

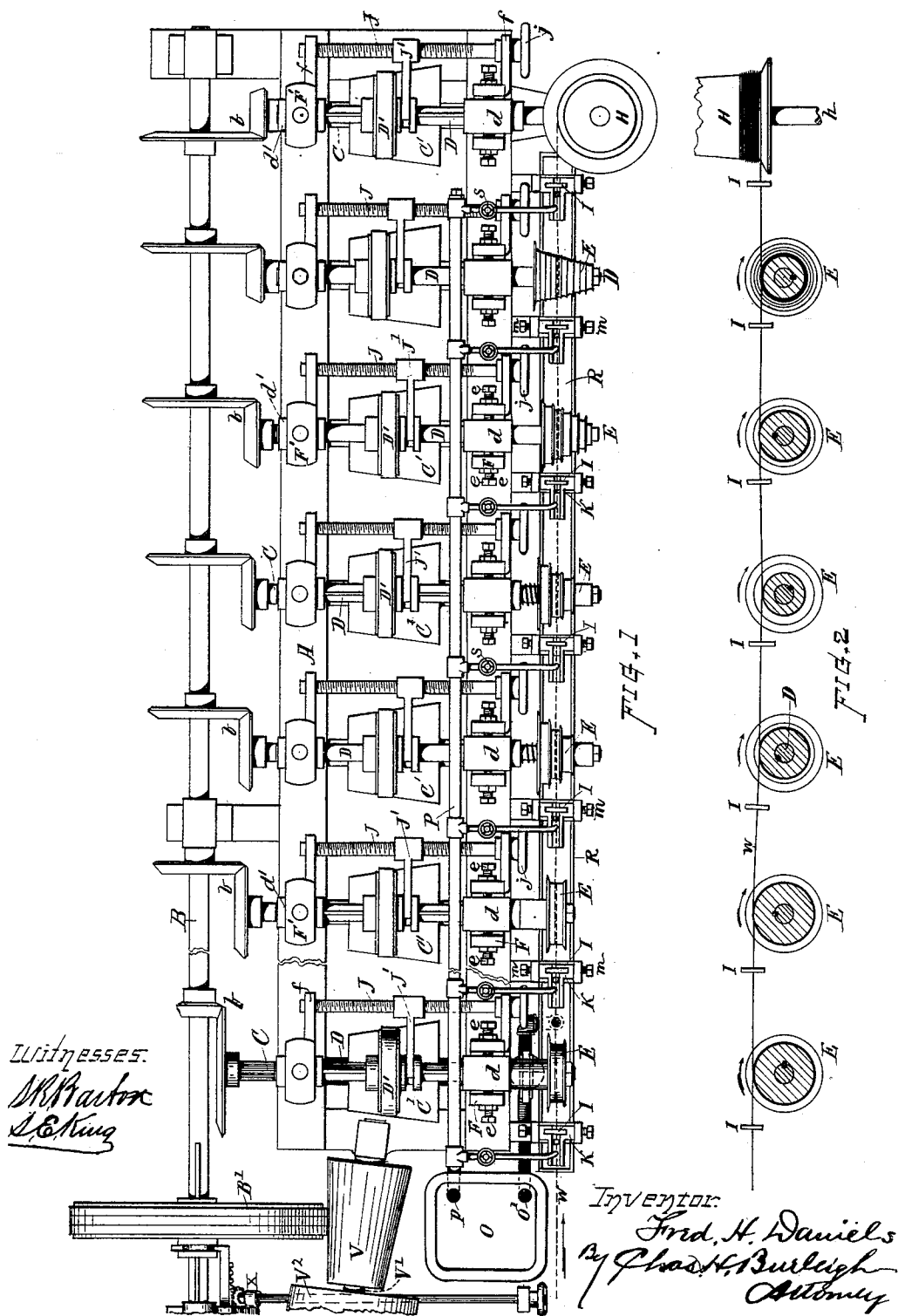
(No Model.)

3 Sheets—Sheet 1.

F. H. DANIELS.
WIRE DRAWING MACHINE.

No. 406,030.

Patented July 2, 1889.



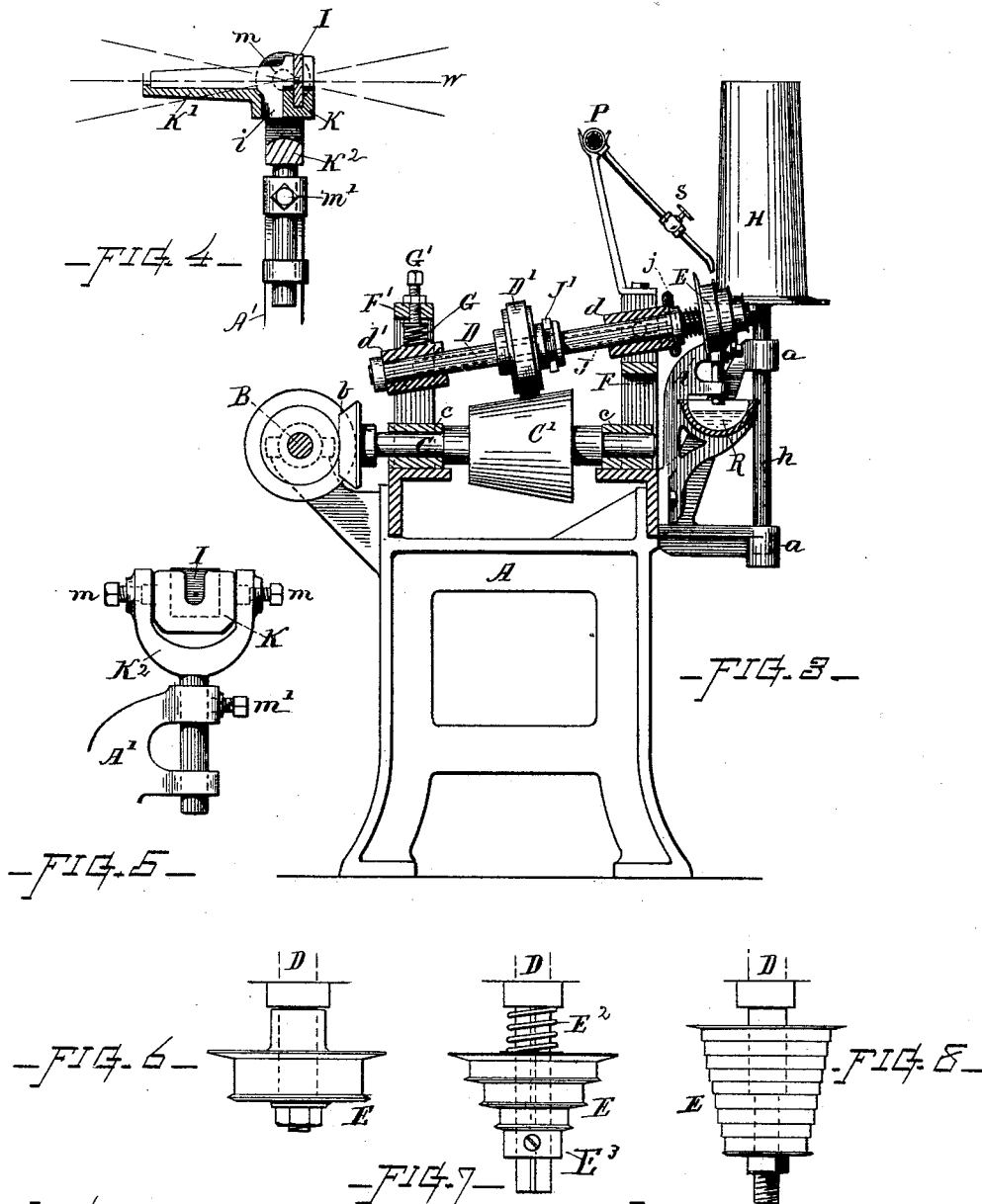
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W. R. Barton
S. King

Inventor.

And H. Daniels
By Chas. H. Burleigh
Attorney

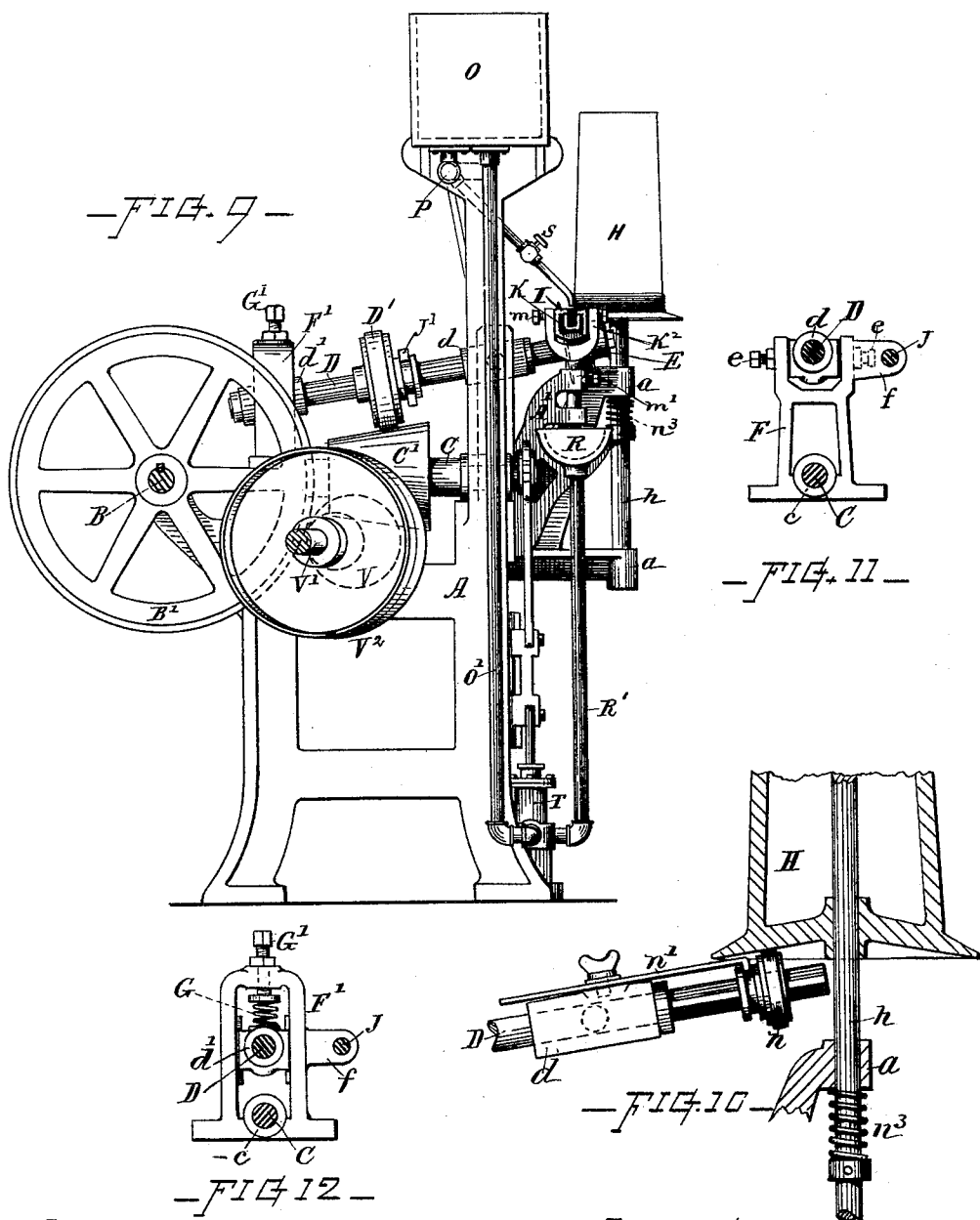
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UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

WIRE-DRAWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 406,030, dated July 2, 1889.

Application filed December 17, 1888. Serial No. 293,773. (No model.)

To all whom it may concern:

Be it known that I, FRED H. DANIELS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Continuous Wire-Drawing Machines, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The object of my present invention is to improve the construction and render more efficient and successfully operative machinery for the automatic drawing of wire through a series of reducing-dies by simultaneous and continuous operation, and to afford ample facilities for adjustment of the mechanism and for the regulation of speed at the different parts to meet the requirements of the work, and give economical and practically beneficial results as regards the quality and quantity of wire produced; also, to provide, in combination with the series of dies and drawing mechanism, means for the continuous lubrication of the wire as it advances through the machine.

Another object is to provide a die-holder having facilities for adjustment in various directions to accommodate the placing of the die, so that it will stand at right angles to the direction in which the wire is drawn to the draft-pulley.

Another object is to provide a horizontally-pivoted die holder or support, combined with a standard that is vertically and rotatively adjustable on a vertical axis, for the purpose hereinafter explained.

These objects I attain by mechanism the nature and operation of which are explained in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a plan view of a continuous wire-drawing machine, illustrating my invention. Fig. 2 is a sectional diagram showing the relative arrangements of the dies and drawing-rolls. Fig. 3 is a vertical transverse section of the machine. Fig. 4 is a vertical section through one of the dies and die-holders. Fig. 5 is a side view of one of the die-holders. Figs. 6, 7, and 8 show the

wire-drawing heads or rotating draft-pulleys. Fig. 9 is an end view of the machine. Fig. 10 is a detail view illustrating the manner of driving the final draw-block; and Figs. 11 and 12, respectively, show the arrangement of the front and rear bearing standards or housings for the journals of the draft-arbors.

In my present drawings I have shown but seven sets of drawing-arbors and dies; but it will be understood that any desired number may be employed in practice, as the general construction, arrangement, and manner of operation for each set are substantially the same throughout the series, excepting that the gearing is proportioned to give an increased speed of revolution to the successive arbors and draft-pulleys, in order to accommodate the increase in length of the wire as its size is reduced. Therefore the description of one set of draw-heads, driving-arbors, and die-supporters will suffice for a full understanding of all the series.

Referring to parts, A denotes the main frame, of suitable construction to support the working parts, and B indicates the main shaft extending longitudinally of the frame and mounted to rotate in suitable bearings thereon.

C indicates operators or transversely-disposed shafts located at intervals along the frame, journaled in suitable bearings *c*, and driven from the longitudinal shaft B by suitable gearing at *b*. These operator-shafts are each provided with a conoidal drum *C'* for transmitting power and motion therefrom.

D indicates the draft-arbors, upon the front ends of which are mounted the draft-pulleys E for drawing the wire through the dies I. Said draft-arbors are arranged above and parallel with the coned surface of the operators *C'*, and are respectively journaled in bearings *d* and *d'*, arranged in supporting-housings F and F' in the manner indicated, the forward bearing *d* being horizontally pivoted within its housing F by trunnions or centering-studs *e* at its opposite sides, while the rear bearing *d'* is fitted to slide up and down within the housing F'. A spring G is placed above the bearing *d'* for pressing it downward, and a screw G' is provided for regulating the tension of said spring.

Upon the arbor D, I arrange a wheel D', having a peripheral rim or surface that engages by frictional contact with the surface of the operator-cone C', transmitting motion from the operator-shaft to the arbor D and draft-pulley E. The friction-wheel D' and arbor D are fitted together with a suitable spline or feather, so that the two rotate in unison while the friction-wheel can slide endwise on said arbor, so that its periphery can engage with the operator-cone at the larger or the smaller end thereof, or at any intermediate position, for varying the speed or number of revolutions of the arbor and draft-pulley relatively to the speed of the operator-shaft. For effecting the adjustment of the friction-wheel D' in relation to the operator-cone, I prefer to employ a screw-threaded shaft J, journaled in suitable bearings *f* on the housings F F' and connected with the wheel by an arm J', one end of which is provided with a threaded hub that works on said screw-shaft, while the other end is forked and fitted to engage in a groove formed around the hub of the friction-wheel. The screw-shafts J are respectively provided with suitable heads or hand-wheels *j* for conveniently rotating them, and thereby adjusting the several friction-wheels D' relatively to their cones C, to regulate the speed to exactly the degree required for drawing the wire at each of the respective draw-heads.

For supporting the wire-drawing dies I, which are of usual form, I employ die-holding mechanism constructed substantially as shown in Figs. 3, 4, and 5, and comprising a head-piece K, having a socket for receiving the die I and a trough-shaped extension K'. This head-piece is supported by lateral trunnions, pivot-studs, or supporting-screws at *m* upon a forked standard K² in a manner to rock in a vertical plane coincident with the axis of the die, while the standard K², which is supported in bearings on a suitable bracket A', fixed on the frame A, is arranged to have rotative adjustment on a vertical axis, and also to be capable of adjustment upward or downward, a suitable clamp or set-screw *m'* being provided for securing it in place at any position of adjustment desired.

H indicates the drawing-block upon which the wire is wound when finished. Said drawing-block is supported on an upright shaft *h*, that rotates in bearings *a*, and is rotated by means of an arbor D and operating devices similar to those employed for the draft-heads E, the end of said arbor being connected for imparting motion to the drawing-block by suitable gearing, or, preferably, by a friction-wheel *n*, that engages a disk or surface at the under part of the drawing-block, as indicated in Fig. 10, and which wheel *n* is fitted to slide on the splined end of the arbor and furnished with an adjusting-bar *n'*, or means for effecting its adjustment, to vary the speed of rotation at which the drawing-block is operated in relation to the arbor. A suitable spring

*n*³ may, if desired, be employed for pressing the friction-surface of the draw-block against the wheel *n* in case the weight of the parts is not sufficient to give the required traction or draft of the wire.

O indicates an elevated tank, and P a distributing-pipe having a series of branches provided with suitable stop-cocks S arranged for supplying by gravity a constant flow of liquid lubricating material and delivering it upon the wire as it passes through the trough-shaped extensions of the die-holding heads K. Said heads are preferably formed with an opening *i*, that allows the lubricating-liquid to escape in front of the die I. A receiving-trough R is arranged beneath the series of dies, into which the liquid drips from the die-holders. A pipe R' leads therefrom to a suitable pump T, operated by an eccentric on one of the shafts, or in other convenient manner, which pump forces or elevates the liquid lubricant from the trough R through the pipe O' into the tank O, and thus maintains a continuous circulation. The tank O can, if desired, in some instances, be omitted, the pipe O' and pipe P being connected together as a continuous pipe, as indicated by dotted lines on Fig. 9.

The main shaft B is preferably provided with a friction-driving wheel B', the periphery of which engages with and is operated by a conoidal drum V, fixed on the counter-shaft V', whereon is mounted the pulley or pulleys V², which receive power and motion from the driving-belt. The friction-wheel B' is adjustable longitudinally upon the shaft B, and is confined from independent rotation by a suitable spline. It is also furnished with a suitable shifting mechanism X, whereby it can be shifted for working in contact with the larger or smaller end of the cone V, or at intermediate position, for giving faster or slower speed to the entire machine. If in any instance it is desired, the machine can be made without the coned drum V and friction-wheel B', the operating-pulley being placed directly on the shaft B, or on a shaft connected therewith by ordinary spur-gears.

The drawing-heads or draft-pulleys E are formed and connected with the ends of their arbors D, as illustrated. If desired, draft-pulleys having a single face, as in Fig. 6, may be used, or an improved draft-pulley, substantially as shown in Figs. 7 and 8, having a coned face or a series of offsetting fillets of different diameter, said draft-pulley being adjustable inward or outward on the arbor D to bring any portion thereof to range in line with the dies. This form of draft-pulley permits of the wire being wrapped around a circle of larger or smaller diameter, as may best meet the requirements of draft at any particular die, and the corresponding variation in the speed of draft without changing the number of revolutions of the arbor or draft-pulley.

Any convenient means may be employed for retaining the draft-pulley E at proper po-

sition on the arbor D—as, for instance, a nut, set-screw, a collar E³, and spring E², as in Fig. 7, or other suitable device.

The tilting adjustment of the die-holder facilitates the placing of the die-plates squarely perpendicular to the longitudinal axis of the wire *w*, as it passes from the periphery of one roll or head to the next, regardless of any variations in the relative diameters or position of the several drawing-heads.

In the operation of my improved continuous wire-drawing machine the wire from a coil, supported on the usual or any suitable reel, is passed through the first die, wrapped about the first drawing-head E, then passed through the second die and wrapped around the second draw-head, and so on in order throughout the series, and finally wound upon the drawing-block H. The speed of the several arbors D and heads E is adjusted so as to give an excess of speed for each succeeding draft properly in proportion to the elongation of the wire by the successive reductions, by means of the adjustable friction-wheels D and hand-screws or shafts J.

The speed of the entire machine can be varied by means of the friction-wheel B' and cone V for starting slowly and then increasing the speed, when it is seen that all of the dies and draft-pulleys are drawing properly. This variable mechanism also permits of the machine being worked at any desired speed. This feature is of practical utility in the operation of this class of machines.

It will be understood that I do not herein claim, broadly, a machine comprising a series of dies and drawing-heads arranged for the continuous drawing of the wire and having means for the variation of the speed of the drawing-heads, as I am aware that machines embracing such features have heretofore been made; but in all such machines heretofore made the mechanism is essentially different in construction, nature, and mode of operation from my improvements.

I claim as my invention, to be secured by Letters Patent—

1. A wire-drawing machine having draft-pulley arbors provided with movable friction-wheels, in combination with operator-shafts provided with conoidal drums, and in which the revolution of the draft-pulley can be varied by shifting the friction-wheel endwise on its arbor while in contact with the conoidal drum of the operator-shaft which imparts motion thereto, substantially as set forth.

2. In a wire-drawing machine, the combination, with a conoidal-drum operator, of the draft-arbor for supporting the wire-drawing pulley mounted in a pivoted bearing at one end and in a sliding bearing at the other end, and a spring or equivalent means for forcing said sliding bearing toward the operator-shaft, for the purpose set forth.

3. The combination of the operator-shaft having a conoidal drum, the draft-pulley arbor provided with a friction-wheel that is

movable longitudinally on said arbor and peripherally in contact with said drum, supporting-bearings for said arbor which afford a yielding action, and a connection for effecting endwise adjustment of the friction-wheel in relation to the arbor and conoidal drum, substantially as set forth.

4. In a wire-drawing machine, the screw-shaft J and engaging-arm J', combined with the friction-wheel D' and arbor D, for effecting endwise adjustment of said friction-wheel on the arbor, substantially as set forth.

5. In a wire-drawing machine, the combination, with the draft-pulley, draft-arbor, its friction-wheel, the operator shaft and drum, and adjusting-screw shaft and wheel-shifting arm J', of the housings F F', the arbor-bearings *d d'*, supported in the respective housings in the manner shown, the spring G, and set-screw G', for the purposes set forth.

6. In a wire-drawing machine, in combination with the wire-reducing dies, the draft-pulleys having their working-faces formed as cones or steps of offsetting fillets, adapted for arranging the wire thereon at different positions relatively to the coned surface, whereby the speed of draft can be varied without changing the number of revolutions of the drawing-arbors or the draft-pulleys, substantially as set forth.

7. In a machine for drawing wire, the wire-drawing roll or draft-pulley having its face formed as a cone or series of offsetting fillets of different diameters, in combination with the wire-reducing die and a rotatable supporting-arbor, whereon said draft-pulley is adjustable longitudinally, substantially as and for the purpose set forth.

8. In a machine for drawing wire, in combination with the draft-pulley and wire-drawing die, the die-holder consisting of a head-piece having a socket for supporting a wire-drawing die, connected by pivots or trunnions with an adjustable standard, which standard is capable of endwise and rotative adjustment, substantially as set forth.

9. In a wire-drawing machine, the combination of a draft-pulley having its face formed as a cone or offsetting series of fillets, a wire-reducing die, and a rocking die-holder mounted upon a rotatively adjustable supporter.

10. In a machine for drawing wire by continuous operation, a series of wire-drawing rolls or draft-pulleys having faces formed as cones or in offsetting fillets of varying diameter, in combination with a series of wire-reducing dies and adjustable die-holders for supporting said dies, which afford facility for placing the dies at right angles to the direction of the wire, whether running onto the larger or smaller portion of the draft-pulleys, substantially as set forth.

11. In a wire-drawing machine, the combination, with the draw-block, of the rotatable arbor D, provided with an adjustable friction-roll *n*, that engages a surface or disk con-

nected with said draw-block for imparting motion thereto, substantially as set forth.

12. In a continuous wire-drawing machine, the combination of a series of drawing-dies, a series of arbors carrying draft-pulleys, a main shaft with operating mechanism for imparting rotative motion to said series of arbors and draft-pulleys from said main shaft, a driving-shaft provided with a pulley or pulleys for the drive-belt, a friction-drum of varying diameter and an adjustable friction-wheel for transmitting power and motion from said

driving-shaft to said main shaft, and a shifter for changing the relative engaging position of the friction-surfaces of said wheel and drum to vary the number of revolutions of said main shaft relatively to the speed of the driving-shaft, for the purpose set forth.

Witness my hand this 13th day of December, A. D. 1888.

FRED H. DANIELS.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.