No. 696,344.

Patented Mar. 25, 1902.

G. DE LAVAL & C. W. CHISHOLM.

WIRE ROD STRAIGHTENING MACHINE.

(Application filed May 2, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

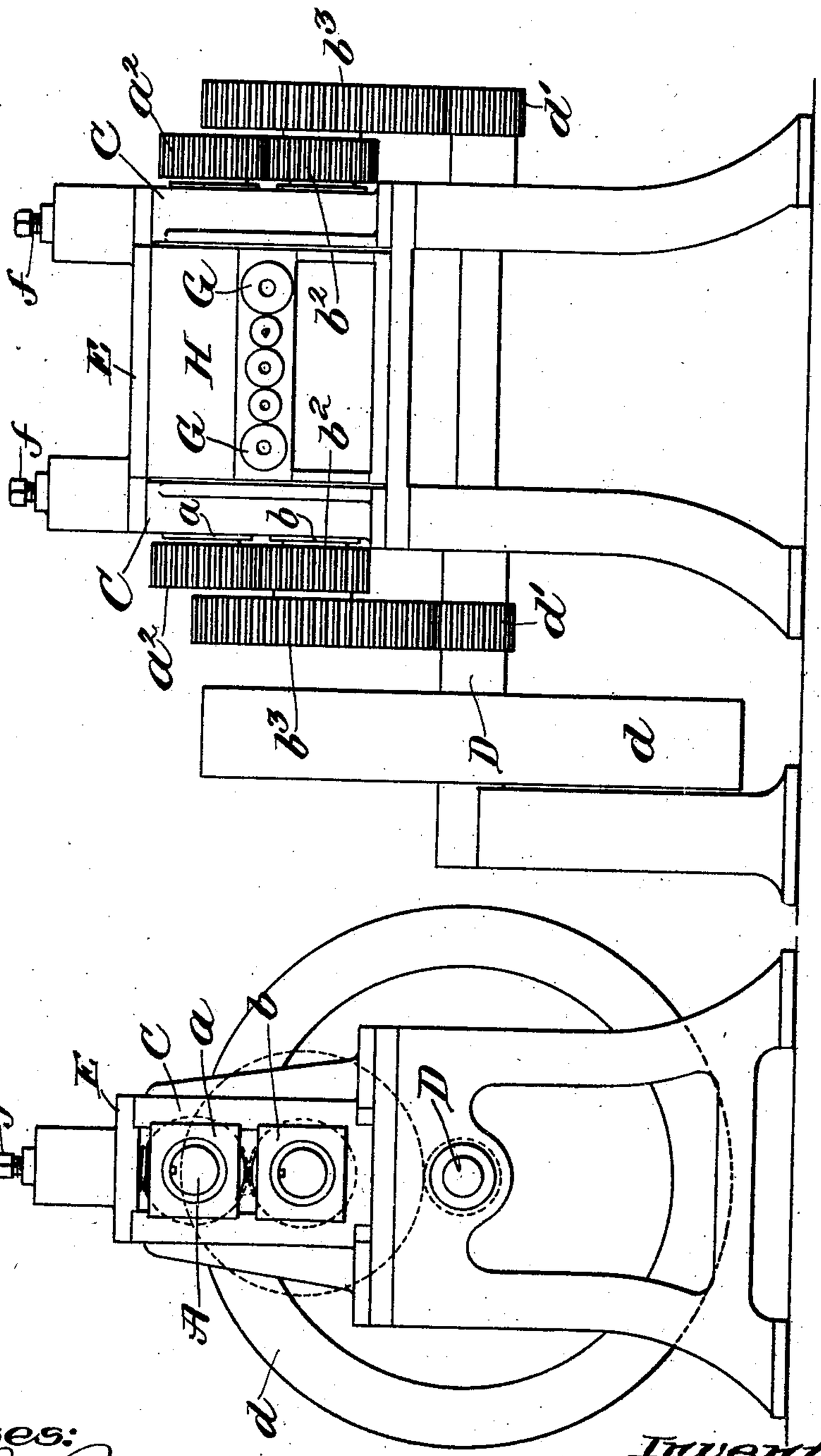

Fig. 2.

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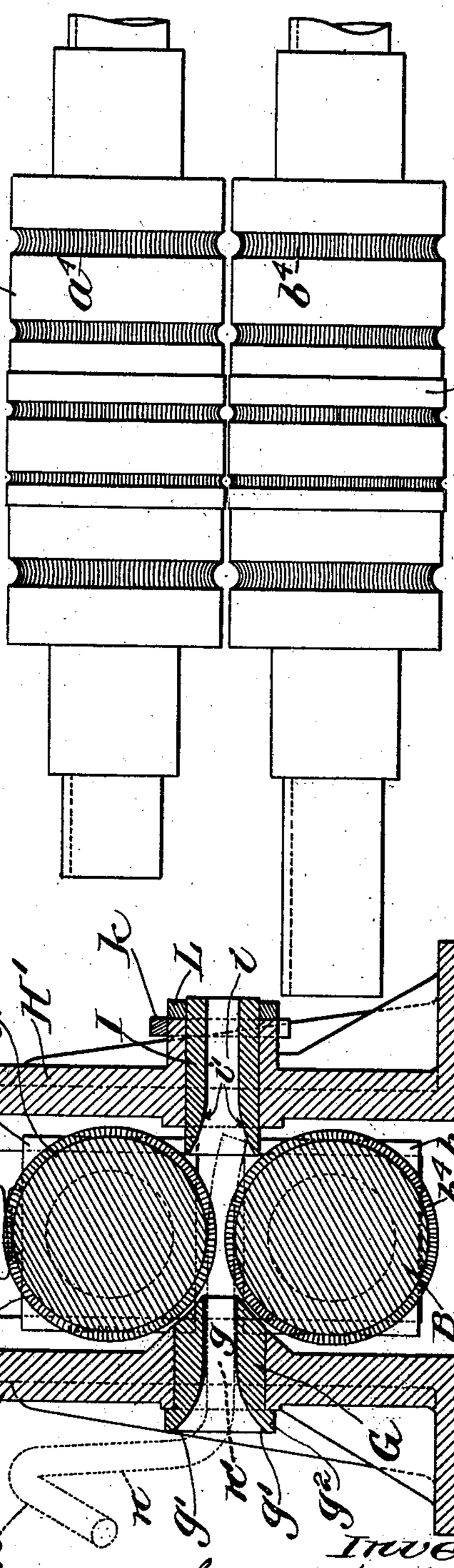

Fig. 4.

Fig. 5.

Fig. 6.

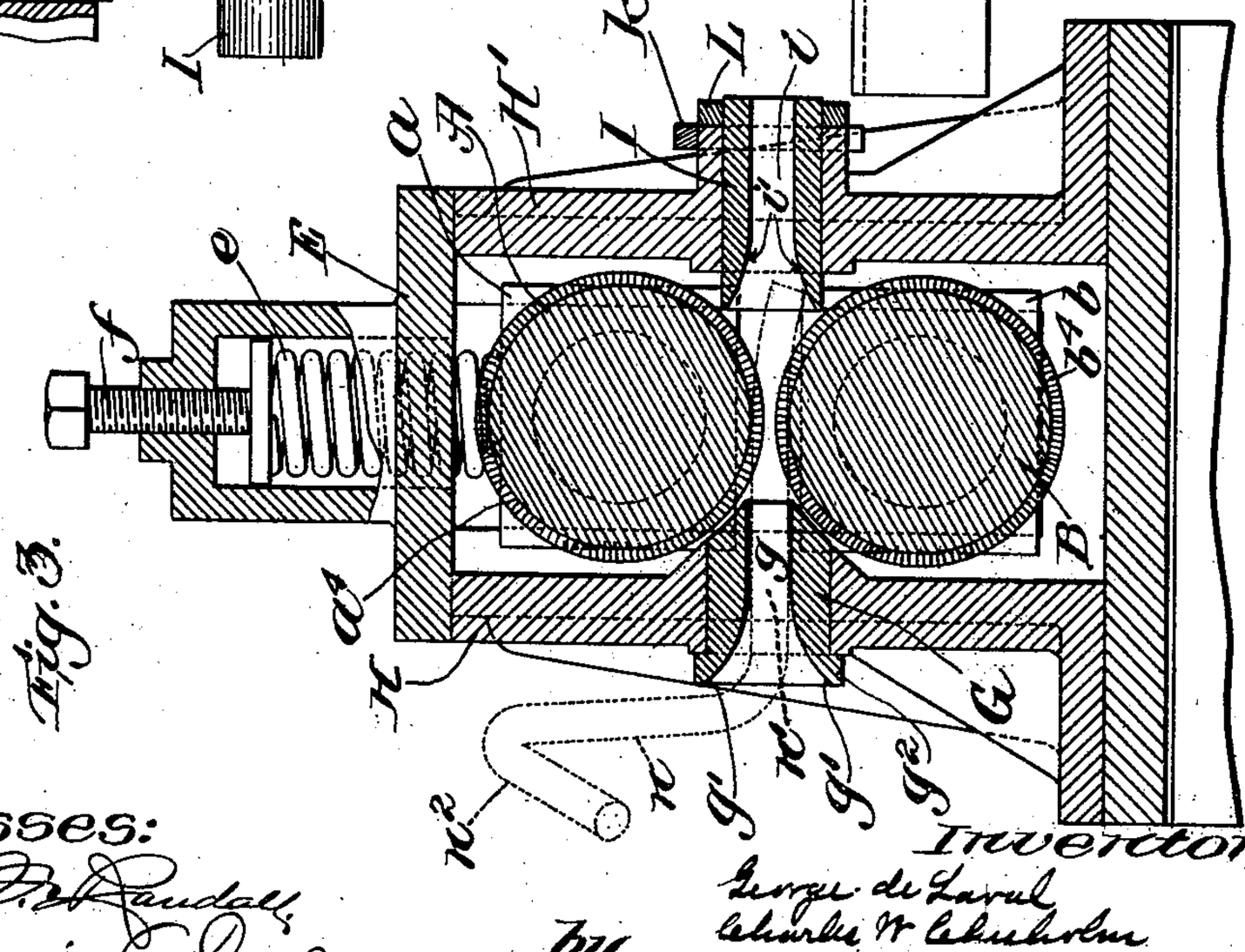

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE DE LAVAL, OF CAMBRIDGE, AND CHARLES W. CHISHOLM, OF SOMERVILLE, MASSACHUSETTS, ASSIGNORS TO INTERNATIONAL STEAM PUMP COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

WIRE-ROD-STRAIGHTENING MACHINE.

SPECIFICATION forming part of Letters Patent No. 696,344, dated March 25, 1902.

Application filed May 2, 1901. Serial No. 58,451. (No model.)

To all whom it may concern:

Be it known that we, GEORGE DE LAVAL, of Cambridge, and CHARLES W. CHISHOLM, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Wire-Rod-Straightening Machines, of which the following is a specification.

This invention relates to the straightening of wire rods; and its object is to provide a machine capable of straightening short lengths of wire or wire rods which have been bent into various shapes and in which the different parts of the rods are in various planes and extend at various angles to the other parts of the rods or wires. Wire rods of such a character are extensively used in foundry-work to support the cores used in such work, these "core-wires," as they are called, being bent into all sorts of shapes to suit the various cores in which they are used and also being of various lengths and sizes. After the castings have been made the core-wires are either thrown into the scrap-heap or straightened for future use. Heretofore the straightening of these wires when done at all has been slow and expensive, being done by hand, and manufacturers have frequently found it less expensive to use new wires for the cores than to straighten the old core-wires.

The present invention provides an efficient means by which core-wires or other bent or crooked wire rods may be quickly straightened at little expense, thus enabling the repeated use of the core-wires and a material reduction in the cost of wire used in the foundry-work. The devices employed for straightening the wires comprise rolls which act to grip the end of the rod and draw it forward, a bending device through which the rod is drawn, and a device arranged to receive the end of the rod as it comes from the rolls and acting to rectify or prevent bending of the rod by the action of the rolls. The bending device is so constructed that it will engage any part of the rod which is bent or out of line with the part passing through the center of the bending device, whatever the angle or direction in which said bent part extends from the center of said bending device—that is to say, the bending device is what may be termed for convenience in hereinafter referring thereto a "universal" bending device. As the rod is drawn through the bending device any and all bends or crooks are removed by the action of said device, and the rod is straightened as it passes to the feeding-rolls. The action of the rolls upon the rod as it passes between them, due to inequalities in the density of the rod or to variations in the size or to other causes, is liable to and usually does tend to bend or curve the rod, so that as the end of the wire comes from between the rolls it will travel in a curved path, and the direction of this path is uncertain, varying with different rods. To prevent or rectify this action of the rolls, so that the rods will be delivered straight instead of being delivered in a curved form, as would otherwise frequently, if not always, be the case, a device is arranged behind the rolls to receive the end of the rod as it comes from between the rolls, and this device is so constructed that it will act to rectify or prevent bending of the rod by the action of the rolls. This device is preferably in the form of a guide arranged adjacent to the rolls and acting to cause the rod to travel away from the rolls in a straight line.

The invention can be best understood by referring to a machine embodying the invention, and in the accompanying drawings a machine has therefore been illustrated which embodies the features of the invention in a simple, efficient, and preferred form.

In these drawings, Figure 1 is a front elevation of such machine. Fig. 2 is an end elevation, the gears being indicated by dotted lines. Fig. 3 is a vertical sectional view. Fig. 4 is a detail showing the rolls. Figs. 5 and 6 are details of a rear guide and locking means.

In the machine shown the rolls A B for feeding or drawing forward the wire rods are mounted in boxes a b, supported in the end standards C, and said rolls are connected to revolve in unison by gears a^2 b^2, secured to the ends of the rolls. The rolls are driven

through a driving-shaft D, suitably mounted and having secured thereto a pulley d and pinions d', which engage gears b^3, secured to the ends of the lower roll B. The rolls are provided with registering grooves $a^4 b^4$, shaped to substantially fit the size of wire to be acted upon, and these grooves may be and preferably are corrugated, so as to more firmly grip the rod passing through the rolls. The boxes b of the lower roll are stationary, and the boxes a of the upper rolls are movable and are forced downward by springs e, mounted in suitable guides formed in the top plate E above said boxes. The pressure of the rolls upon the rods, and consequently the grip thereon, may be regulated by adjusting the force of the spring e by means of screws f.

The bending device through which the rods are drawn by the rolls comprises a cylindrical guiding-passage g of substantially the diameter of the rods to be straightened and a surrounding bending-surface g' in front of said guiding-passage and out of line therewith, so that it will act upon the rod to one side of the line of force drawing said rod through the cylindrical guide. The bending-surface preferably converges toward the central passage and forms a cam-surface, which surrounds the rod and engages any part of the rod which may be bent or out of line with the passage g and directs said bent part into said line. As this cam or bending surface surrounds the rod passing through the passage g, it will act equally well upon all sides of said passage and is a simple and efficient form of universal bending device for cooperating with the rolls in straightening rods having bent portions extending in various directions and planes. The bending device is preferably made in the form of a bushing G, provided with a central bore g, having a bell-mouth and mounted in a hole in the front plate H and held against forward movement by a flange g^2 which engages the front face of said plate, which forms a rigid abutment for resisting the heavy strain put upon the bushing in drawing the rod therethrough. With this construction the bushing is effectively supported to resist the heavy strain put thereon and still may be readily removed to allow access to the rolls, if desired. In the rear of the rolls a guide is arranged so that it receives the end of the rod as it comes from the rolls and causes it and the following parts of the rod to travel in a straight line. This guide is preferably in the form of a cylindrical passage i, substantially the size of the rod being acted upon and provided with a bell-mouth i', arranged in close proximity to the rolls. With this construction the end of the rod will engage the cam-surface formed by the bell-mouth of the guide in case said end is deflected out of line by the action of the rolls and will be directed into the cylindrical part of the guide and be caused to travel in a straight line through said cylindrical part. The guide is preferably made in a bushing I, mounted in a hole in the rear plate H' and removably held therein by a locking device, so that it may be readily removed to give access to the rolls. A simple and convenient form of locking device is that shown, which consists of a U-shaped bar k, the legs of which pass through grooves in the rear plate H' and through slots i^3, formed in the bushings I, the bars being held in the grooves by a plate L. The bushing is rigidly held in place by the locking-bar, which may be readily removed to allow the bushing to be drawn out when desired.

The core-wires used in a foundry vary in diameter from one-fourth of an inch or less to three-fourths of an inch or more, and a single machine may be given the capacity of straightening the various sizes of wires by providing the rolls A B with a series of grooves of varying sizes to fit the various sizes of wires and providing coöperating series of bending devices and guides. The machine shown is of such a character, the rolls being provided with five grooves of different sizes and the front and rear plate being formed to support a corresponding number of bending devices and guides constructed to coöperate with the various grooves in the rolls.

The operation of the machine will be readily understood by reference to Fig. 3. Suppose, for instance, the wire rod to be straightened has the shape indicated—that is, that the part n extends at right angles to the part n' and the part n^2 extends at right angles to the part n and at substantially a right angle to the plane of the parts $n\,n'$. The end of the rod is thrust through the bushing G and into the grip of the rolls A B, by which it is fed or drawn forward, the part n extending in any direction with relation to the bushing G—as, for instance, vertically upward. As the part n' is drawn through the passage g the part n is brought into engagement with the bending-surface g', which is above the part n', and said part n is bent downward into line with the passage g, thus bringing the parts $n\,n'$ into line with each other. As the part n passes through the passage g the part n^2 engages the bending-surface g' at one side of the passage g, and said part n^2 is bent into line with the passage g. As the front end of the rod comes from between the rolls it may tend to move out of the proper line of travel, owing to the action of the rolls upon the rod passing between them, and this tendency may be in any direction—as, for instance, vertically downward. If the end of the rod is thus deflected, it engages the converging surface i' of the bell-mouthed guide and is directed up into the cylindrical passage i, through which it and the following parts of the rod travel away from the rolls in a straight line.

The bending-surface of the bending device should be to one side or out of the line of the central guiding-passage, so that it will act against the rod to one side of the line of force drawing the rod forward, and the outer

part of such bending-surface should be sufficiently to one side to properly act upon the rod when it has sharp bends therein—that is, the bending-surface should be properly located to bend the parts of the rod into line with the center guide.

What we claim, and desire to secure by Letters Patent, is—

1. In a machine for straightening core-wires and similarly-bent wire rods, the combination of a bending device constructed and arranged to act upon rods having parts bent in various planes and at various angles to each other and to direct said parts into a straight line as the rods are drawn through said bending device, rolls for gripping said rods and drawing them through said bending device, and a device in the rear of the rolls constructed and arranged to receive the ends of the rods as they come from the rolls and rectify or prevent bending of said rods by the action of the rolls, substantially as described.

2. In a machine for straightening core-wires and similarly-bent wire rods, the combination of a bending device having a central guiding-passage and a surrounding bending-surface arranged to engage parts of the rods extending at various angles to the central passage and in various planes and to direct said parts into the central passage as the rods are drawn therethrough rolls for gripping and drawing the rods through the bending device, and means for supporting the bending device to resist the strain put thereon by drawing the rods therethrough, substantially as described.

3. In a machine for straightening core-wires and similarly-bent wire rods, the combination of a bushing G having a shoulder thereon, a rigid abutment engaging said shoulder, a central passage g through said bushing, a bending-surface g' at the mouth of said passage arranged to engage parts of the rods extending at various angles from the passage g and in various planes and direct said parts into the passage g, rolls A and B having grooves registering with the passage g, means for operating said rolls to draw the rods through the bushing G, and a guide I in the rear of said rolls, substantially as described.

4. In a machine for straightening core-wires and similarly-bent wire rods, the combination of a series of bending devices having central passages of varying diameters, a bending-surface surrounding each passage arranged to engage parts of the rods extending at various angles to the central passage and in various planes and direct said parts into said passage, rolls provided with a series of grooves corresponding in diameters to the sizes of the central passages and registering therewith, means for supporting the bending devices to resist the strain put thereon by drawing the rods therethrough, and a series of devices for directing the rods away from the rolls in straight lines, substantially as described.

In testimony whereof we have affixed our signatures in presence of two witnesses.

GEORGE DE LAVAL.
C. W. CHISHOLM.

Witnesses:
H. S. HAMBLETT,
JOHN J. FINLEY.