the upper ends of levers a^5 , substantially as and for the purpose described.

4. In combination with the needle-bar, and the devices for supporting and operating it, the segment b^3 , having teeth or notches b^4 b^5 on its periphery and side, respectively, which teeth b^4 receive a gravitating catch or stop-lever, b^7 , and which teeth b^5 receive a spring-catch, b^8 , in order to enable the stiffness of the work to be varied and the same restored after a slack course has been taken, as herein explained.

5. The combination of the elements for reciprocating the thread-carrier, and those represented in Fig. 10, for giving the dip to the same, as described.

6. The automatic narrowing apparatus, consisting of the devices t to t^{13} , inclusive, u to u^3 , inclusive, main shaft c , and Jacquard apparatus v to v^6 , inclusive, substantially as set forth.

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WILLIAM CAMPION.

Witnesses:

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ROBT. ROBERTS.