

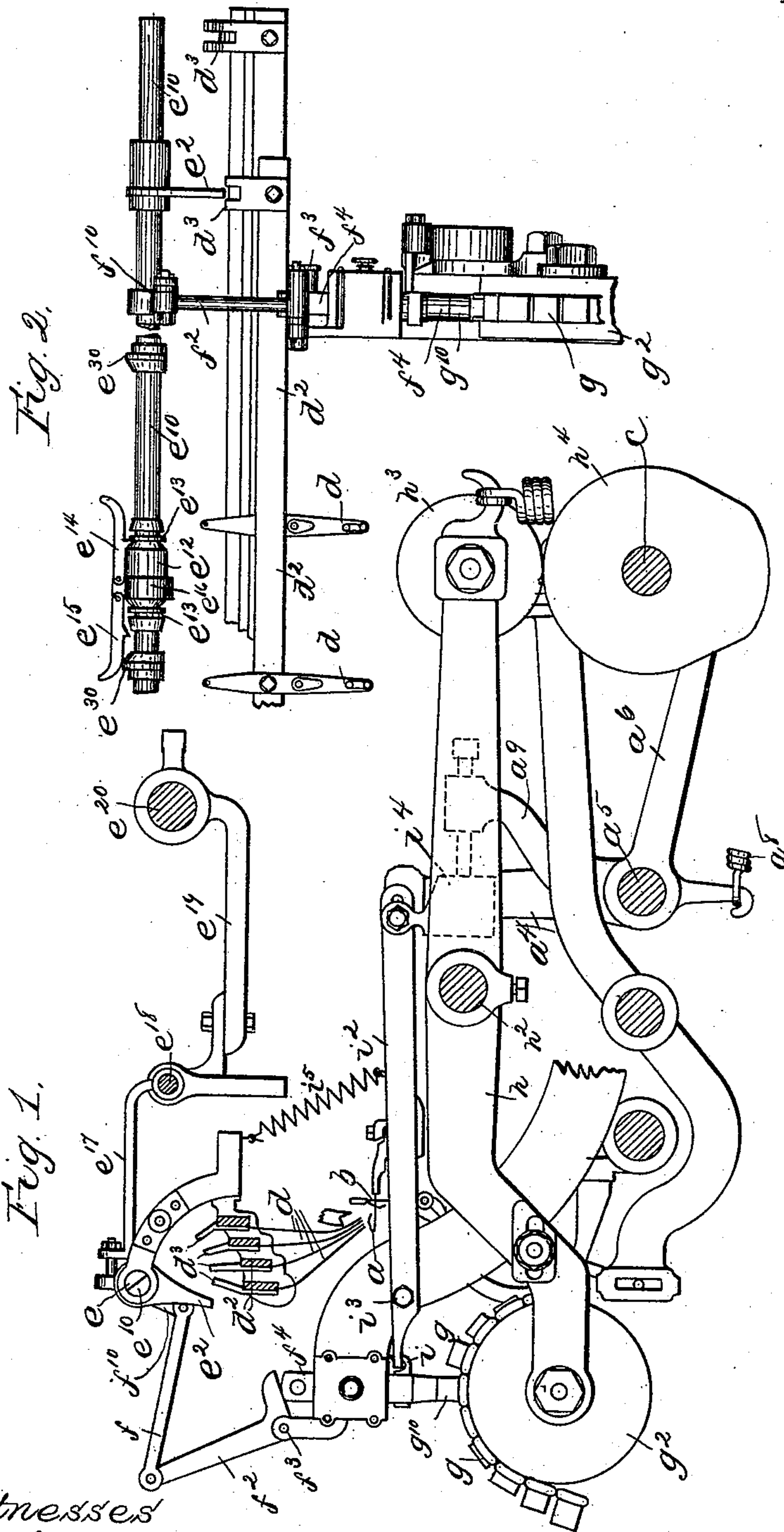
(No Model.)

2 Sheets—Sheet 1.

W. COULT.
STRAIGHT KNITTING MACHINE.

No. 472,698.

Patented Apr. 12, 1892.



Witnesses
Jas. J. McAloney.
W. E. Hill.

Inventor,
Walter Coult.
by J. P. Linnard
Att'y

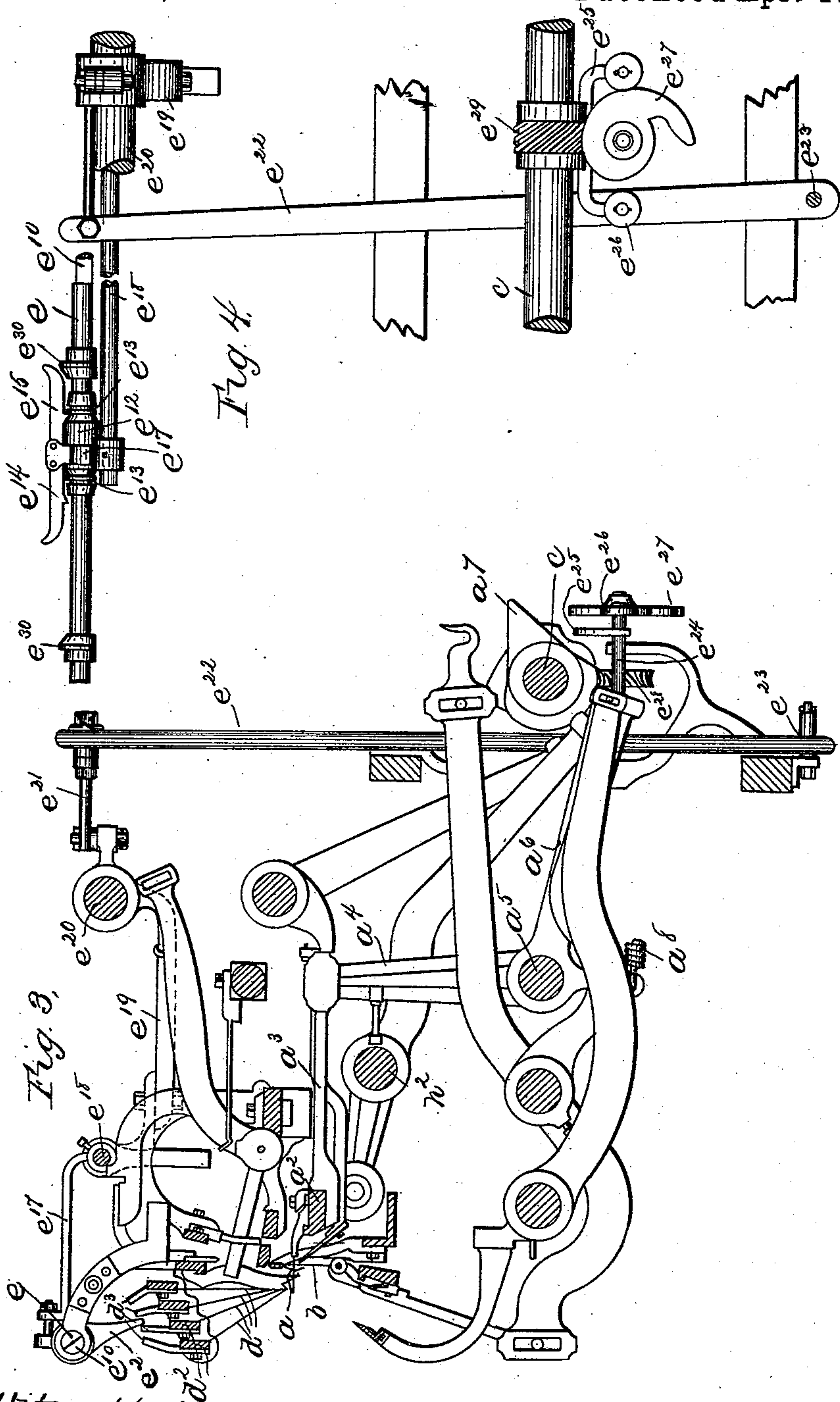
(No Model.)

2 Sheets—Sheet 2.

W. COULT.
STRAIGHT KNITTING MACHINE.

No. 472,698.

Patented Apr. 12, 1892.



Witnesses
Jas. J. McAloney.
W. E. Hill.

Inventor,
Walter Coult,
by J. P. Swann
Att'y.

UNITED STATES PATENT OFFICE.

WALTER COULT, OF WALTHAM, MASSACHUSETTS, ASSIGNOR TO THE BOSTON MANUFACTURING COMPANY, OF SAME PLACE.

STRAIGHT-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 472,698, dated April 12, 1892.

Application filed August 26, 1889. Serial No. 321,944. (No model.)

To all whom it may concern:

Be it known that I, WALTER COULT, of Waltham, county of Middlesex, State of Massachusetts, have invented an Improvement in Straight-Knitting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to a knitting-frame for knitting cuff-work, and is embodied in a machine of that class in which several different yarns are employed and used in the several courses of knitting in accordance with a predetermined pattern.

The invention is shown as applied to a machine of the kind known as the "Attenborough & Blackburn knitting-frame," the construction of which is well known, portions of said frame being represented in English Patent No. 4,358, of 1877, to which reference may be had for an understanding of some of the parts of the machine which do not enter into the present invention, except in so far as they are combined and co-operate with the devices hereinafter described.

The machine employs two sets or gangs of needles, one horizontal and the other vertical, and the yarn is supplied to the needles for each course by a yarn-carrier which is caused to travel along the row of needles when properly advanced to receive it. There are separate yarn-carriers for each kind or color of yarn used, and any desired one of said yarn-carriers is caused to operate by an actuating-bar which engages with one or the other of the yarn-carriers by means of a pattern-chain.

In machines of this class heretofore made if the yarn-carriers are originally all at the same end of their traverse it is impossible to knit a single course or an uneven number of courses of any one of the yarns, as the actuating-slide for the yarn-carriers has to engage with a yarn-carrier at the same end of its traverse at which it disengages the yarn-carrier previously operated by it, and it is always necessary to discontinue the yarn that is being used at the end of the traverse of its yarn-carrier at which the yarn-carrier of the next yarn to be used is then standing, so that it may be necessary to make one course (more or less) of a given yarn than might be pre-

ferred for the pattern if such necessity did not exist.

The object of the present invention is to provide means by which a yarn-carrier may be disengaged and left at one end of the traverse of the actuator and another yarn-carrier engaged at the other end of the traverse, so that, if desired, a single course or any desired number of courses of any yarn desired for the pattern may be knitted. In order to accomplish this result in accordance with this invention, the machine goes through what may be called an "idle movement," the parts, with the exception of the needles and yarn-carrier, going through the same operation as in knitting a single course, in which movement the actuator for the yarn-carriers moves to the other end of its traverse without, however, moving one of the yarn carriers with it and consequently without laying in any yarn upon the needles. If the needles should be operated in the usual manner in such idle movement of the machine the work would be cast off, as the needles would be drawn out from the loops previously made upon them and no yarn would be drawn through to form a new course of loops, and in order that the idle movement may be made for the purpose of getting the actuators for the yarn-carrier at the other end of its traverse means are provided for preventing the needles from going through their movements or performing their usual functions with relation to the loops, so that, although all other parts of the machine operate in the usual manner, the horizontal needles remain stationary and retain the loops of their last course in their hooked ends.

Figure 1 is an end view of a portion of the operative parts of a knitting-frame embodying this invention, the greater portion of the frame-work being omitted, as well as the usual devices common to all knitting-machines of this class, in order to more clearly show the parts to which the present invention especially relates; Fig. 2, a front elevation of the yarn-carriers and operating portion of their actuating-bar; Fig. 3, a transverse vertical section showing a portion of the working parts of the knitting-frame which co-operates with the devices shown in Figs. 1 and 2, the said parts being all of usual construction and of

themselves forming no part of the present invention, and Fig. 4 a detail showing in rear elevation the mechanism by which the yarn-carriers are actuated.

5 The horizontal or "bed" needles *a*, vertical or "machine" needles *b*, and their actuating mechanism, and the parts co-operating therewith to produce the knitting—i. e., the sinkers and the pressers which close the beards
10 of the needles in drawing the loops—are all of usual construction and are only shown so far as is necessary to illustrate their relations to the other parts, they being the same as in the well-known Blackburn and Attenborough
15 knitting-frames.

The horizontal needle-bar *a*² is connected by rods or links *a*³ with arms *a*⁴ from a rock-shaft *a*⁵, provided with an arm *a*⁶, acted upon by a cam *a*⁷ on the main shaft *c* of the machine, the needles being drawn back positively by the cam and being thrown forward by the action of a spring *a*⁸, such actuating mechanism being all of the usual construction. It is to be understood that the needles
20 *a* and *b* are in a gang or series of width equal to the width of the fabric being knit.

When the needles *a* are thrown forward, the yarn is laid over their shanks at the rear of the beards by one of a set of yarn-carriers
30 *d*, connected with slide-bars *d*², provided near the end of the machine with notched engaging arms *d*³, there being one of said yarn-carriers to each kind of yarn that is being used and one of said yarn-carriers being traversed
35 across the needles at each course of the knitting. The yarn-carriers are thus caused to travel and lay the yarn into the needle by an actuating slide-bar *e*, which, in addition to the longitudinal movement in the direction of
40 the traverse of the yarn-carriers, also has an oscillating movement in its bearings, and is provided with a finger *e*², which may engage with any desired one of the notched projections *d*³ on the yarn-carrier bars, according to
45 the angular position that the finger *e*² assumes before beginning and retains in making its longitudinal movement.

The mechanism for operating the actuating slide-bar *e* is of usual construction and is best
50 shown in Figs. 3 and 4. The slide-bar *e* is made in the form of a half-round shaft which lies against another half-round shaft *e*¹⁰, the construction being such that the shafts *e* *e*¹⁰ will fit in suitable bearings for a round shaft
55 and will both be caused to oscillate together if either part, as *e*¹⁰, of said shaft is oscillated or rocked in its bearings, while the other half-round shaft *e* may have a longitudinal movement unaccompanied by the half-round shaft
60 *e*¹⁰. The portion *e* of the shaft, which has the finger *e*² fixed upon it, also has fixed upon it a hub or collar *e*¹², (see Figs. 2 and 4,) having annular shoulders *e*¹³ near each end adapted to be engaged by finger levers or pawls *e*¹⁴ *e*¹⁵, piv-
65 oted to a ring *e*¹⁶, which loosely encircles the hub *e*¹² and is connected with an arm *e*¹⁷, fixed upon a slide-rod *e*¹⁸, rigidly connected with an

arm *e*¹⁹, capable of having a sliding movement on a shaft *e*²⁰. The said arm *e*¹⁹ is caused to
70 traverse in one direction at each alternate rotation of the main shaft *c* of the knitting-frame and to make its return traverse at the intermediate rotations of said main shaft by means of a link *e*²¹, connected with a lever *e*²²,
75 pivoted at *e*²³ on the frame and having connected with it a stud *e*²⁴, carrying at its end a yoke or frame *e*²⁵, provided with two cam-rolls *e*²⁶, adapted to be operated upon by a spiral surfaced cam *e*²⁷ on a short shaft provided with a
80 worm-gear *e*²⁸, meshing with a worm *e*²⁹ on the main shaft *c*, the pitch of said worm-gear and worm being such that the cam *e*²⁷ makes a half-turn at each complete rotation of the main shaft. Thus through the connections before
85 described the ring *e*¹⁶ is caused to traverse in one or the other direction at each rotation of the main shaft, and the dog *e*¹⁴ or *e*¹⁵, which is at any time at the forward end, engages the corresponding shoulder *e*¹³ on the hub *e*¹², con-
90 nected with the shaft *e*, and thus causes the said shaft to move longitudinally for the purpose of actuating, through the projection *e*², any desired one of the yarn-carriers. The pawl-and-shoulder connection *e*¹³ *e*¹⁴ enables
95 the pawls and their ring *e*¹⁶ and the other parts moving in conjunction therewith to have a slight additional motion to that imparted to the yarn-carriers, or, in other words, it is necessary that the traverse of the yarn-carriers
100 should cease slightly before the traversing movement of the arm *e*¹⁹ is finished, although the yarn-carrier should begin its movement with the said arm, which actuates certain other parts in the knitting operation that need
105 not be described, as they have nothing to do with the present invention.

The lost motion between the collar *e*¹⁶ and hub *e*¹² is provided for by means of trip-cams *e*³⁰, which are fixed upon the half-round shaft *e*¹⁰, that has no longitudinal movement, so that
110 near the end of the movement of the pawl-carrier *e*¹⁶ the pawl that is at the forward end rides up on the trip-cam *e*³⁰ and is thereby tripped from engagement with the shoulder *e*¹³ and ceases to actuate the shaft *e*, the move-
115 ment of the ring *e*¹⁶, however, continuing far enough to carry the other pawl into position to engage the corresponding shoulder at the return movement of the ring.

The actuator-bar *e* is oscillated to cause the
120 finger *e*² to engage with the desired one of the yarn-carrier bars by means of a pitman or link *f*, connected at one end with an arm *f*¹⁰, fixed upon the half-shaft *e*¹⁰, and connected at its
125 other end with one arm of a lever *f*², fulcrumed at *f*³ on the frame-work, and having its other arm acted upon by a slide *f*⁴, controlled by a pattern-chain *g*. The said pattern-chain passes over a pulley *g*², supported on a lever
130 *h*, fulcrumed at *h*² and provided with a roller *h*³ to be acted upon by a cam *h*⁴ on the main shaft *c*. The lever *h* is acted upon by a spring connected with it near the roller *h*³, as shown, which tends to depress the said end of the le-

ver and to raise the pulley g^2 , over which the pattern passes, the parts being represented with the roller h^3 on the low part of the cam h^4 , so that the pulley g^2 and pattern supported upon it is in its highest position. The cam h^4 has a high part which at the proper time depresses the roller g^2 , so that the pattern is disengaged from the slide f^4 and can be shifted to bring a new link under the said slide by the usual means, these parts, with the exception of certain portions of the pattern itself, which will be hereinafter specified, being the same as in machines of this class heretofore made and substantially the same is in the British patent before mentioned, except that in the present machine the pattern-chain is advanced one link at each rotation of the main shaft of the machine. The said cam h^4 at the end of the traverse of the bar e thus raises the roller h^3 , and thus permits the slide f^4 to drop, and just before the bar e begins its traverse the pulley g^2 is raised to the position which it occupies during the complete traverse of the bar e , bringing one or the other of the blocks or links of the chain g under the slide f^4 , and consequently raising the said slide to one or another height, according to the thickness of the block beneath it, the slide thus determining the position of the finger e^2 and bringing it into engagement with any desired one of the yarn-carrier bars d^2 , so as to operate the said bar in the traverse of the actuator e , causing the particular yarn controlled by said bar to be laid into the needles and knit in the next course.

It will be seen that in the ordinary natural operation of the machine the finger e^2 will, at the end of the traverse, disengage one of the yarn-carrier bars and immediately engage another at the same end of the traverse, and thus the engagement and disengagement will always have to be made at one end of the traverse or after a complete to-and-fro movement of the yarn-carrier, producing two courses of the yarn carried by it if the engaging arms d^3 are originally all at the same end of the space traversed by them. This has always been the operation of the machines of this class prior to my invention so far as known to me.

It is sometimes desirable to knit a single course of a given yarn or such a number of courses as will require that the carrier should be left at the opposite end of the traverse to that at which it was engaged and the one previously operated disengaged. In order that the actuator e may thus leave a carrier-bar at one end of its traverse and return to engage another carrier at the other end of its traverse, the following instrumentalities are provided in accordance with this invention: First, the pattern-chain g has a block g^{10} higher than any of the blocks corresponding to the several yarn-carriers, so that when the slide f^4 is upon said block, as shown in Fig. 1, the finger e^2 will be beyond the reach of all of the notched engaging projections d^3 of the yarn-carriers, and

will thus be able to make its traverse without carrying any of said yarn-carriers with it. It may thus leave the yarn-carrier at one end of its traverse and return and next engage another yarn-carrier at the other end of its traverse, while heretofore it has always been necessary that it should cause the yarn-carrier first engaged by it to return with it. Such return movement of the actuator e , as well as the corresponding movement of the chain-pulley g^2 , the advance of the pattern-chain, and so on are all made by the machine's going through the usual operation, which commonly causes the course to be knit; but as no yarn-carrier is traversed to supply yarn to the needles no course actually will be knit in the operation of the machine, which may therefore be spoken of as an "idle movement." The pulley g^2 is operated by the cam h^4 to permit the shifting of the pattern-chain at each course, as is usual in machines of this kind heretofore in common use in the United States, for although if the carrier-bars are all originally at the same end of the traverse it has been necessary to make two courses before the carrier can be shifted, means are provided for shifting the carrier at the end of each course, because it may be desirable to set the pattern with some of the carriers originally at one end and others at the other end of their traverse. For example, if the different carriers are numbered successively and Nos. 1 and 2 are originally at one end and No. 3 at the other end of the traverse and No. 1 yarn is first used it will be understood that if No. 2 is to follow an even number of courses must be knit by No. 1, while if No. 3 is to follow an odd number of courses must be knit; but by the present invention an odd or even number may be knit of any given yarn, regardless of what yarn is to follow, it being necessary only to make an idle operation of the machine if the desired number of courses for a given yarn leaves its carrier at the opposite end of the traverse from that occupied by the carrier of the yarn next to be knit.

If the needles a advanced and withdrew in the usual manner in such idle operation of the machine they would advance through the loops of the last course of knitting and then in returning their beards would be carried under said loops, and as no yarn is supplied to engage said loops the work would be cast off from the needles. In order to prevent this from occurring the said needles are prevented from moving in the idle operation of the machine, by which the finger e^2 is brought to the desired end of its traverse as follows: The slide f^4 , that is operated by the pattern-chain to control the position of the finger e^2 , is provided with a projection i , engaging with one arm of a lever i^2 , fulcrumed at i^3 on the arm and provided at its end with a block or projection i^4 , which when said slide f^4 is raised high enough to carry the finger beyond the range of the notched projections

d^3 is dropped in front of an arm a^9 , connected with the rock-shaft a^5 , forming part of the needle-actuating mechanism, preventing the said needles from being carried forward under the action of the spring a^8 . The lever i^2 is acted upon by a spring i^5 , as shown, which raises it, so as to remove the obstruction i^4 from the path of movement of the arm a^9 , except when the said lever is positively acted upon by the projection i , so as to depress the said obstruction i^4 into position to prevent the movement of the arm a^9 and the needle-actuating arm a^4 , connected therewith, through the rock-shaft a^5 . The lever i^2 is so proportioned that the obstruction i^4 is lowered into such position as to prevent the movement of the needles when the slide f^4 is raised high enough to throw the arm e^2 beyond the range of all the yarn-carrier arms d^3 , or, in other words, when the machine is to go through an idle movement. The said needles thus retain the loops of the course last knit under their beards, and at the next course when the pattern-chain is advanced, so that one of the yarn-carriers is traversed, the projection i^4 will be raised and no longer constitute an obstruction to the advance of the needles, which will thus go forward, receive the yarn, and continue the knitting operation in the usual manner.

The vertical needles b may go through their usual movement in the idle movement of the machine, but will not cast off their loops, as the latter are held by the needles a , drawn back across the shanks of the needles b and at such height that the beards of the needles b are not closed by their presser until after they have passed below the loops held on the said needles and supported by the needles a . In the ordinary knitting operation when the loops are cast off by the needles a the fabric drops a short distance, so that the corresponding loops on the needles b come lower down and thus pass outside the beards of the needles b , which are closed before reaching them in the downward movement of said needles; but when the needles a are prevented from moving, as just described, in the idle movement of the machine the corresponding loops on the needles b will not, as before stated, drop far enough to pass outside their beards, and said needles b will merely move up and down through the said loops without producing any effect upon the fabric.

By the mechanism thus far described a single course or any desired number of courses

may be knit, if desired, in carrying out a given pattern with only the loss of time occasioned by a single idle movement of the machine each time that the desired pattern requires that the new yarn should be taken at the opposite end of the traverse from that at which the yarn just knit is left.

It is to be understood that, with the exception of the links g^{10} of the pattern-chain and the obstruction i^4 to the operation of the needles a and devices for operating such obstruction, the machine is all of usual construction, and that said devices can be readily applied to said machines without any change whatever in their existing parts, although the invention is not limited to the specific construction of the other parts of the machine to which the novel devices are applied. Any other knitting mechanism having substantially the same mode of operation to which said devices can be applied is regarded as a substantial equivalent for that hereinbefore mentioned, as it is obvious that the mechanism can be varied, and that, for example, instead of a pattern-chain, as represented, any pattern device having suitable projections to control the position of the slide f^4 or to otherwise control the engagement of the various yarn-carriers with their actuator is a substantial equivalent for the pattern-chain shown.

I claim—

In a knitting-machine, the combination of a gang of needles and means for actuating the same, a series of yarn-carriers for supplying the different yarns to the said needles and an actuator for said yarn-carriers, and a pattern and connections between said pattern and said actuator, whereby the latter is caused to engage with the yarn-carrier determined by the pattern, and a pattern projection that permits the actuator to traverse its whole course without engaging any yarn-carrier, and an obstruction operated by said pattern projection that prevents the needles from operating in the operation of the machine when the actuator traverses without engaging any yarn-carrier, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER COULT.

Witnesses:

J. M. GOODALE,
M. H. YOUNG.