(No Model.) 3 Sheets—Sheet 1.

N. A. WOODHEAD.

JACQUARD MECHANISM FOR LOOMS.

No. 511,986. Patented Jan. 2, 1894.

FIG. 1

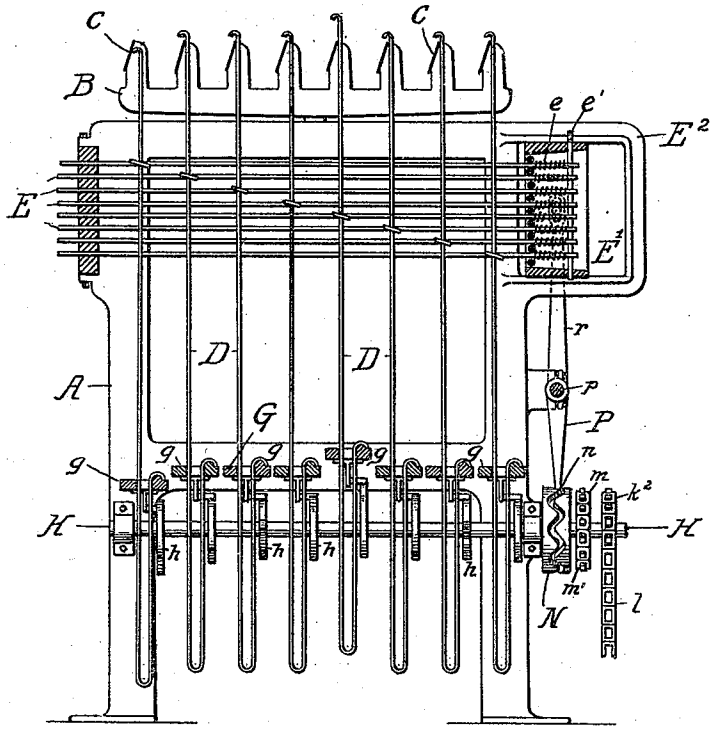

FIG. 4

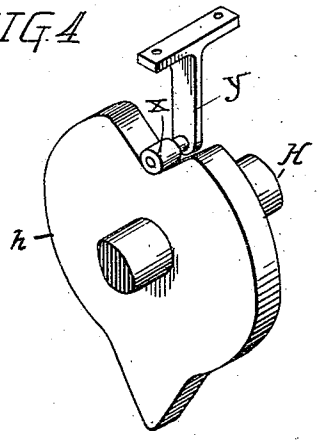

FIG. 3

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FIG. 2

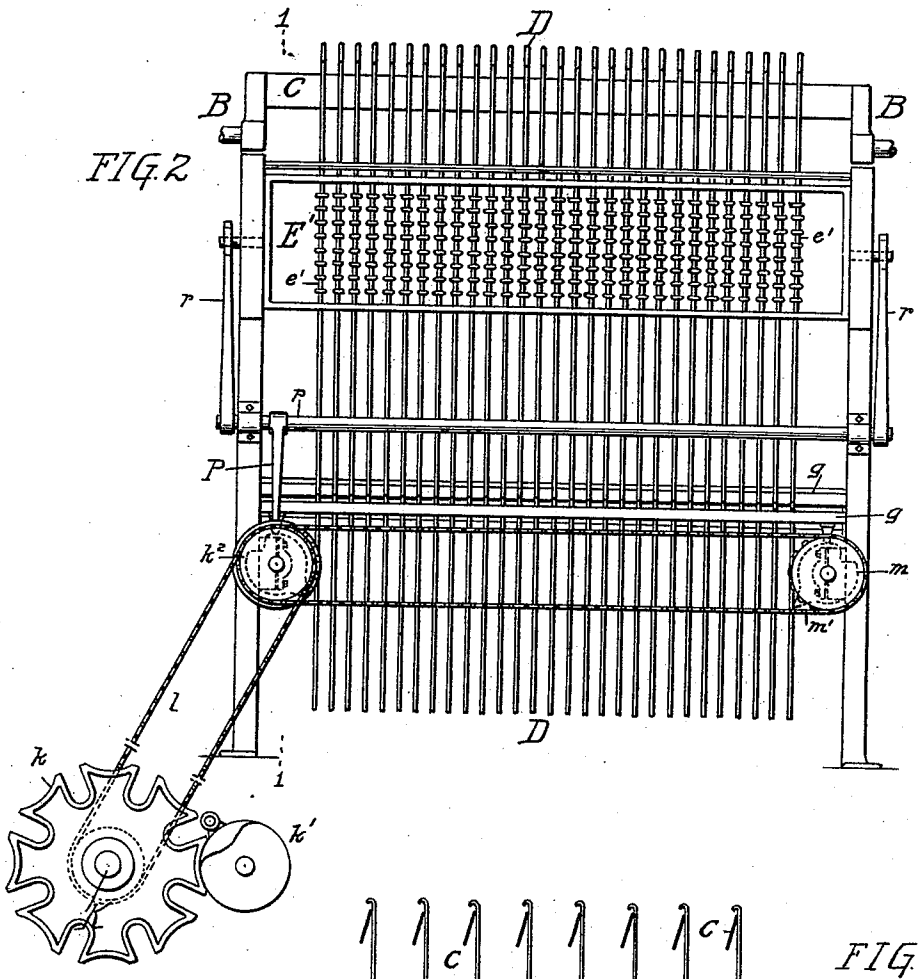
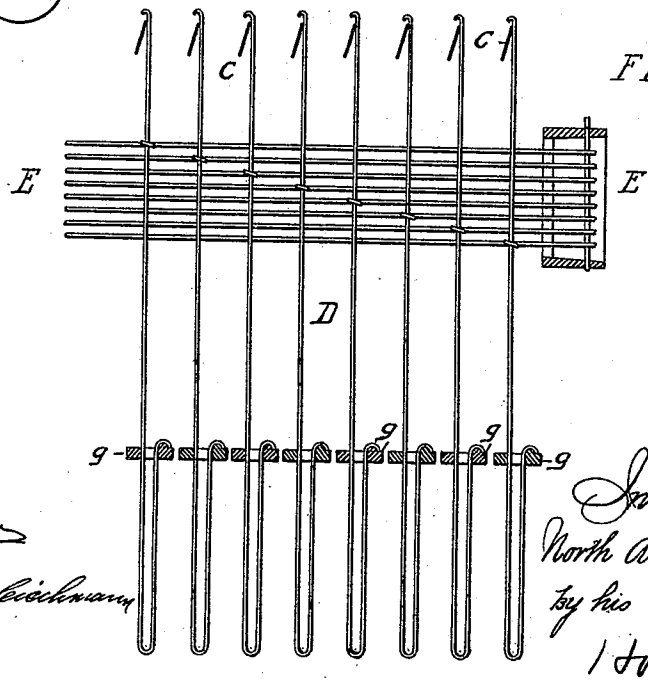


FIG. 5



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(No Model.) 3 Sheets—Sheet 3.

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No. 511,986. Patented Jan. 2, 1894.

FIG. 6

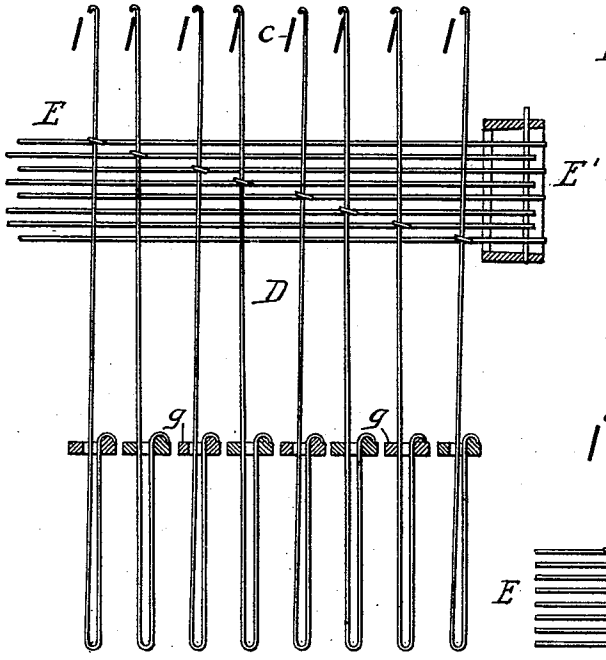


FIG. 7

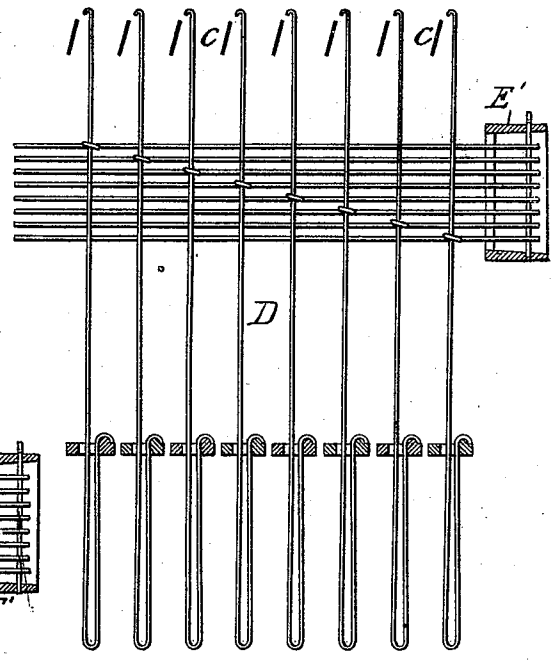
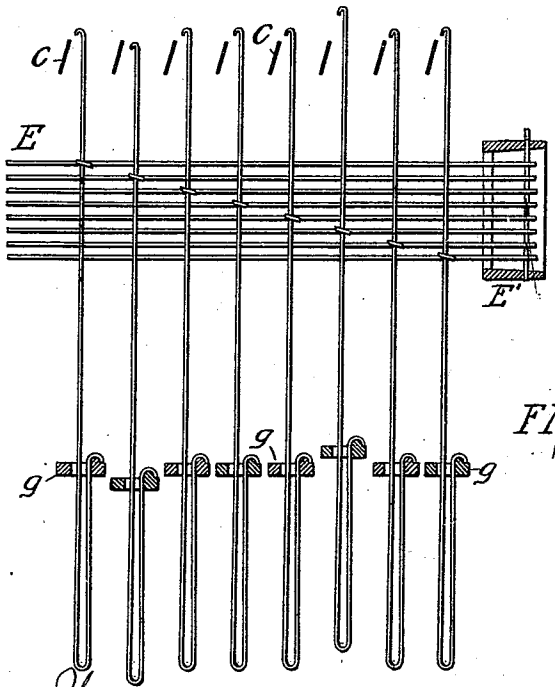


FIG. 8



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JACQUARD MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 511,986, dated January 2, 1894.

Application filed May 8, 1893. Serial No. 473,404. (No model.)

To all whom it may concern:

Be it known that I, NORTH A. WOODHEAD, of the city of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Jacquard Mechanism for Looms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention has relation to jacquard mechanism and has for its object the construction of a jacquard adapted more especially for use in the weaving of twilled fabrics and is designed to lessen the number of pattern cards now employed when weaving this material with an ordinary jacquard. In twilled fabrics each warp thread instead of passing under and over successive weft threads, passes under every third, fourth, fifth, &c., weft and over the remaining threads, producing on the surface of the fabric an apparent diagonal rib and on the opposite side of the fabric other warps are disposed in a similar manner to produce the same effect. To gain this effect with the aid of an ordinary jacquard it is necessary to employ a very large number of intricate pattern cards to effect the raising and lowering of the required warp threads to form the shed and the jacquard, especially when weaving patterned goods, is very much complicated.

In carrying my invention into effect I propose to so construct the jacquard as to divide the entire number of vertical lift hooks into a number of series, the number of such series depending on the character of the twill to be made, and in the present instance where the warp is supposed to pass over seven weft threads the arrangement of the series of hooks is such that at each pick, one eighth of the entire number of hooks will fall automatically and form the lower part of the shed and one eighth of the entire number of hooks will be raised to form the upper part of the shed.

In the accompanying drawings Figure 1 is a transverse sectional elevation on the line 1—1 Fig. 2 of sufficient of a Jacquard mechanism to illustrate my invention. Fig. 2 is a rear view of the same. Figs. 3 and 4 are detached perspective views of details and Figs. 5 to 8 are diagrams illustrating the positions assumed by the various parts at successive stages of the operation of the device.

In the drawings the card cylinder has been omitted but its position and operation form no part of this invention as any ordinary form of cylinder may be employed.

A represents a suitable framework provided with the usual guideways for the griff frame, B, supporting griffs or knives C, of ordinary construction which are adapted to act upon the usual lift hooks, D, the latter being as usual under the control of the cross wires or needles E, which are acted upon by the card cylinder to alter the position of the lift hooks as successively fresh cards are forced against the ends of the wires. These devices may be of any ordinary construction and operate as usual in devices of this class.

The spring box, E′, in which the ends of the cross wires are held is of any suitable construction and is provided as usual with a series of springs, *e*, one surrounding each of the cross wires and the usual locking pins, *e′*, to prevent any excessive movement of the wires.

The spring box, E′, is held in suitable guideways, E^2, in the upper portion of the frame, A, and carried by suitable levers pivoted to the opposite sides of the frame or so mounted in any suitable manner as to be capable of a movement in the direction of the length of the cross wires, E, and as each of such cross wires is to a certain extent held by the spring box, each cross wire will be moved with each movement of the box. The lower board, G, which in an ordinary jacquard is a solid structure forming a support for the lift hooks is in this case divided into a number of sections *g*, equal in number to the number of rows of lift hooks extending transversely across the machine and each section serves to carry one of such rows of hooks. The opposite ends of each section, *g*, are suitably guided by the frame in such manner as to be capable of movement in a vertical direction only and each section is capable of movement independent of any of the other sections.

In the drawings I have illustrated, for the sake of convenience, eight transversely extending rows of lift hooks and eight sections,

g, forming the lower board. Six of the sections, g, or six eighths of the entire number are shown on same level, the upper ends of the lift hooks they support being a short distance above the griffs, C, in the position ordinarily assumed by the lift hooks of a jacquard when not in operation. One section, or one eighth of the entire number, representing one eighth of the entire number of warp threads on the beam are lowered to such position that the upper ends of the lift hooks supported thereby are below and in the rear of the griff or knife which ordinarily raises them so that every eighth thread is in the lower portion of the shed to form the twill on the lower face of the fabric. One section, or one eighth of the entire number, also representing one eighth of the entire number of warp threads on the beam, is raised to such a position that the upper ends of the lift hooks carried thereby are above and directly in the path of one of the griffs or knives and each of the hooks will, as hereinafter described, be so raised by the knife as to bring one eighth of the warp threads into position in the upper shed to form the twill on the upper face of the fabric. The remaining six eighths of the threads are disposed in either the upper or the lower portion of the shed or partly in both as dictated by the pattern to be made, and the lift hooks which govern the position of these threads are operated upon by the proper cross wires and knives in a manner similar to that accomplished by an ordinary jacquard.

Referring now to Figs. 1, 2, 3 and 4 I will proceed to describe one form of mechanism which may be employed for effecting the movements of the various sections of the lower board and of the spring box. On each side of the frame of the machine and adapted to suitable bearings thereon is a shaft, H, carrying a series of cams, h, equal in number to the number of sections of the lower board and each cam being of precisely the same contour as more clearly shown in Fig. 3. The cams are so disposed upon the shafts and the latter are so moved that the cams will act successively on the various sections of the lower board, for instance as illustrated in Figs. 1 to 8. In Fig. 1 the first of the series of sections is shown as lowered, the fifth as raised and the remainder at the normal level. The griffs are then raised and after one pick in this position the shafts, H, are moved one eighth of a revolution, bringing the operating portions of the second and sixth pairs of cams under the second and sixth sections of the lower board, lowering the second section and raising the sixth section and so on throughout the series, one section being lowered and one section raised at each partial rotation of the shafts, H. The cams, h, are arranged as shown in Fig. 1, and more clearly in Fig. 3 in such manner that the projecting and depressed portions of their peripheries will be moved successively under successive sections of the lower board, the cams acting on anti-friction rollers x carried by brackets y depending from each section, as shown in Fig. 4, and this step by step movement may be given by star locking wheels, k, k', the operating wheel k' being secured to, say the crank shaft of the loom, or otherwise so operated as to rotate once at each pick and eight complete revolutions being necessary to complete one revolution of the wheel, k, or the number of revolutions may be increased or diminished as may be necessary, this depending on the number of movable sections, g, and the character of the twill to be made.

On the shaft, K, is a sprocket wheel adapted to rotate a sprocket wheel, k^2, on one of the shafts, H, through the medium of the link belt, l, and each shaft, H, has a sprocket wheel, m, the latter being connected together by a link belt, m', so that both will rotate at the same speed and the cams, h, under the various sections will act in pairs.

Near one end of one of the shafts, H, is secured a cam, N, provided with a peripheral groove, n, in which is traveled one end of a lever, P, secured to a rock shaft, p, mounted in suitable bearings on the frame, A, and from the shaft, p, extend levers, r, to the opposite ends of the spring box, E'. The construction of the cam, N, is such that at each eighth part of a revolution the spring box will be drawn back, carrying with it all of the cross wires and all of the hooks in the jacquard being thus drawn back until their hooked ends are beyond the line of travel of the griffs. The spring box is then released to permit the lift hooks to assume the position they occupied before this movement, but before being released one pair of the cams, h, will have been so moved as to effect the lowering, and another pair the raising, of one of the sections, g, of the lower board. This backward movement of the spring box by withdrawing all the hooks of the jacquard beyond the line of travel of the griffs enables the lowering of any row or rows of hooks which may be necessary to form the lower twill.

The operation is as follows:—With the parts in the position shown in Fig. 1 the first section and its row of hooks being lowered so as to form part of the lower portion of the shed and the fifth section and its row of hooks being raised to the position shown, the card cylinder has operated and is about retreating and the griff starting to rise. The griffs on their upward movement will carry with them such of the lift hooks as have not been acted upon by the cross wires on the jacquard and will form the upper part of the shed and the first movement of the griffs is sufficient to engage with the hook ends of those of the lift hooks left in the normal position and not supported by either the first or the fifth section of the lower board. The first section is of course, left down as the upper ends of the lift hooks of this section are below the knife, and the upper ends of the hooks of the fifth section have been moved

to such a distance above the fifth knife that even though some or all of its hooks have been operated upon by the pattern card and forced back, the card cylinder will have been moved beyond the ends of the cross wires before the knife reaches the hooks, and such of the hooks as have been moved by the card are of course released when the card cylinder retreats and all of the hooks of this section assume a position directly in the path of the knife and are raised by the further movement of the griff to form the upper portion of the shed. As the griff descends, in readiness to form the next shed, the hooks of the various sections will, for the time being, assume the normal level and occupy the position such hooks ordinarily occupy in a jacquard as shown in Fig. 5; the card cylinder is then moved back against the cross wires, E, and acts on such of the lift hooks as may be necessary to form the pattern say on the first, third, fifth and eighth wires as shown in Fig. 6; immediately after this movement the spring box, E′, is drawn back and with it every cross wire and every lift hook in the jacquard until they assume the position shown in Fig. 7, the extent of movement being sufficient to move the upper ends of the lift hooks out of the path of the knives; the second pair of operating cams and the sixth pair of operating cams are then moved respectively under the second and sixth sections, *g*, of the lower board while the spring box holds the hooks in this position (Fig. 7), the hooks carried by the second section are lowered until their upper ends are below the knife, and the hooks carried by the sixth section are raised to the same height as the hooks on the fifth section were raised to at the previous pick the parts at this time being in the position shown in Fig. 8; the spring box then reassumes its normal position, the cross wires being forced against the card cylinder and assuming the position occupied by them immediately after the card cylinder acted as shown in Fig. 6, except that the second row of hooks is lowered and the sixth row of hooks, raised; the griffs then rise and as soon as they start to move the lift wires in their path the card cylinder is moved away permitting the cross wires to assume the inoperative position and all of the hooks of the sixth row assuming a position directly in the line of travel of the sixth knife and all of the warp threads attached to this row of hooks being elevated to form part or all of the upper portion of the shed.

The number of rows of hooks may be increased to any desired extent and if, for instance, twenty four rows be employed each cross wire may be connected to three hooks, that is to say every eighth hook, diminishing the number of cross wires usually considered necessary in a jacquard.

In weaving twilled patterned fabrics, as ordinarily practiced, a fresh card must be employed after each pick, to change the shed, even where the pattern is not altered for a number of picks; this changing being necessary only for the purpose of altering the position of the threads for forming the twill.

In a jacquard constructed in accordance with my invention, the cylinder and perforated cards are really necessary only when weaving a patterned fabric, and even then while weaving between figures, longitudinally of the fabric, the operation of the cylinder may be suspended by the operation of a suitable pattern chain or other device which will prevent the rotation of the card cylinder, the same card being forced against the ends of the cross wires time after time, and the twilling effect being produced by the successive movements of the lower board. This temporary suspension of the action of the card cylinder may also take place at such times when weaving figures as there may be no change in the disposition of the warp threads forming the figures, while in weaving unpatterned or plain twilled fabrics, the card cylinder may be entirely dispensed with and no cards whatever employed.

Various mechanisms for operating the sectional lower board may be employed and I do not limit my invention to the particular form described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination in a Jacquard mechanism, of a sectional lower board, a movable spring box, and devices for effecting the movement of the sections of the lower board and of the spring box.

2. The combination in a Jacquard mechanism, of a lower board comprising a series of independently movable sections, devices for effecting a movement of such sections, the lift hooks, cross wires connected thereto, a spring box carrying said cross wires and mechanism for effecting the movement of such spring box.

3. The combination in a Jacquard mechanism, of the supporting frame, guides thereon, a movable spring box adapted to such guides, the lift hooks, cross wires connected to such lift hooks and secured to the spring box, with a sectional lower board and devices for operating each section thereof independently of the other sections, substantially as specified.

4. The combination in a Jacquard mechanism of a lower board comprising a series of independently movable sections, a series of rows of lift hooks equal in number to the number of such sections and each row being supported upon a separate section, devices for effecting the movement of such sections in succession, cross wires connected to the lift hooks, a spring box carrying said cross wires and devices for effecting the movement of such spring box, substantially as specified.

5. The combination in a Jacquard mechanism of a supporting frame, guides thereon, a

movable spring box adapted to such guides, cross wires carried by the spring box, lift hooks on which said cross wires are adapted to act, a lower board comprising a series of independently movable sections, each of such sections being adapted to support one row of lift hooks and mechanism for lowering one of such sections and its hooks and raising another of such sections and its hooks immediately before each pick of the loom, substantially as specified.

6. The combination in a Jacquard mechanism, of the lift hooks, cross wires connected thereto, a movable spring box carrying such cross wires, devices for moving such spring box, a lower board comprising a number of independently movable sections each of which supports a row of lift hooks, a series of cams adapted to act upon such sections in succession, shafts supporting said cams and mechanism for imparting a step by step movement to such shaft, substantially as specified.

7. The combination in a Jacquard mechanism, of the lift hooks, cross wires connected thereto, a movable spring box carrying such cross wires, devices for effecting the movement of the spring box, a lower board comprising a series of sections each of which is adapted to support a separate row of lift hooks, shafts, as H, at the opposite sides, cams thereon adapted to operate successively and in pairs on the sections of the lower board and mechanism for imparting to the shafts a partial rotation of each pick of the loom, substantially as described.

8. The combination in a Jacquard mechanism, of the lift hooks, cross wires connected thereto, a movable spring box carrying such cross wires, shafts as H, a cam as N, thereon having a peripheral cam groove, a lever fulcrumed to the framework and having one of its ends connected to the spring box and its opposite end adapted to such cam groove, a lower board comprising a series of independently movable sections each of which is adapted to support a separate row of lift hooks, cams on said shaft, H, adapted to operate in succession on the sections and devices for imparting a step by step movement to such shaft, H, substantially as specified.

In witness whereof I have hereunto set my hand this 29th day of April, A. D. 1893.

NORTH A. WOODHEAD.

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H. GORDON MCCOUCH.