No. 646,910. Patented Apr. 3, 1900.

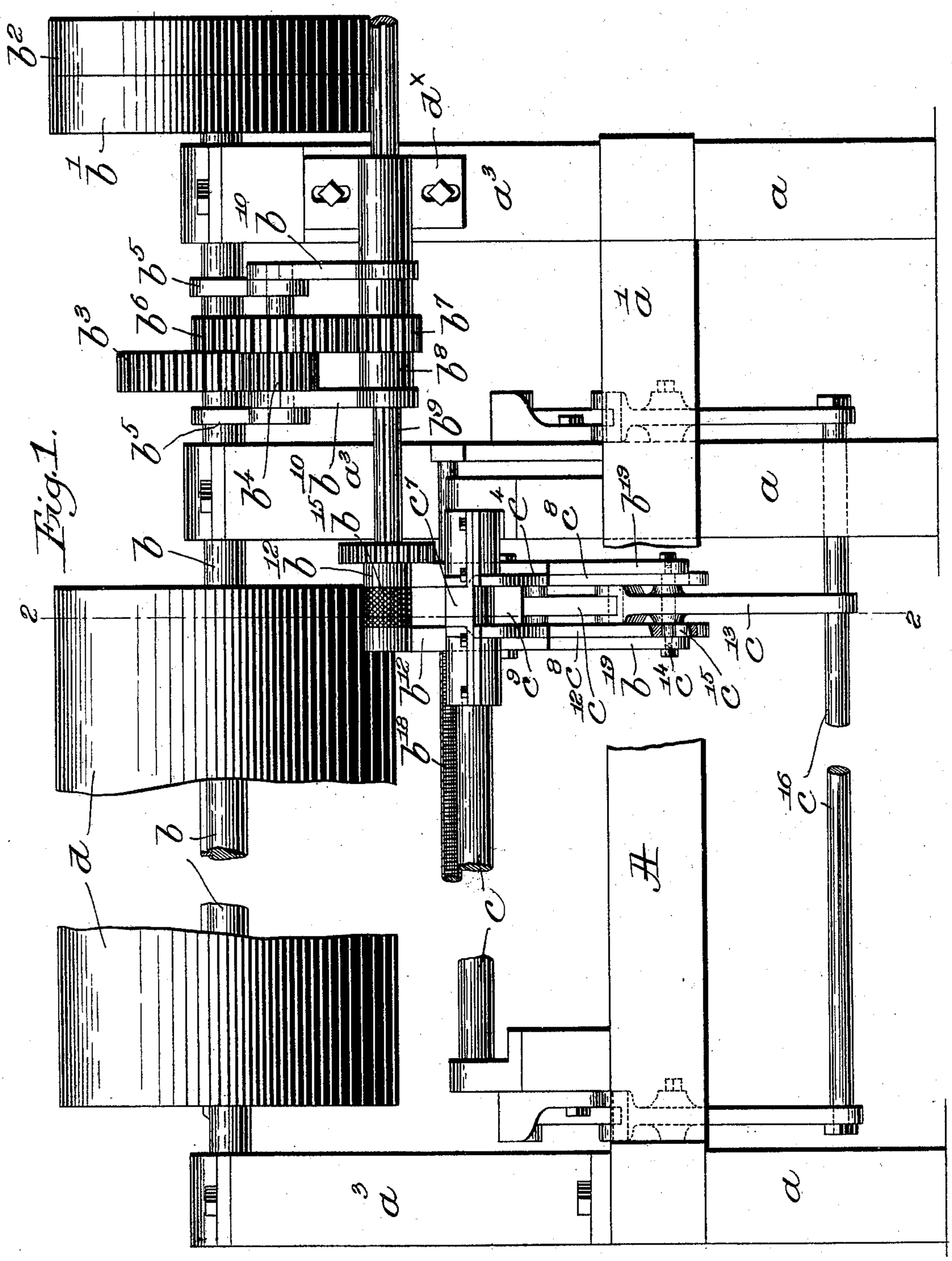
A. B. KEYES.

MACHINE FOR BENDING WOOD.

(Application filed Dec. 27, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



Witnesses:
Fred S. Grundy.
James M. Urquhart.

Inventor:
Atwood B. Keyes,
by Crosby Gregory,
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Fig. 3.

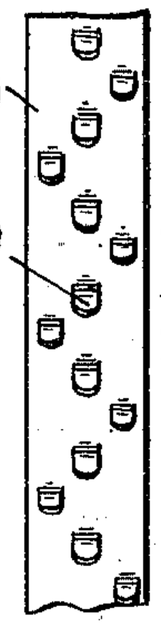

Fig. 4.

Fig. 2.

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UNITED STATES PATENT OFFICE.

ATWOOD B. KEYES, OF PRINCETON, MASSACHUSETTS.

MACHINE FOR BENDING WOOD.

SPECIFICATION forming part of Letters Patent No. 646,910, dated April 3, 1900.

Application filed December 27, 1897. Serial No. 663,707. (No model.)

To all whom it may concern:

Be it known that I, ATWOOD B. KEYES, a resident of Princeton, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Machines for Bending Wood, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention is an improved machine for bending strips of wood of considerable thickness—such, for instance, as are employed in making bicycle-rims.

In bending wood for the purpose mentioned and for analogous purposes it is essential that the fiber of the wood should retain its original strength so far as possible, and accordingly all stretching of the wood should be prevented, inasmuch as stretching ruptures the fiber and destroys the strength of the wood; and accordingly I have devised the present machine, which has for its object the positive crimping and compressing of the wood on its inner surface as it is wound on a cylinder.

My invention also preferably includes means whereby any number of successive lengths of wood may be continuously wound one after the other on one and the same drum in a spiral form, to be thereafter set or fixed in their bent form in usual manner.

By means of my improved machine no stretching of the wood is possible, but all the distortion thereof takes place as compression and is restricted entirely to the inner surface of the wood, leaving the outer circumferential surface thereof in its original and natural condition of greatest strength, and, moreover, by means of my invention the bending of wood for the purpose mentioned is rendered extremely simple, rapid, and inexpensive.

The constructional details of my invention and various other advantages thereof will be more fully pointed out in the course of the following description, reference being had to the accompanying drawings, illustrative of a preferred embodiment thereof, and the invention will be more particularly defined in the appended claims, also forming part of this specification.

In the drawings, Figure 1 shows my improved machine in front elevation, parts being broken away; Fig. 2, a vertical transverse section thereof, taken on the line 2 2, Fig. 1. Figs. 3 and 4 are detail views in plan and longitudinal section, showing a preferred form of the carrier-strap.

The frame A, comprising end and intermediate legs or standards a, carrying longitudinal timbers a' and cross-timbers a^2, on which are mounted vertical posts a^3, may be of any desired construction to accommodate the operating parts. On the posts a^3 is journaled a drive-shaft b, having at its outer end suitable fast and loose pulleys b' b^2 to receive a driving-belt from a usual counter-shaft. (Not shown.) At its other end the shaft b has removably mounted thereon a winding-drum d, which is normally rotated by the shaft b and will usually be of considerable length, preferably sufficient to receive at least twenty-five bicycle-rims, although I do not intend to limit my invention in any wise in this respect, as the drum may be longer or shorter, as preferred. A driving-gear b^3 is fixed on the shaft b in suitable position, herein shown as between the driving-pulley b' and the drum d, this gear being in mesh with a pinion b^4, journaled in the lower ends of opposite link-hangers b^5, mounted loosely on the shaft b at opposite sides of the driving-gear b^3. An idler b^6 is mounted adjacent the pinion b^4 to rotate therewith, being in mesh with a drive-pinion b^7, fast on a sleeve b^8, splined on a shaft b^9, said sleeve and shaft being supported in the lower ends of links b^{10}, loosely mounted at their upper ends adjacent the links b^5 and coaxially of the pinion and gear b^4 b^6.

The shaft b^9 has considerable length and is arranged for longitudinal movement while being rotated by the drive-pinion b^7, said shaft carrying at its inner end depending brackets b^{12}, shown in Fig. 2 as having T-shaped heads, the shaft being journaled in the rear projections of said heads. A feed-roll b^{13} is mounted on the shaft b^9 between said brackets, and an opposite short shaft b^{14} carries a similar and positively-driven feed-roll b^{15}, said shaft b^{14} being journaled in the opposite projections of said T-shaped headed brackets and the two feed-rolls being caused to rotate in unison in the same direction by meshing into an intermediate pinion b^{16}, which also serves to feed the rolls and their carrying-brackets along

longitudinally of the winding-drum, said pinion b^{16} having central threaded engagement with a feed-screw b^{18}, fast in the frame of the machine at its ends parallel to opposite guide-rods c c'. These guide-rods are supported in a swinging frame c^2, pivoted at c^3 on the main frame of the machine.

On the guide-rods c c' of the swinging frame c^2 is mounted a head-block c^4, carrying pressure-rolls c^5 c^6, flush with or slightly above receiving-tables c^7, also carried by said head-block and which receive and direct the strips w of wood to be bent, as will presently be explained. Said head-block is open on its under side and has two depending legs c^8, between which is bolted a block c^9, preferably adjustable up and down, as indicated at c^{10}, said block being recessed on its under side, as at c^{11}, Fig. 2, to receive the upper link c^{12} of a toggle-lever, whose lower link c^{13} is pivotally mounted on a bolt c^{14}, fixedly journaled in the depending members b^{19} of the brackets b^{12}, the legs c^8 being slotted, as indicated at c^{15}, to permit the toggle to straighten in order to lift the head-block and swinging frame c^2 toward the feed-rolls b^{13} b^{15}. At the lower end of the toggle-lever c^{13} I provide a foot-rest c^{16} for operating it, the upper end of the lever c^{13} having an ear c^{17} to prevent the toggle from going too far beyond a dead-center.

Slightly to the rear of the feeding mechanism described I provide on the frame c^2 a deflecting-roll c^{18} for bending up the free ends of the strips of wood as they are fed into the machine and aiding in the proper and uniform bending of the strips themselves.

At some suitable place I secure, preferably to the traveling head-block and feeding mechanism, as at c^{19}, a strap-receptacle c^{20}, in which is coiled the length of strap s required for winding the entire drum, said strap being secured at c^{21} to the drum. This strap is composed of flexible or inelastic material—such, preferably, as brass—and also preferably has a roughened upper surface, herein shown as provided by small prongs or spurs s', which positively prevent any possible slip or backward movement of the wood thereon. The feed-rolls b^{13} b^{15} have a roughened or corrugated surface for compelling the strips of wood to feed along at a predetermined speed.

One leading feature of my invention resides in positively driving the feed-rolls, and this driving movement under usual conditions will be at the same peripheral speed as the travel of the outer circumference or surface of the strips wound on the drum, my object being to compel all the necessary distortion of the fiber of the strips to take place on the inner side thereof in the form of compression, this compression taking place between the feed-rolls and the drum.

The feed-rolls pinch into and crimp the inner surface of the strips of wood, and as the wood is positively held by the winding-strap s in an unyielding condition at its outer circumferential surface as it is being bent it necessarily follows that the entire bending has to take place in the form of compression on the inner side instead of in the form of stretching, as on the outer side.

If it is desired to wind on a larger or smaller drum, the feed-rolls will be changed accordingly, and the winding mechanism will be raised or lowered by means of an adjustable bearing $d^{\times}$ or any other suitable means.

In operation the distance between the pressure-rolls b^{13} b^{15} and the opposite rolls c^5 c^6 is regulated by adjusting the block c^9 on the legs or hangers c^8 to the thickness of the strips w being bent, and then the toggle is straightened, so as to raise the frame c^2 and carriage or head-block mounted thereon, whereupon the strips are fed into the machine between said rolls, one strip following another, and as they are wound on the drum by the positively-driven feeding mechanism the carriage is sumultaneously carried along, sliding on the ways c c' by means of the pinion or nut gear b^{16}, which travels along on the stationary screw b^{18}. It will be understood that any other carrying mechanism may be substituted and, indeed, that I am not restricted in any wise to the various details as such which I have herein described. The strips w are laid on the band s and held tightly thereby against the drum, so that they cannot possibly change their position or stretch in the slightest, being absolutely prevented from slipping or stretching by the spurs s' and, further, prevented from even the slightest longitudinal yielding by reason of the fact that the positively-driven roughened feed-rolls b^{13} b^{15} engage successively every point of the inner surface of the strips and crimp them forward little by little.

I am aware of Rastetter's patent, No. 565,923, dated August 18, 1896; but my machine is to be distinguished radically therefrom in that it positively prevents any chance or tendency of the strip to yield unevenly at any weak places and it positively feeds the strip to the roll with a uniform and progressive feeding propulsion, proceeding along the entire strip from the beginning to the end. Moreover, in my machine strip after strip is fed into the machine and there is practically no limit to the number of strips which may be fed, if desired.

It will be understood that when the drum has received its complement of bent strips it will be removed from its shaft and subjected to the usual processes for fixing the wood in its bent position.

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

1. In a machine for bending wooden strips, a coil-receiving drum to receive the strips to be bent, means for feeding them to the drum, and means for positively engaging the surface of the strips substantially throughout

their lengths for holding them onto the drum and preventing their stretching, substantially as described.

2. In a machine for bending wooden strips, a drum to receive the strips to be bent, means for feeding them to the drum, and means for positively engaging the surface of the strips substantially throughout their lengths for holding them onto the drum and preventing their stretching, said feeding means engaging and moving the inner surface of the strip at the same speed as the peripheral travel of the outer surface of the strip on the drum, substantially as described.

3. In a machine for bending wooden strips, a winding-drum, means to rotate it, a feed-roll, a pressure-roll opposite said feed-roll, means to receive and hold a strip positively throughout its length tight against the drum when fed between said pressure-roll and feed-roll, and means to rotate said pressure-roll for feeding the strips of wood to said drum, substantially as described.

4. In a machine for bending strips of wood, a positively-driven winding-drum, a pair of feed-rolls geared to move in unison, driving mechanism therefor, a pair of pressure-rolls opposite said feed-rolls, means to move said pressure-rolls and feed-rolls together to pinch a strip of wood between them for feeding, means to hold the strip against the winding-drum as it is wound, and means for carrying said rolls and connected mechanism longitudinally of the drum as the strip is being wound, substantially as described.

5. In a machine for bending strips of wood, a winding-drum to receive the strips, continuously-operating feeding mechanism to feed a plurality of disconnected strips continuously and in succession, and means for holding said plurality of strips without interruption tight against the winding-drum as they are wound, said mechanism operating to wind the strips successively without interruption, substantially as described.

6. In a machine for bending strips of wood, a positively-driven winding-drum, a feed-roll, means for positively rotating it, a pressure-roll opposite said feed-roll, a carriage carrying said pressure-roll, guides parallel to said drum and on which said carriage moves, and means for moving said carriage along on said guides in unison with the winding of the strip on said drum, substantially as described.

7. In a machine for bending strips of wood, a positively-driven winding-drum, a feed-roll, means for positively rotating it, a pressure-roll opposite said feed-roll, a carriage carrying said pressure-roll, guides parallel to said drum, and on which said carriage moves, and means for moving said carriage along on said guides in unison with the winding of the strip on said drum, and a deflecting-roll between said carriage and said drum for deflecting the inner end of the strip against said drum, substantially as described.

8. In a machine for bending strips of wood, a positively-driven winding-drum, a swinging frame parallel thereto, a carriage for traversing said frame, feed-rolls and pressure-rolls moving with said carriage, means for positively driving said feed-rolls, means for moving said feed-rolls and pressure-rolls toward each other, and means for holding the strips against said drum as they are wound, substantially as described.

9. In a machine for bending strips of wood, a positively-driven winding-drum, a swinging frame parallel thereto, a carriage for traversing said frame, feed-rolls and pressure-rolls moving with said carriage, means for positively driving said feed-rolls, a toggle-lever for moving said feed-rolls and pressure-rolls toward each other, and means for holding the strips against said drum as they are wound, substantially as described.

10. In a machine for bending strips of wood, a positively-driven winding-drum, and a winding-strap secured at one end to said drum for receiving between it and the drum the strips of wood to be wound, said strap having a plurality of spurs on its upper surface, substantially as described.

11. In a machine for bending strips of wood, a positively-driven winding-drum, a winding-strap secured at one end to said drum for receiving between it and the drum the strips of wood to be wound, said strap having a plurality of spurs on its upper surface, feed mechanism for feeding the strips to the drum, means for moving said winding mechanism longitudinally of the drum in unison with the winding thereon of the strips, and a receptacle for the strap, said receptacle also moving longitudinally with the feeding mechanism, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 9th day of October, A. D. 1897.

ATWOOD B. KEYES.

Witnesses:
H. DUNHAM,
S. F. SUTHERLAND.