

(No Model.)

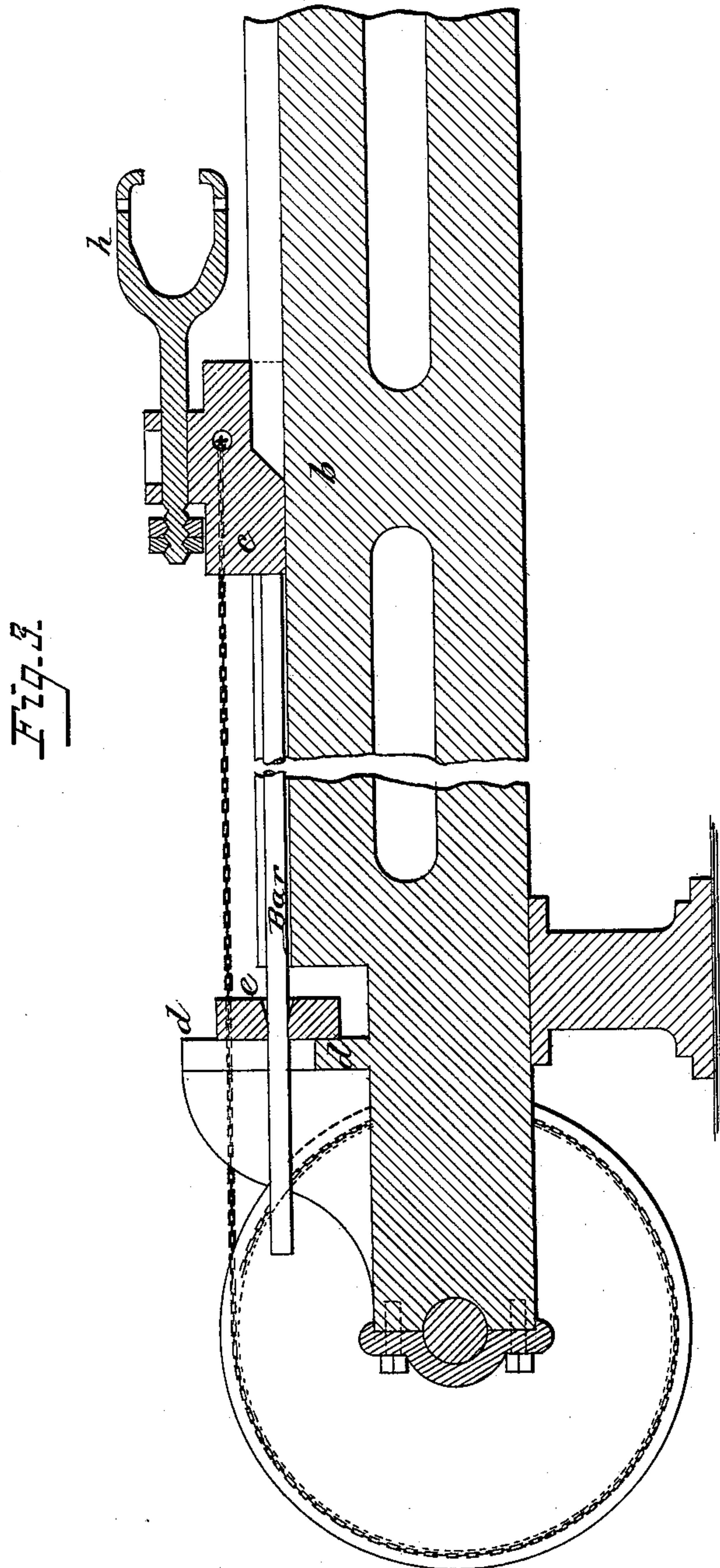
2 Sheets—Sheet 1.

P. M. HAAS.

ART OF MANUFACTURING ROLLED AND POLISHED SHAFTING.

No. 332,075.

Patented Dec. 8, 1885.



Attest:  
Court A. Cooper,  
Lucius Morris.

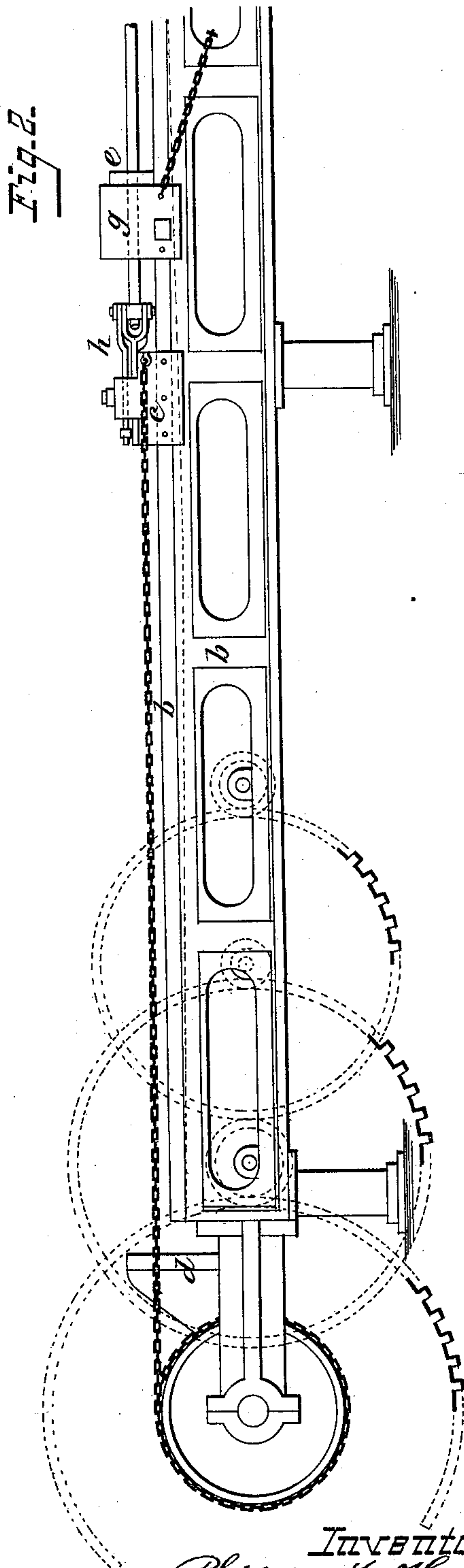
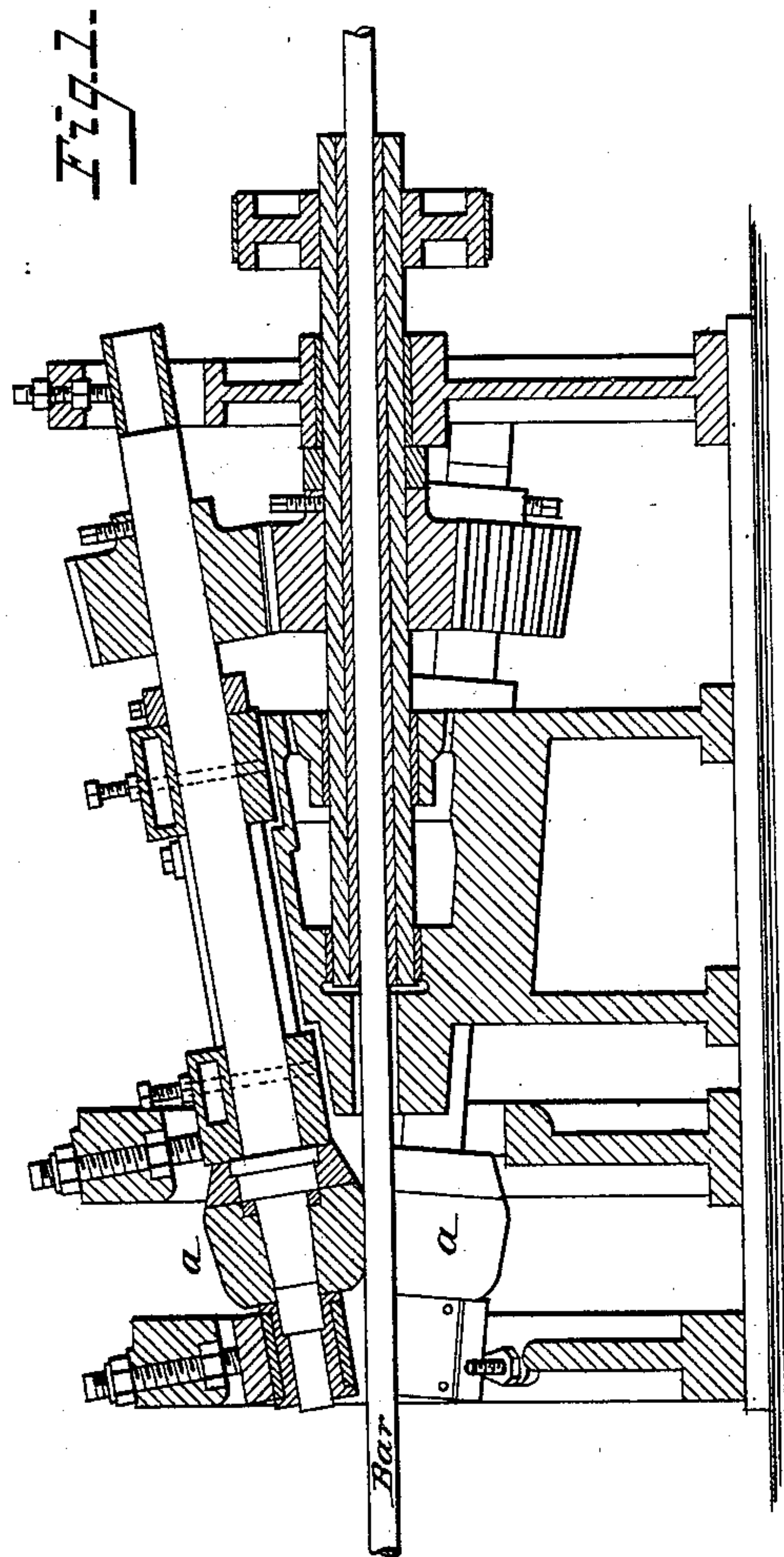
Inventor:  
Philip M. Haas  
by his Attorneys  
Johnson & Johnson

(No Model.)

2 Sheets—Sheet 2.

P. M. HAAS.

ART OF MANUFACTURING ROLLED AND POLISHED SHAFTING.  
No. 332,075. Patented Dec. 8, 1885.



Attest:  
Count A. Cooper.  
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Johnson & Johnson



# UNITED STATES PATENT OFFICE.

PHILIP MELANCTHON HAAS, OF YOUNGSTOWN, OHIO, ASSIGNOR OF ONE-HALF TO ANDREWS BROS. & CO., OF SAME PLACE.

## ART OF MANUFACTURING ROLLED AND POLISHED SHAFTING.

SPECIFICATION forming part of Letters Patent No. 332,075, dated December 8, 1885.

Application filed January 15, 1884. Serial No. 117,588. (No model.)

*To all whom it may concern:*

Be it known that I, PHILIP MELANCTHON HAAS, a citizen of the United States, residing at Youngstown, in the county of Mahoning and State of Ohio, have invented new and useful Improvements in the Manufacture of Shafting, of which the following is a specification.

My said improvements relate to the manufacture of high finished or polished shafting. Heretofore polished shafting has been produced by lathe-turning, grinding, and polishing round bars or rods as developed by the ordinary longitudinal rolling operations of the well-known rolling-mill; also, by subjecting such rolling-mill bars or rods, practically free from heat, to numerous successive passes, as in the well-known process of cold-rolling; also, by subjecting such rolling-mill bars or rods, practically free from heat, to die-drawing operations, said rods having previously been merely freed from scale, usually by acid-pickling; also, by subjecting such rolling-mill bars, while slightly softened by heat, to a well-known but peculiar rolling operation, during which the rod or bar is progressively rolled peripherally while rotating.

The aforesaid lathe-turning, grinding, and polishing operations are well known to produce a fine finish; but the cost thereof is so great that said operations have for many years been practically superseded by the other operations referred to.

The aforesaid die-drawing operations, it is well known, must be preceded by acid-pickling, because always heretofore the only working to which the metal is subjected prior to drawing is that of the usual rolling-mill, and no iron can be delivered therefrom free from scale. The finish thus produced upon the shafting by die-drawing is necessarily of an inferior character, because only a comparatively slight reduction in diameter can be made, and the surface of a rolling-mill rod acted upon by acids, as in pickling, for the removal of scale is not and cannot be so smooth and so free from pits or checks that these latter can be eliminated by any practicable die-drawing operation; and, moreover, the surface of said prior die-drawn shafting is not condensed sufficiently to enable it to receive and

maintain a fine finish, or to fairly resist roughening, as from the driving of pulleys, keys, &c.

The aforesaid cold-rolling operation upon rolling-mill rods or bars results in a fairly condensed metal at the surface, and in a fairly desirable external finish; but cold-rolled shafting is well known to lack uniformity, both as to diameter and to roundness, and although it is well known that by die-drawing shafting can be made absolutely true in these last-named respects, it is obviously practically impossible to subject cold-rolled shafting to die-drawing operations, because of the extreme density and hardness of the surface metal.

The aforesaid peculiar rolling operation, in which the rolling-mill bar or rod is progressively rolled peripherally by grouped rolls while the bar is revolving, affords a fair surface finish; but the shafting is of necessity more or less marked in spiral lines by the action of the rolls, and it is liable to and does frequently vary in diameter and in roundness, and also in the density of the surface metal.

The objects of my invention are to produce shafting having as fine or a finer finish than cold-rolled shafting, and with surface metal which is condensed as much as or more than said cold-rolled shafting, and which is as straight and as uniform in diameter and in roundness as prior die-drawn shafting, but with a much superior external finish.

My said invention is based upon my discovery that if a round rolling-mill bar be further rolled, as by a group of rolls, in peripheral or spiral lines at a proper heat, it will be admirably fitted for cold die-drawing—first, as to freedom from scale, and, secondly, as to having its surface metal already more or less polished and materially condensed and hardened; and, further, that a bar so rolled, when subjected to die-drawing operations, will have its previous imperfections remedied and its surface metal still further condensed to a greater degree of hardness than would be possible by die-drawing operations as heretofore practiced upon round bars rolled in longitudinal lines, as is common in ordinary rolling-mills; and that by thus consecutively applying a condensing pressure to the metal in peripheral lines by rolling, followed by a condensing pressure



in longitudinal lines by die-drawing, I can obtain as fine as or a finer finish than has, as I believe, ever heretofore been obtained; and I obtain this at a comparatively low cost—much less than either lathe-turning and grinding or by cold-rolling.

My invention mainly consists in subjecting a round bar of metal as ordinarily delivered from an ordinary rolling-mill, and at such a heat as will materially contribute to its ductility, but with little or no liability of further oxidation, to the action of grouped condensing-rolls which operate peripherally and progressively upon said bar while the latter is rotating, and then, after said bar is substantially free from heat, subjecting it to a die-drawing operation.

In one sense my method or process may be said to involve three steps, inasmuch as for obtaining the most economic results I in practice operate in close proximity to a round-bar rolling-mill, in order that I may utilize so much as I need of the heat which remains in each bar after its usual finishing-pass. If the bars be too hot for my peripheral or spiral rolling operation, they are allowed to cool, and if perchance they get too cold they are not used by me, but are sold as "merchant round bar-iron." If, however, it should be desirable for me to practice my invention independently of iron-producing works, the round bar-iron of commerce would be used, in which case it must be first heated to a proper temperature prior to the peripheral rolling operation.

In another sense my method or process may be said to involve only one mechanical step, inasmuch as I could obtain in the market spirally-rolled shafting much of which, after proper tests as to the density of the surface metal, would be found suitable, and could then be subjected to the die-drawing operation, and in this connection it is to be understood that the high character of the valuable surface finish for the first time obtained by me is mainly due to the fact that I follow a spiral-line partial finish with a straight-line complete finish. In other words, the peripherally or spirally rolled metal is surfaced in peripheral or spiral lines, the condensing pressure being applied thereto progressively while the bar is rotating, and the die-drawn metal is finished in straight lines which are practically at right angles to the said peripheral lines, and hence a finer, closer finish is obtained by the dies than would be possible with metal previously surfaced in straight lines; and therefore the gist of my invention may be said to consist in die-drawing shafting which has been previously surfaced in peripheral lines, whereby the surface metal is first worked in one direction for producing a condensed scaleless surface, and then in a direction substantially at right angles to the first for producing the perfect finish desired.

The matter of suitable temperature during the spiral-rolling operation is of practical consequence, and while it can be somewhat varied

without materially affecting the desired results, and while it is difficult for me to indicate the precise temperature best suited for my purposes, skilled iron-workers will be readily guided when I state that I obtain the best results with the metal at a "cherry-red" heat, so that as the bar revolves and the grouped rolls act thereon in spiral lines the surface metal will be condensed, well smoothed, and roughly polished, and also be thereafter so far free from heat as to render oxidation practically impossible during, or at least immediately after, the operation.

The die-drawing operation may immediately succeed the spiral-rolling operation with fair results, because the surface of the metal by that time should be so far free from heat as to not materially affect its ductility; but I prefer that it be cold enough to be safely manipulated with the naked hand. The extent of reduction by the peripheral rolling operation from the rolling-mill bar can of course be somewhat varied; but I obtain good results by a reduction of about one thirty-second of an inch in diameter, and in die-drawing I get desirable results by a reduction from the peripherally-rolled bar of about one sixty-fourth of an inch, although this also may be somewhat varied without materially affecting the results.

Shafting produced by my process constitutes what is widely recognized as an improved article of manufacture, which can readily be distinguished from any shafting heretofore known in the market.

As compared with prior turned and polished shafting, mine has surface metal much harder and more thoroughly condensed than the inner portion. It also differs in color therefrom, mine being blue, and said prior shafting being bright or so-called "white;" and, moreover, the fact that my shafting is die-drawn is so clearly indicated by the appearance of the surface that no doubts thereon could occur.

As compared with the prior die-drawn shafting produced from rolling-mill bars without spiral rolling, my shafting differs therefrom in being free from pits, checks, or scars, and in having a much harder surface, it being well known that a single drawing operation can only condense the metal to a certain degree, and that such a condensed condition cannot be increased by a second drawing, because intermediate annealing is necessary, and that inevitably involves more scale, more pickling, and a repetition of the original checks and scars common to this class of shafting.

As compared with the prior spiral-rolled shafting, mine differs therefrom in having a more thoroughly condensed surface, in being uniform in roundness and diameter, and in being free from the spiraling roll-marks well known to be common to this variety of shafting.

Mechanical means for carrying out my invention are fully illustrated in the accompanying drawings, and they are preferred by me



for obtaining the best results, because they have been thoroughly tested and embody certain novel features devised by me.

Referring to said drawings, Figures 1 and 2 respectively illustrate in vertical section and in elevation apparatus for peripherally rolling and for die-drawing shafting in accordance with my invention, and Fig. 3 represents in enlarged sectional view so much of the die-drawing apparatus as illustrates the operation of entering the bar in the die as an initial step in the drawing operation.

In Fig. 1 tapered rolls *a* are shown grouped together in a well-known manner to surround a bar of metal and afford a central tapering pass for longitudinally receiving a round bar of metal, and provided with means for adjustably forcing said rolls inwardly according to requirements in each case, so that when in operation they will peripherally roll the surface of the bar and cause it to be moved forwardly, and thereby condense its surface in spiral lines, and deliver it in a partially-polished condition, wholly free from scale. For a further description of these rolls, if need be, reference may be had to my Letters Patent granted upon my application filed April 14, 1883, Serial No. 91,715; but it is to be understood that other well-known organizations for peripherally rolling a rod or bar progressively may be employed with more or less desirable results without departure from my present invention.

In the die-drawing machine shown in Fig. 2 there is a metallic frame or trough, *b*, which is V-shaped in cross-section. Upon and in said trough or frame a sliding head, *f*, is fitted, which at its front lower end has a face, *c*, which serves as an abutment for a rod or bar during the initial thrust thereof into and slightly through the solid drawing-die *e*, which for that part of the operation is placed against the stationary vertical abutment *d*, located near the rear end of the frame or trough. After the rod or bar has thus been entered into the die *e*, both are then moved so that the die will abut against the vertical standards *g*, and so that the protruding end of the rod or bar will

so project beyond said standards that it can be securely grasped by the dogs *h*, which are mounted upon the sliding head *f*, this latter, in a manner well known, being coupled by chains to a revolving drum, to which power is applied through a suitable train of gearing:

For a further description of this particular machine, if need be, reference may be had to my Letters Patent granted upon my application filed April 20, 1883, Serial No. 92,323; but it is to be understood that solid die-drawing machines otherwise organized may be employed without departure from my present invention.

The improved article of manufacture which I have described, consisting of die-drawn shafting uniform in diameter and having its surface metal condensed and hardened, and also having a die-drawn surface finish free from pits or checks, is not claimed herein, and will be made the subject of a separate application for a patent.

I claim—

1. The improvement in the manufacture of shafting, substantially as hereinbefore described, which consists, first, in spirally rolling a round bar of suitable metal at substantially a cherry-red heat, and, secondly, in die-drawing said bar when substantially free from heat, whereby said rod or bar is converted into shafting uniform in diameter, and having a highly-finished and well-condensed surface.

2. The improvement in the art of surface-finishing shafting, substantially as hereinbefore described, which consists, first, in cleansing and partially condensing the surface of a rod or bar of metal by rolling pressure applied thereto in peripheral lines, and, secondly, die-drawing said metal.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

PHILIP MELANCTHON HAAS.

Witnesses:

STEWART D. McKELVAY,  
JAS. P. KENNEDY.