Oct. 13, 1936. A. FRIEDMANN 2,057,375

KNITTED FABRIC AND METHOD FOR MAKING THE SAME

Filed June 15, 1932 3 Sheets-Sheet 1

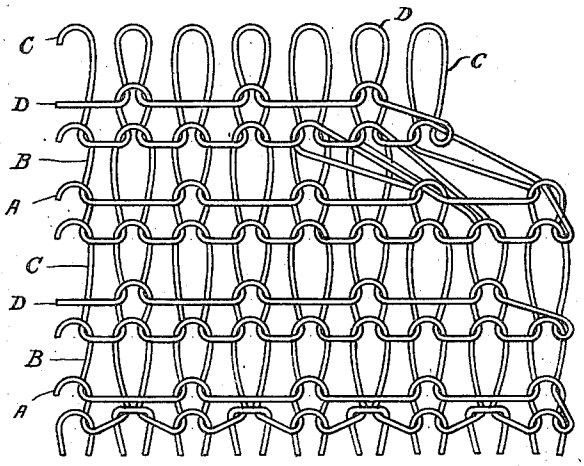


FIG. 1

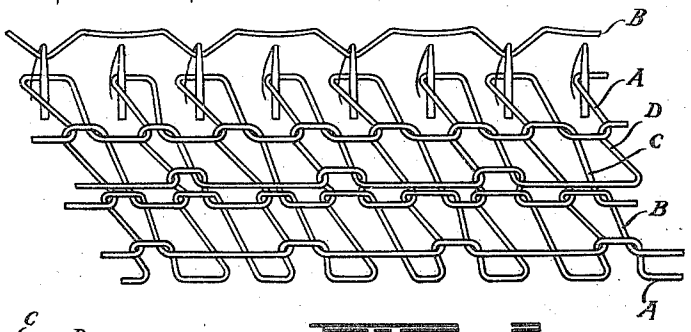


FIG. 2

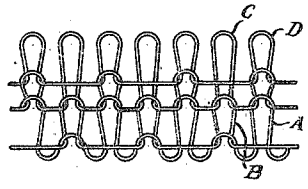


FIG. 6

FIG. 13.

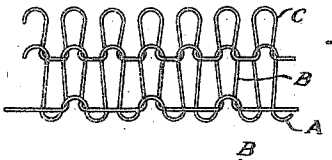


FIG. 5

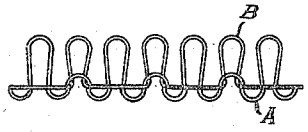
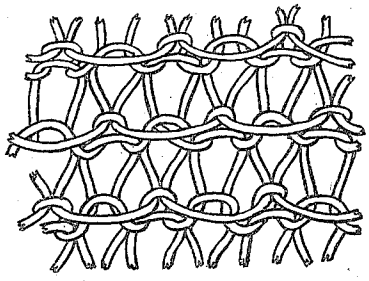


FIG. 4



FIG. 3



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KNITTED FABRIC AND METHOD FOR MAKING THE SAME

Filed June 15, 1932 3 Sheets-Sheet 2

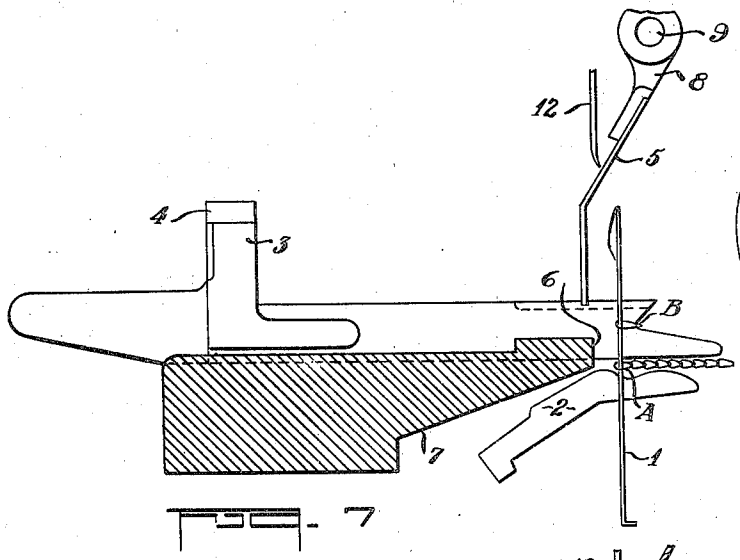


FIG. 7

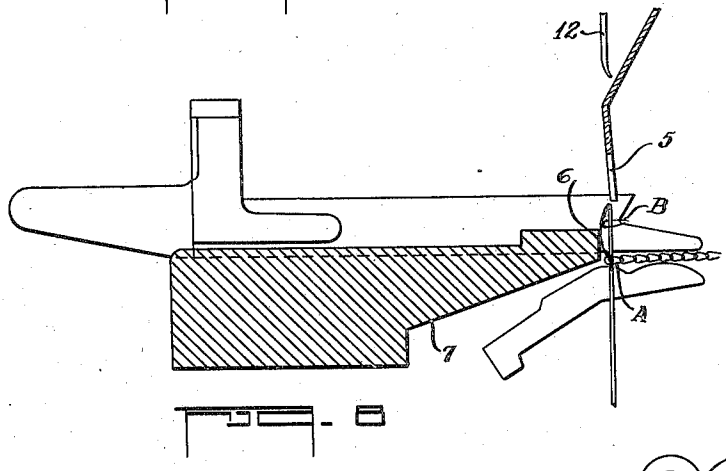


FIG. 8

FIG. 14

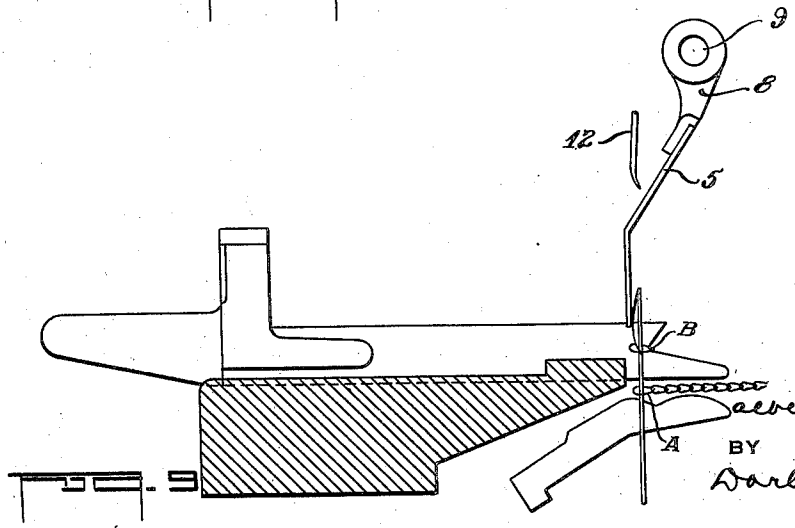


FIG. 9

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KNITTED FABRIC AND METHOD FOR MAKING THE SAME

Filed June 15, 1932 3 Sheets-Sheet 3

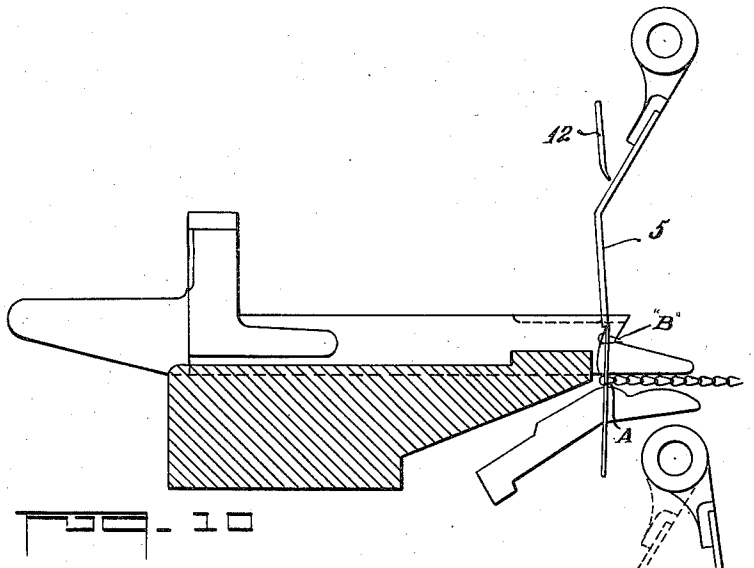


FIG. 10

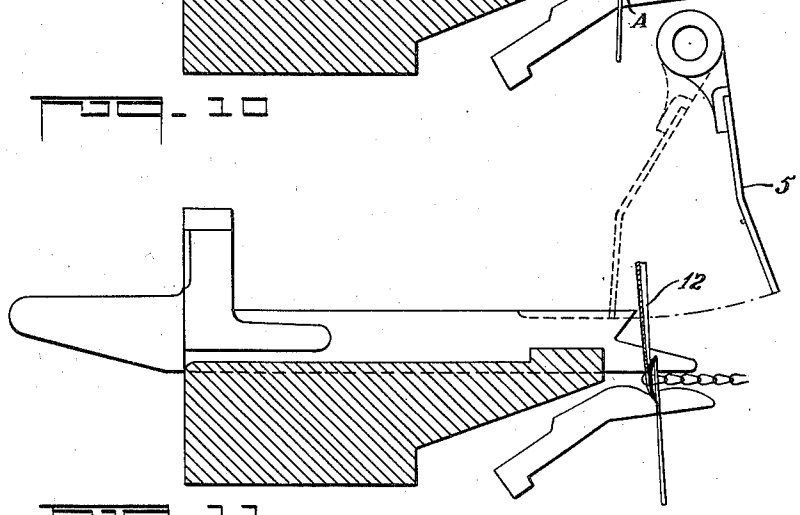


FIG. 11

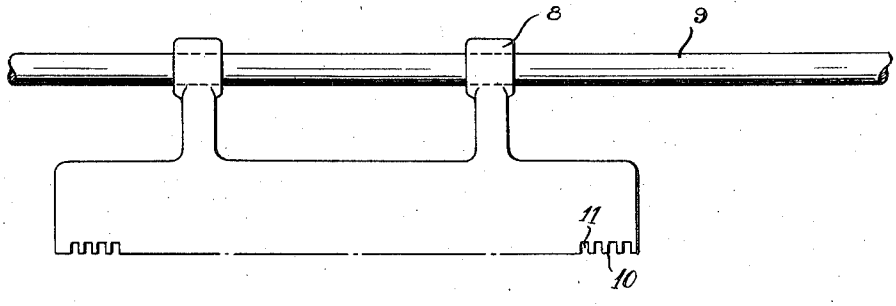


FIG. 12

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Patented Oct. 13, 1936

2,057,375

UNITED STATES PATENT OFFICE

2,057,375

KNITTED FABRIC AND METHOD FOR MAKING THE SAME

Albert Friedmann, Wyomissing, Pa., assignor to Louis Hirsch Textile Machines, Inc., New York, N. Y., a corporation of New York

Application June 15, 1932, Serial No. 617,321

3 Claims. (Cl. 66—169)

This invention relates to knitted fabrics particularly of the single thread full fashioned type, to a method of producing them in a simple and economical manner on a flat knitting machine of the cotton type employing spring beard needles.

Among the objects of this invention is the production of a single thread fabric having all of the qualities inherent in the best hosiery fabric, but in which the tendency to run through the breaking of a thread is greatly reduced, if not entirely eliminated.

As is well known in the art, particularly to those who manufacture silk hosiery, if a thread of one loop breaks the loops ahead and behind in the same needle wale are no longer anchored and so open up. This opening progresses successively from loop to loop resulting in what is known as runs or ladders. If a thread is broken before the stocking is put on this running or laddering becomes aggravated as soon as the stocking is stretched over the leg so that it is often ruined before it has been worn.

A further object of the invention is the production of such a fabric without the transferring or cross of loops from one needle wale to another with the exception of those used in fashioning and which, consequently, with this exception consists of but a single layer of loops throughout with the result that the face or outer surface of the fabric is uniformly smooth. This minimizes the danger of pulled threads during later use.

Hitherto attempts have been made to produce non-run single thread fabric on flat bar knitting machines by transferring loops from one needle wale to another or by the introduction of an interlocking warp thread. In so doing the stocking has lost some of its major full fashioned characteristics, such as the identifying fashion marks, neat and comfortable seams, proper transverse and longitudinal elasticity, etc. By the invention of this application run-resisting fabric is produced possessing all of the desirable characteristics of the best grade of hosiery fabric including finished selvages and fashioning marks.

Moreover, because of the manner in which the fabric is made no time is lost in transferring loops or in laying in additional threads so that the same rate of production as in plain knitting is maintained. Furthermore, no changes are required in the timing of the movements of the various loop forming elements so that much work and expense is eliminated in comparison with the ordinary methods of production. If the fabric of this invention happens to be damaged during the manufacturing process the yarn may be readily back-wound so that much waste is eliminated.

It is well known in knitting fabric on a flat bar knitting machine that a single thread runs across the fabric in a series of loops, each of the loops in one course being chained or linked to the loops in the same wale of the next preceding and succeeding courses. The nature of the usual loops is well understood. One characteristic is that ordinarily they are all of the same length. In case of breakage of the thread in one loop the adjacent loops in the same needle wale will have nothing to hang to and will, consequently, open up and a run will begin.

By this invention loops of unequal length are linked together in the same needle wale in such a way that in case a thread breaks the run will progress only as far as the next enlarged loop. The longer loop cannot easily pass through the shorter one so that a substantial guard against running is afforded. As a matter of fact, the longer loops can be unlinked from the shorter ones only by deliberately and violently pulling the fabric transversely.

The fabric of this invention can be made by hand or upon standard types of flat knitting machines. When made upon a flat knitting machine suitable means should be employed for modifying the needle pressing operations.

A clearer understanding of the invention may be had by reference to the following diagrammatic drawings in which—

Figure 1 shows the back surface of the improved fabric with the loops somewhat loosened up to more clearly indicate their formation and relation;

Fig. 2 shows a perspective view of fabric in similar condition to that shown in Fig. 1 as it hangs on the needles showing how some of the new loops are being pulled through the old ones, while other new loops are being thrown off the needles, while the old loops on these same needles are retained thereon;

Figs. 3, 4, 5, and 6 show in similar condition the fabric after the first, second, third and fourth courses, respectively, are formed; in short, the complete development of the improved loop construction;

Fig. 7 shows the loop forming elements of a conventional cotton type knitting machine suitable for use in producing a fabric according to my present invention with old and new loops positioned on the needles and sinkers just after couliering and dividing as the needles begin to descend; it also shows diagrammatically a form of attachment for modifying the operation in producing the fabric of this invention;

Fig. 8 shows the same elements in an advanced position to illustrate the conventional manner in which the new loops are kept under the beard while the old loops are pressed or stripped over the beards;

Fig. 9 shows the first stage in the manipulation of some of the needles to make the peculiar stitch of the invention and how the new loops are

forced over the needle beards preparatory to being dropped from the needles;

Fig. 10 shows the second stage of special manipulation of the needles shown in Fig. 9, and how the old loops are retained on the needles by preventing the needle beards from engaging with the regular press edge;

Fig. 11 shows the arrangement of the loop forming elements during the fashioning or narrowing cycle and how the special press bar is thrown out of operation at this time;

Fig. 12 is a front view of the special presser bar;

Figure 13 is a view similar to Figures 1 and 2, but somewhat enlarged showing the arrangement and relative sizes of the loops and the closure of the loops in the completed fabric with the extremely short loops pulled tightly around the bases of the longer loops; and

Fig. 14 is a diagrammatic view of a full fashioned stocking blank as produced on a flat bar knitting machine.

In the drawings no attempt has been made, except in Figure 13, to maintain actual and correct dimensions and links of the loops, but as stated, Figures 1 to 6 show the fabric with the loops in loosened up condition in order to more clearly show the relation of the loops.

To start the knitting of the fabric of this invention the course of loops is laid, formed and pressed in the usual way as shown in course A of Fig. 3. At the end of this operation there will be a loop hanging on each needle shank between sinkers 3 and knock-over bits 2, (Fig. 7).

Yarn for course B is then laid and loops are sinkered and divided around each needle. But instead of pressing off all the old loops of course A (hanging on needle shanks) and pulling all the new loops of course B (those in process of formation) through them, only alternate old loops are pressed off and their complementary new loops drawn through them. The old loops of course A on the remaining needles are not pressed off, and the complementary new loops of course B are thrown from their needles which results in a thread stretching or floating from one normal loop to the next. The loops in course A which were not pressed off are consequently elongated to what may be called a long length loop, while those which were pressed off are correspondingly shortened to what may be called a short length loop. Because alternate loops in course B are first partially formed but then thrown from the needles, those remaining are elongated into medium length loops. Upon completion of course B, there are now the long loops of course A on alternate needles, while the remaining needles carry the loops of intermediate length formed in course B. These course B loops are connected to the short loops of course A.

Yarn for course C is now laid, sinkered and divided. All the loops hanging on the needle shanks (those formed in courses A and B) are now pressed off and the new loops of course C are pulled through them in the usual manner, (Fig. 5).

Course D is now laid, sinkered and divided, but, as in courses A and B, only alternate loops of course C are pressed off, and only corresponding new loops of course D are drawn through them. In course D, however, the needles which were not pressed in course B are now pressed so that in each needle valve there is a long loop, then an extremely short one, then one of medium length, again a long one, etc.

Figs. 1 to 6 of the drawings illustrate this method of knitting. The fabric is, of course, greatly enlarged or loosened up in these figures to clearly show the loop formations. In actual practice the short loops are so short that they surround the bases of the following long loops in the same wale so closely that they effectively anchor the long loops and make it substantially impossible for them to slip through the short loops unless unusual strain is applied to the fabric with the deliberate intent of making them do so.

A run-resisting fabric is thus produced in a very simple manner without the transfer of loops from one wale to another and without the introduction of additional interlocking warp threads or any other complications. The fabric retains its highly desirable characteristic of uniform thickness throughout and no trouble is experienced in making uniform selvages and, consequently, neat seams. Also the elasticity of the fabric is unimpaired.

A further characteristic of very great value is that the fabric of this invention may be fashioned by narrowing without the least difficulty simply by transferring selvage loops after such courses as B and D are knit from one needle to another in the well known manner. Thus the important identifying characteristic of full fashioned hosiery, i. e., the fashion marks, may be preserved.

In Figures 7 to 12, I have shown somewhat diagrammatically one form of apparatus suitable for use in carrying out my invention. In general, the apparatus shown is that of a flat knitting machine of standard construction having the usual arrangement of spring bearded needles 1, sinkers 3, dividers 4, knock-over bits 2 and presser edge 6. In addition, there is provided an auxiliary presser bar 5 rockably mounted on a suitable shaft 9 which may be operated from the main cam shaft of the machine. The press edge of auxiliary presser bar 5 is provided with a series of points 10 spaced so as to engage with every other needle and to function to close the beards of those needles before the action of the regular presser edge 6 would normally take place, and directly thereafter to permit the beards to open but to still prevent engagement between these needles and presser edge 6. The spaces 11 between points 10 are sufficiently deep so as not to interfere with the pressing of the remaining needles on the regular press edge 6 in the usual manner. The operation of the various parts will be clearly understood from a description of the novel method of forming the fabric of my invention.

The loops in course A formed in the usual manner, ultimately hang on needles 1 between the knock-over bits 2 and sinkers 3 (Fig. 7). A new course (course B) is laid and formed around the needles by sinkers 3 and dividers 4 at the throat of the sinkers and dividers (Fig. 7). Then auxiliary presser bar 5 is rocked forward with the result that as the needles descend in the usual manner the beard of every other needle will be first closed and then permitted to open, but these needles will be held out of contact with presser edge 6 through engagement with auxiliary presser bar 5, whereas the remaining needles will be pressed against the regular presser edge 6 as usual. The result of this operation is that the loops of course B carried by those needles which are pressed against the regular presser edge 6 will pass under the needle beards, and the cor-

responding loops of course A will be pressed off over the beards (see Fig. 8). On the other hand, the beards of those needles which engage with auxiliary presser bar 5 and are, consequently, prevented from pressing against presser edge 6, are closed before the normal press would occur with the result that when they reach the new loops of course B these loops will slide over instead of under the beards (see Fig. 9).

As the needles continue to descend, presser bar 5 continues to withhold these needles from contacting with presser edge 6, but allow their beards to open so that the old loops of course A hanging thereon pass under the beards, i. e., are not pressed off (Fig. 10).

Now as the needles and sinkers complete their loop forming cycle, loops of course B hanging on those needles which were specially manipulated are thrown off and disappear, the neighboring normally formed loops taking up the slack and being elongated thereby into medium length loops, while the corresponding old loops in course A are retained on the needles and elongated into long length loops, the yarn required to elongate these loops being supplied by the neighboring loops which were normally pressed off; these latter loops becoming shortened into short length loops in the process.

Course C is now laid, all needles being normally pressed and the loops pulled through the medium length loops of course B, and the long loops of course A. Course D is then laid, sinkered and divided and alternate needles manipulated as in course B, but this time those which were not manipulated in course B are brought into engagement with auxiliary presser bar 5, said auxiliary presser bar being shifted laterally one needle by suitable mechanism which may be similar to the well known means heretofore employed for positioning lace points. By thus knitting plain courses between special courses and staggering the position of loops formed in these special courses a fabric is produced in which each needle wale consists of long, short, and medium length loops, the loops adjacent the medium and short loops of one wale being long.

Presser bar 5 may consist of a slotted and drilled bar with removable press points, or it may be a slotted plate in which case the points 10 are an integral part thereof. The well known picot or lace bar may also be used to serve this purpose by providing it with suitably shaped press points. It will be understood, of course, that such a bar could no longer serve its picoting or lacing functions.

As will be obvious to persons skilled in the operation of flat knitting machines, the presser bar 5 in whatever form it may take, may be mounted and operated in the proper timed relation in any suitable or convenient manner. Inasmuch as this structure forms no part of my present invention, detail description of the mounting and operation of the presser bar is necessary. It will be understood, of course, that the operation of narrowing a fabric in accordance with well known straight, flat knitting, does not effect nor is it effected by the carrying out of the peculiar knitting operations required in producing a fabric in accordance with my invention.

While the above description discloses the auxiliary presser bar 5 as manipulating alternate needles for every other course, it is also possible to arrange the presser bar to manipulate every third, fourth, fifth needle, or any desired needles in any desired course, the only changes required being in the spacing of the points 10 and the timing of the cam action which controls the presser bar.

Also, the fabric of my invention may be reinforced as usual or in any desired parts to form any desired pattern by the use of the usual additional reinforcing thread knit into the fabric with the other thread in the usual way. However, the loop formation of the reinforced portions have the novel characteristics and qualities of my invention.

What I seek to secure by United States Letters Patent is:

1. A run resisting plain knitted selvedge edged fashioned flat fabric knitted of a single thread and having repeats comprising a first course knitted with short tight stitches in alternate wales and long stitches in intermediate wales, a second and next adjacent course knitted with long stitches in alternate wales and having the yarn floated over intermediate wales, a third course next adjacent the second course knitted with long stitches in alternate wales and short tight stitches in intermediate wales, and a fourth course next adjacent the third course knitted with the yarn floated over alternate wales and knitted into long stitches in intermediate wales, whereby each two long stitches are followed by a short tight stitch for arresting a run in such wale.

2. A full fashioned selvedge edged stocking blank having the conventional fashion marks therein and formed of a fabric knitted of a single yarn and having repeats comprising a first course knitted with short tight stitches in alternate wales and long stitches in intermediate wales, a second course knitted with long stitches in alternate wales, and having the yarn floated over intermediate wales, a third course knitted with long stitches in alternate wales and short tight stitches in intermediate wales, and a fourth course having the yarn floated over alternate wales and knitted into long stitches in intermediate wales whereby each two long stitches are followed by a short tight stitch.

3. The method of knitting a run resisting flat selvedged edge fashioned fabric from a single thread which consists in laying and knitting a full first course of ordinary loops, laying a full second course and knitting the alternate loops only, linking these to the alternate loops of the first course, the intervening loops of the second course being floated across intervening loops of the first course, laying and knitting a full third course with its alternate loops linked to the alternate loops of the second course and intervening loops linked to intervening loops of the first course, laying a full fourth course and knitting the intervening loops only and linking these to the intervening loops of the third course, the alternate loops of the fourth course being floated across the alternate loops of the third course, and then laying and knitting a full fifth course, linking the intervening loops thereof to intervening loops of the fourth course and alternate loops to alternate loops of the third course to begin a new series of courses of the same character and arrangement.

ALBERT FRIEDMANN.