

(No Model.)

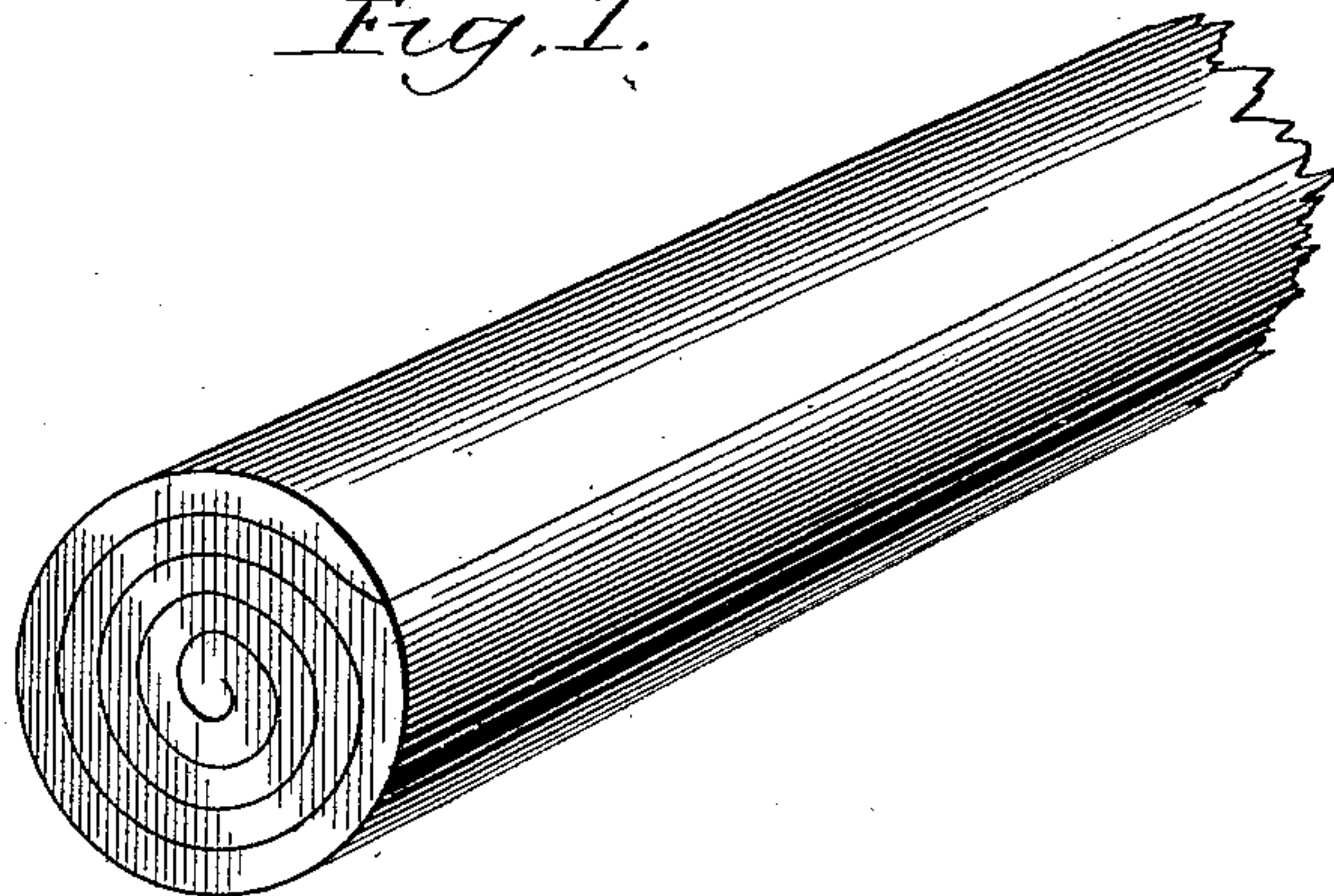
2 Sheets—Sheet 1.

S. McCLOUD.  
MANUFACTURE OF BARS OR ROUNDS OF STEEL OR IRON.

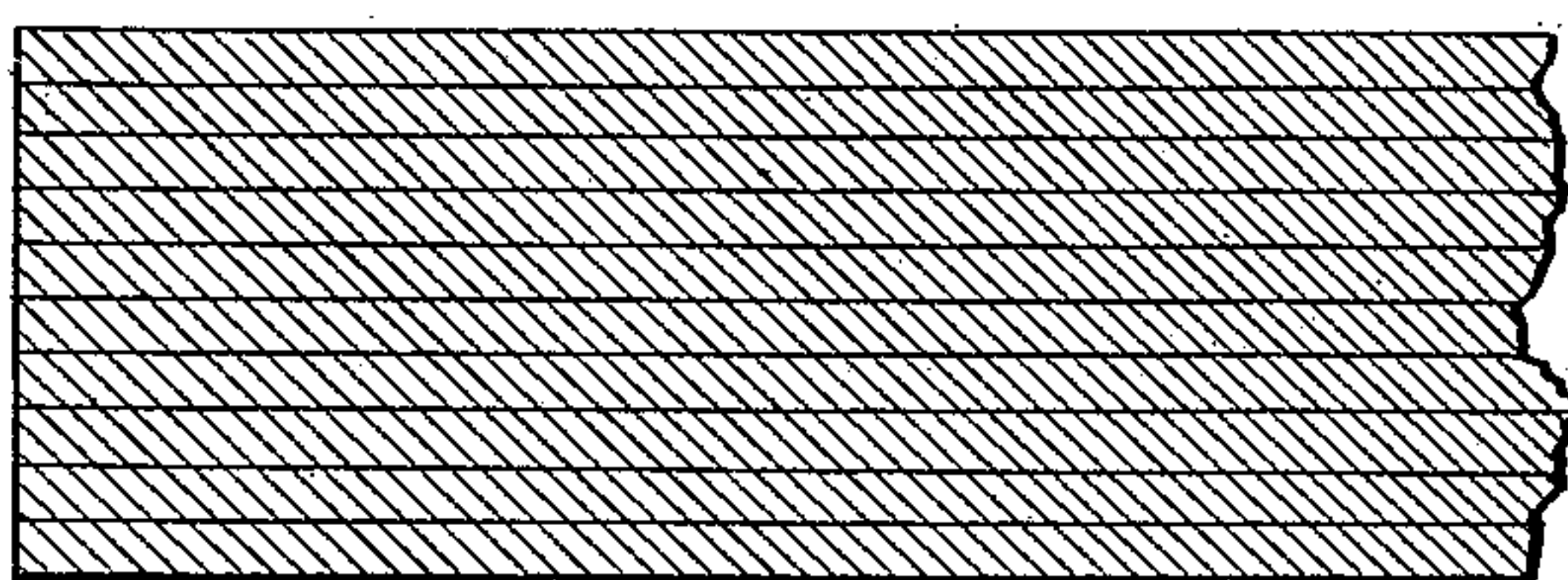
No. 400,931.

Patented Apr. 9, 1889.

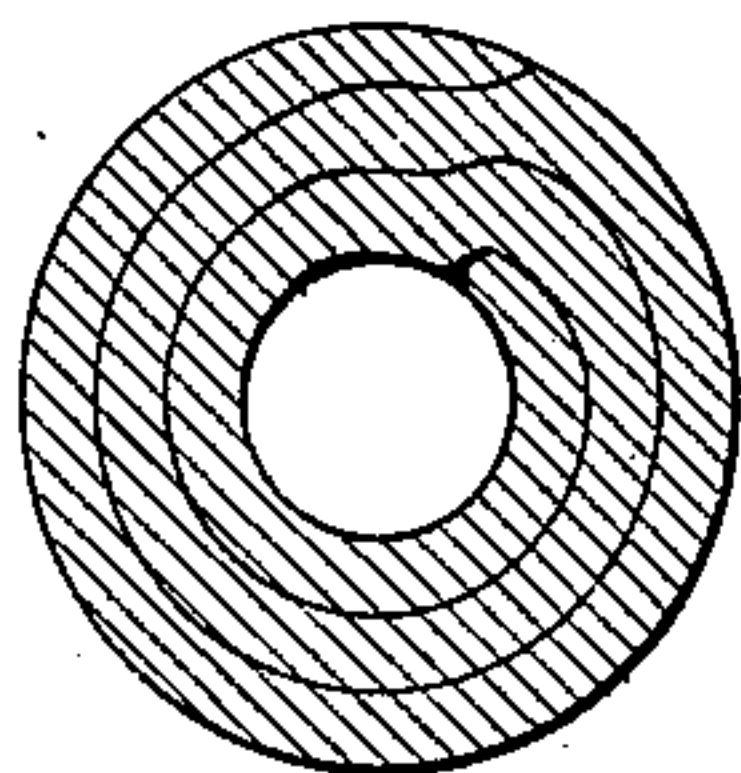
*Fig. 1.*



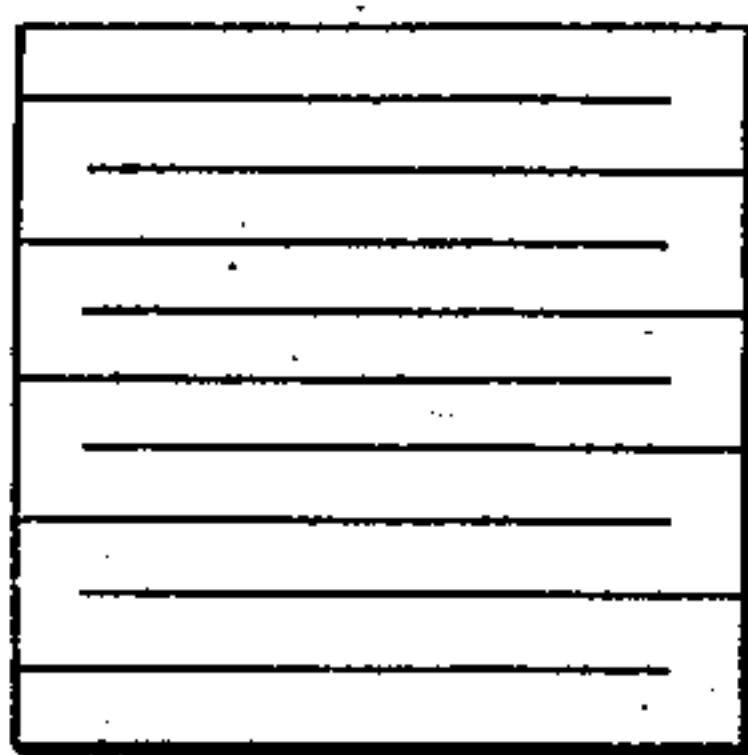
*Fig. 2.*



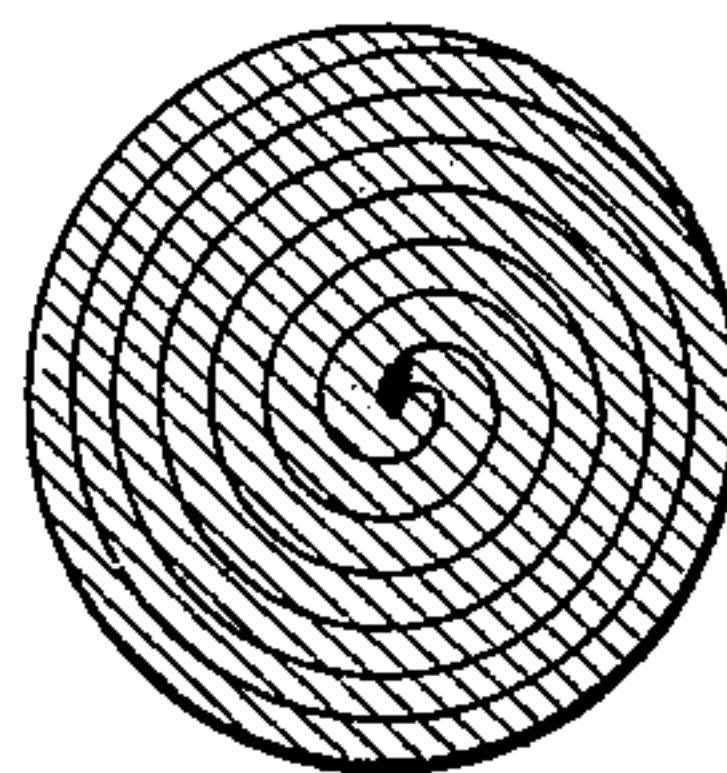
*Fig. 3.*



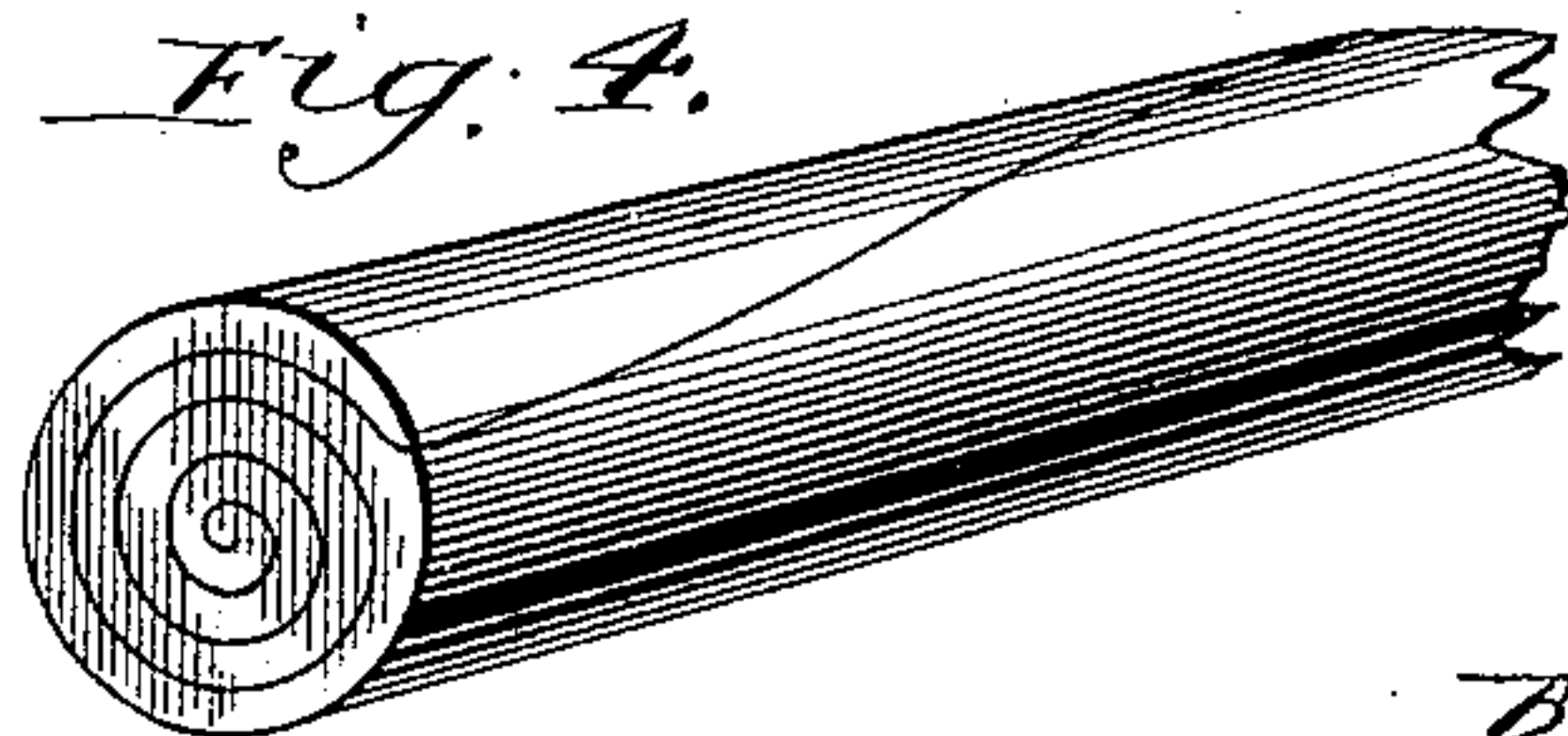
*Fig. 5.*



*Fig. 6.*



*Fig. 4.*



Witnesses.

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*Att'y*

(No Model.)

2 Sheets—Sheet 2.

S. McCLOUD.

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No. 400,931.

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Fig. 1.

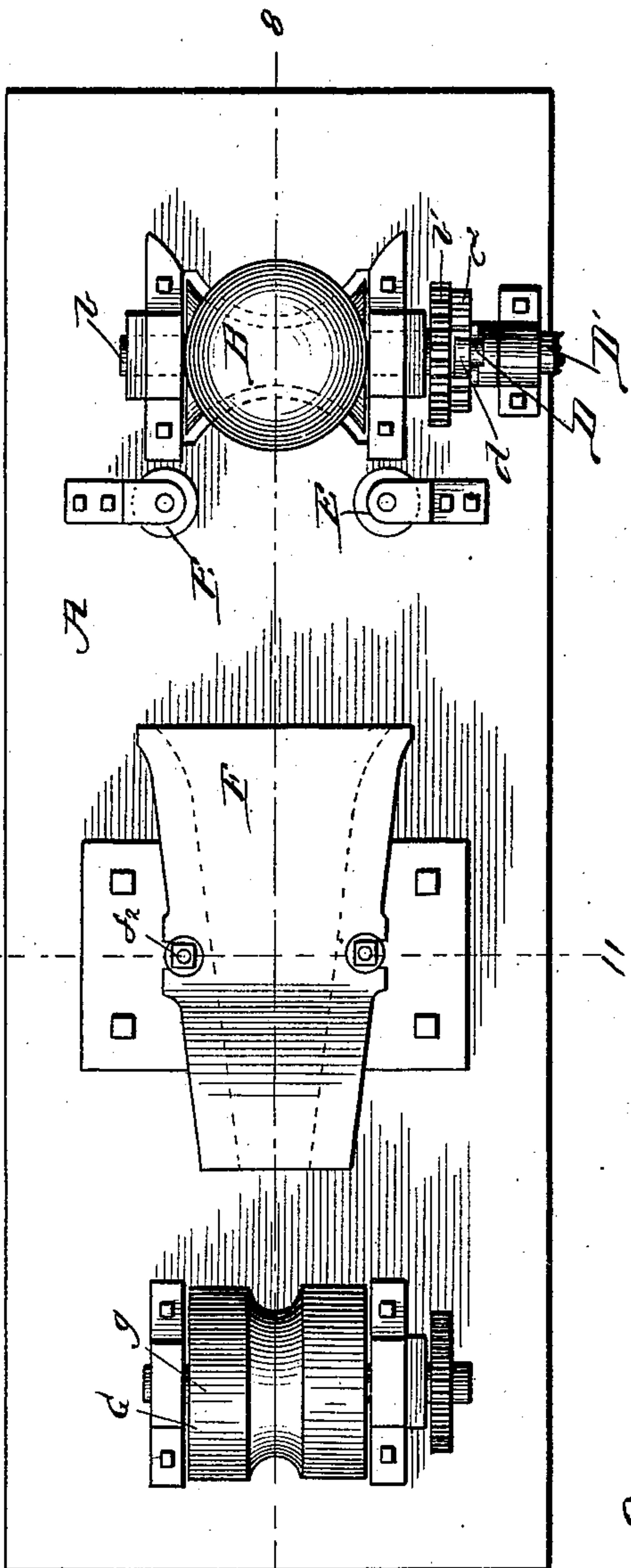


Fig. 8.

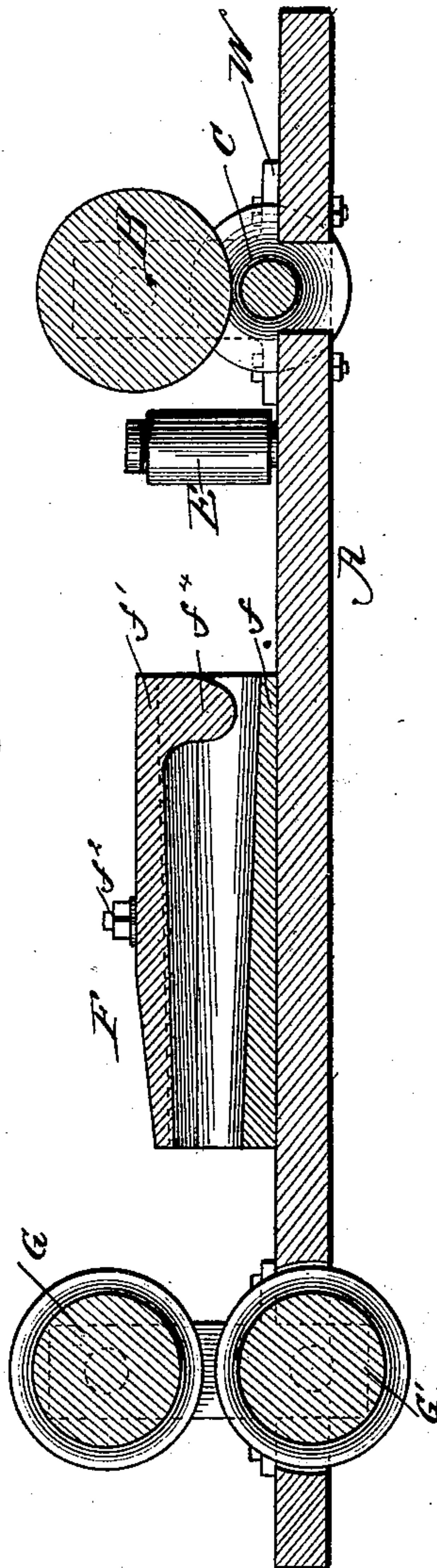


Fig. 9.

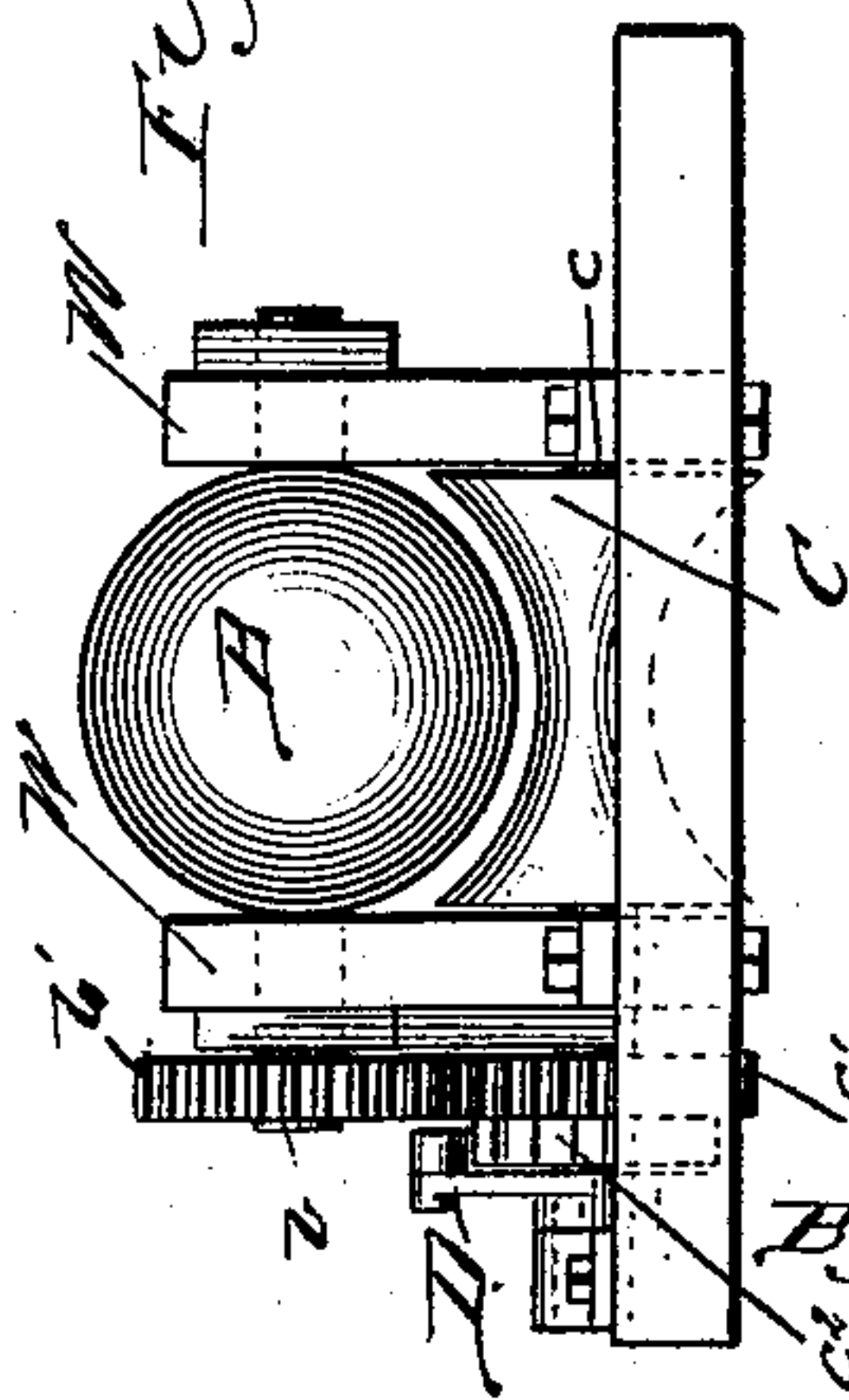


Fig. 10.

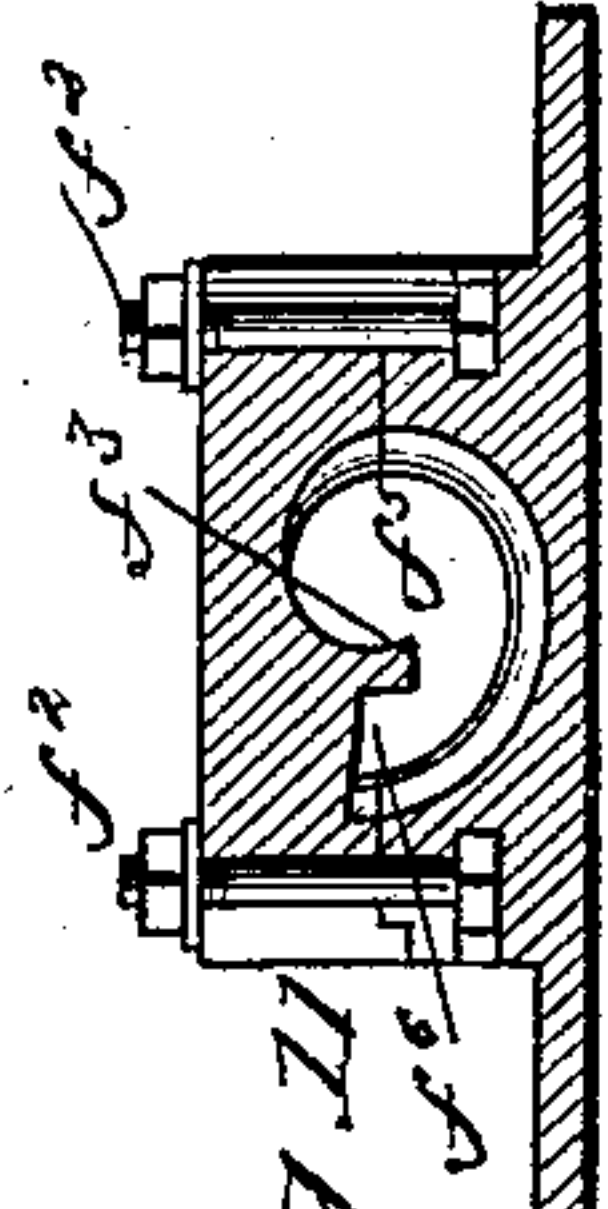
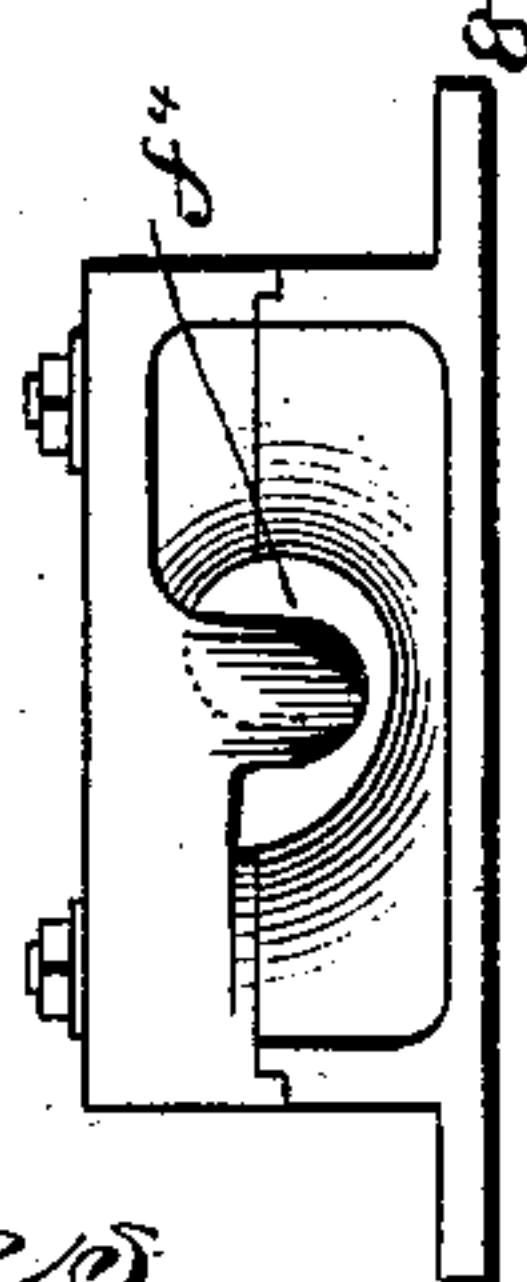


Fig. 11.

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# UNITED STATES PATENT OFFICE.

SIDNEY McCLOUD, OF CHICAGO, ILLINOIS.

## MANUFACTURE OF BARS OR ROUNDS OF STEEL OR IRON.

SPECIFICATION forming part of Letters Patent No. 400,931, dated April 9, 1889.

Application filed December 22, 1888. Serial No. 294,391. (No model.)

*To all whom it may concern:*

Be it known that I, SIDNEY McCLOUD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Manufacture of Bars or Rounds of Steel or Iron, of which I do declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My present invention, while applicable to the manufacture of bars or rounds of iron, is especially well adapted to the manufacture of bars or rounds of malleable steel, such bars being designed to be furnished to the trade as merchant bars or rounds to be subsequently cut up and manufactured into a variety of articles.

In the manufacture of bars or rounds of iron or steel it is customary to reduce the metal to the proper diameter by means of suitable reducing or drawing rolls. Bars or rounds thus made, while suited for a variety of uses, are but poorly suited for others, for the reason, among others, that there is constant danger of the crystallization of the metal incident to long usage or frequent jar or shock, and for the further reason that with bars or rounds of steel, more particularly if the outer surface or skin of the metal be cut, it so detracts from the strength of the bar or round as to render it easily broken. Moreover, with bars or rounds of steel there is danger even when the greatest care is exercised in their manufacture of flaws occurring in the article by reason of "blow-holes" in the ingot or billet from which the bar or round is made, this liability to flaws decreasing, however, with the working of the metal incident to its reduction. It is a fact well recognized that the strongest part of a bar or round of iron or steel is the part adjacent its surface, and particularly is this true with bars or rounds of steel, the metal by reason of the working incident to its reduction seeming to take upon itself a tougher or more fibrous quality adjacent its surface than about its center.

The object of my present invention is to produce a bar or round of iron or steel that shall possess a high degree of strength both

tensile and lateral, and which can be cheaply and readily manufactured. This object of invention I have accomplished by forming a bar or round of iron or steel from a single plate or plates of metal of suitable thickness by folding or winding the plate or plates preferably in the direction of the length in such manner that the bar or round shall consist of multiple thicknesses or layers of the metal superposed and firmly pressed together, so as to form in effect a single piece.

My invention consists in the bar or round hereinafter described, as a new article of manufacture.

In the accompanying drawings, I have shown one form of apparatus whereby my invention may be practiced, although I wish it understood that other forms of apparatus may be used for this purpose, the apparatus here shown being illustrated simply with a view to indicate how the invention may be carried into practice.

Figure 1 is a perspective view of a portion of one form of a bar or round made in accordance with my invention. Fig. 2 is a view in central longitudinal section through the bar or round shown in Fig. 1. Fig. 3 is a view in cross-section through a hollow bar or round made in accordance with my invention. Fig. 4 is a perspective view of a bar or round formed by winding the plate of metal upon itself in spiral direction. Fig. 5 is an end view of still another form of bar or round embodying my invention and formed by folding a plate of metal upon itself. Fig. 6 is a view in cross-section through another form of bar or round made by winding two plates of metal upon themselves. Fig. 7 is a plan view of one form of apparatus whereby the bars or rounds illustrated in Figs. 1, 3, 5, and 6 may be produced. Fig. 8 is a view in longitudinal section on line 8 8 of Fig. 7. Fig. 9 is a front view of the apparatus shown in Figs. 7 and 8. Fig. 10 is an end view of the guide or former shown in Figs. 7 and 8. Fig. 11 is a view in vertical transverse section through the guide or former on line 11 11 of Fig. 7.

Referring more particularly to Figs. 1 and 2 of the drawings, it will be seen that the bar or round there shown consists of multiple layers formed from a single plate of metal, these



layers being superposed by winding or folding the metal plate upon itself in the direction of its length so closely that the finished bar or round shall have much the appearance of a bar or round produced from the reduction of a billet or ingot in the ordinary manner. The bar or round thus shown in Figs. 1 and 2 is formed from a plate of iron or steel previously reduced to the proper width and thickness, (say twelve inches wide and a quarter of an inch thick,) which plate while in heated condition is passed between suitable guides and rolls until it acquires the shape of the bar or round shown.

In Fig. 3 of the drawings my invention is shown as applied to the production of a hollow bar or round, this bar or round being produced in the same manner as that shown in Fig. 1, with the exception that the action of the final reducing-rolls is so modified as to leave the central cavity.

In Fig. 4 of the drawings the bar or round illustrated is similar to that illustrated in Figs. 1 and 2, with the single exception that the plate from which this bar or round is formed is directed into the guides in such manner that, instead of the plate being wound in a direction parallel to its length, it is wound at a slight angle thereto, so that the grain or fiber of the plate shall extend in spiral direction around the bar or round throughout its length.

In Fig. 5 of the drawings is shown a bar formed of multiple layers superposed from a single plate, the layers being arranged one upon the other in parallel position and firmly compressed together.

In Fig. 6 of the drawings is shown a bar or round formed by simultaneously winding or coiling two sheets or plates of metal upon themselves, the operation being the same as described with respect to the formation of the bar or round shown in Figs. 1, 2, and 3, with the exception that two parallel plates are placed together and wound instead of the single plate shown in said figures.

In each of the bars or rounds above described it will be seen that the multiple thicknesses of metal are formed from a continuous plate or plates, so that the finished bar or round will possess not merely the strength and durability of the plate itself, but by reason of the folds or curves given to the metal will acquire an additional strength, the various layers serving to support and strengthen each other. With an ordinary bar or round of steel formed by the reduction of a billet or ingot, if the periphery or outer surface be cut the body of the metal can be readily broken, whereas with a bar or round made from a continuous plate or plates in accordance with my invention a cut or break in the outer layer will only proportionately decrease the strength of the remaining layers of metal, each layer possessing the same strength or toughness that is usually found in that part of an ordinary bar or round of steel adjacent its sur-

face. So, also, it will be seen that when the bar or round is thus formed by superposing multiple thicknesses of metal, there will be an elasticity given to the bar or round, so that any shock or jar received at one point will be distributed throughout the entire body of metal, thus distributing the strain and avoiding the danger of crystallization incident to such articles as heretofore produced.

In Figs. 7 to 11 of the drawings is illustrated a form of apparatus whereby rounds such as are shown in Figs. 1, 3, 4, and 5 may be produced. This apparatus is here illustrated merely with a view to showing how my invention may be carried into effect, but is not here specifically claimed, it being reserved as the subject of a separate application.

Referring to the drawings of the apparatus, A designates the bed of the machine, upon which is mounted suitable rolls, B and C, that will receive the plate of metal as it passes from the reducing-rolls, and will give to such plate a concavo-convex shape. The shaft *b* of the roll B is provided with a suitable gear, *b'*, that meshes with the gear *c'* upon the shaft *c* of the roll C, these shafts *b* and *c* being suitably sustained by brackets or bearings W, mounted upon the bed of the machine. The shaft *c* also carries at its end a ratchet-wheel, *c*<sup>2</sup>, that is driven by means of the pawls *d*, that are pivoted to the driving-arms D, which are keyed to the ends of the drive-shaft D', that is separate from the shaft of the roll C. My purpose in thus driving the rolls B and C by means of a ratchet-wheel and pawls is to permit the rolls B and C to move faster than the drive-shaft D' in case the final reducing-rolls should draw forward the metal plate or bar at a greater speed than that at which the rolls B and C travel, and it is plain that this increased movement of these rolls is possible by reason of the fact that when their speed is increased beyond that of the drive-shaft D' the ratchet-wheel *c*<sup>2</sup> can ride under the teeth of the pawls *d*. As the metal plate passes in concavo-convex shape from the rolls B and C, it will pass between the guide-rolls E, which will serve to further bend up the edges of the metal plate and direct it into the flaring mouth of the former F. This former F is preferably made of the upper and lower parts, *f* and *f'*, suitably bolted together, as at *f*<sup>2</sup>, and sustained upon the bed A of the machine. The lower part, *f*, of the former has an interior of concave shape, its concavity being broad at its mouth and tapering gradually toward its end, and the upper part, *f'*, of the former is provided upon its under side with a guide-rib or deflector, *f*<sup>3</sup>, which is broadened, as at *f*<sup>4</sup>, at its outer end, and which tapers therefrom to a narrow point or rib at its extreme inner end. It will be observed that upon each side of this rib *f*<sup>3</sup>, in the upper part of the former, extend the longitudinal cavities *f*<sup>5</sup> and *f*<sup>6</sup>, the cavity *f*<sup>5</sup> serving to receive one edge of the concavo-convex plate, while the cavity *f*<sup>6</sup> receives the oppo-



site edge of the plate, and these cavities are so arranged and in such shape as to impart a swirl or lap to the concavo-convex plate as it passes through the former. Thus if it be assumed that the metal plate in concavo-convex shape has passed from the rolls B and C and between the guide-rolls E into the mouth of the former F, one edge of this plate will be within the groove or channel  $f^3$  of the former and the outer edge of the plate within the groove  $f^3$  of the former, and it is plain that as the plate is forced forward into the former the edge within the groove  $f^3$  will be curled over as the plate is advanced into the narrowing part of the former until more or less of a coil is given to the plate before it passes from the small end of the former. When the metal plate thus passes from the small end of the former F, it will be received by suitable reducing-rolls, G and G', within the peripheries of which are formed the grooves  $g$  of considerably smaller diameter than the body of the plate as it leaves the former; hence the plate, as it passes between the reducing-rolls G and G', will be so compressed that its layers will be further wound or coiled upon each other. From the reducing-rolls G and G' the plate may be passed into other similar reducing-rolls until the metal is so compressed as to give it the appearance of the finished article shown in Figs. 1 to 4 of the drawings.

I have found in practice that the finished bar or round may be readily formed with a central opening, as shown in Fig. 3, by merely modifying the action of the final reducing-rolls, so that the inner edge of the metal plate will not be forced entirely to the center.

When the form of bar or round illustrated in Fig. 4 is to be produced, the guide or former F of the apparatus will be so arranged with respect to the rolls B and C as to permit the plate of metal to be delivered into the guide at a slight angle, so that the plate will be wound in somewhat spiral direction, as shown. When the form of bar or round illustrated in Fig. 6 is to be made, the apparatus above de-

scribed may also be employed; but at such time two plates will be simultaneously passed through the apparatus instead of a single plate, as in the manner hereinbefore described.

It will be readily understood that when the form of bar illustrated in Fig. 5 of the drawings is to be produced the apparatus must be modified, and for this purpose I prefer to employ first a series of corrugated rolls for imparting deep corrugations to the metal plate, and then passing said corrugated plate through compressing and reducing rolls until the finished bar shown in Fig. 5 is formed.

I do not wish to be understood as claiming in this application either the apparatus above described or the method above set out of manufacturing my improved bars or rounds, as these are reserved as subject-matter for separate applications.

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

1. As a new article of manufacture, a bar or round of steel or iron, comprising multiple layers superposed from the same plate or plates by bending the metal of said plate or plates upon itself, substantially as described.

2. As a new article of manufacture, a bar or round of iron or steel, comprising multiple layers formed by winding a sheet or plate (one or more) of metal upon itself, substantially as described.

3. As a new article of manufacture, a bar or round of steel or iron having the grain of the metal extending in the direction of its length, said bar or round being formed from a plate (one or more) coiled or wound upon itself, substantially as described.

4. As a new article of manufacture, a bar or round of steel or iron formed from a plate (one or more) wound spirally upon itself, substantially as described.

SIDNEY McCLOUD.

Witnesses:

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I. B. CARPENTER.