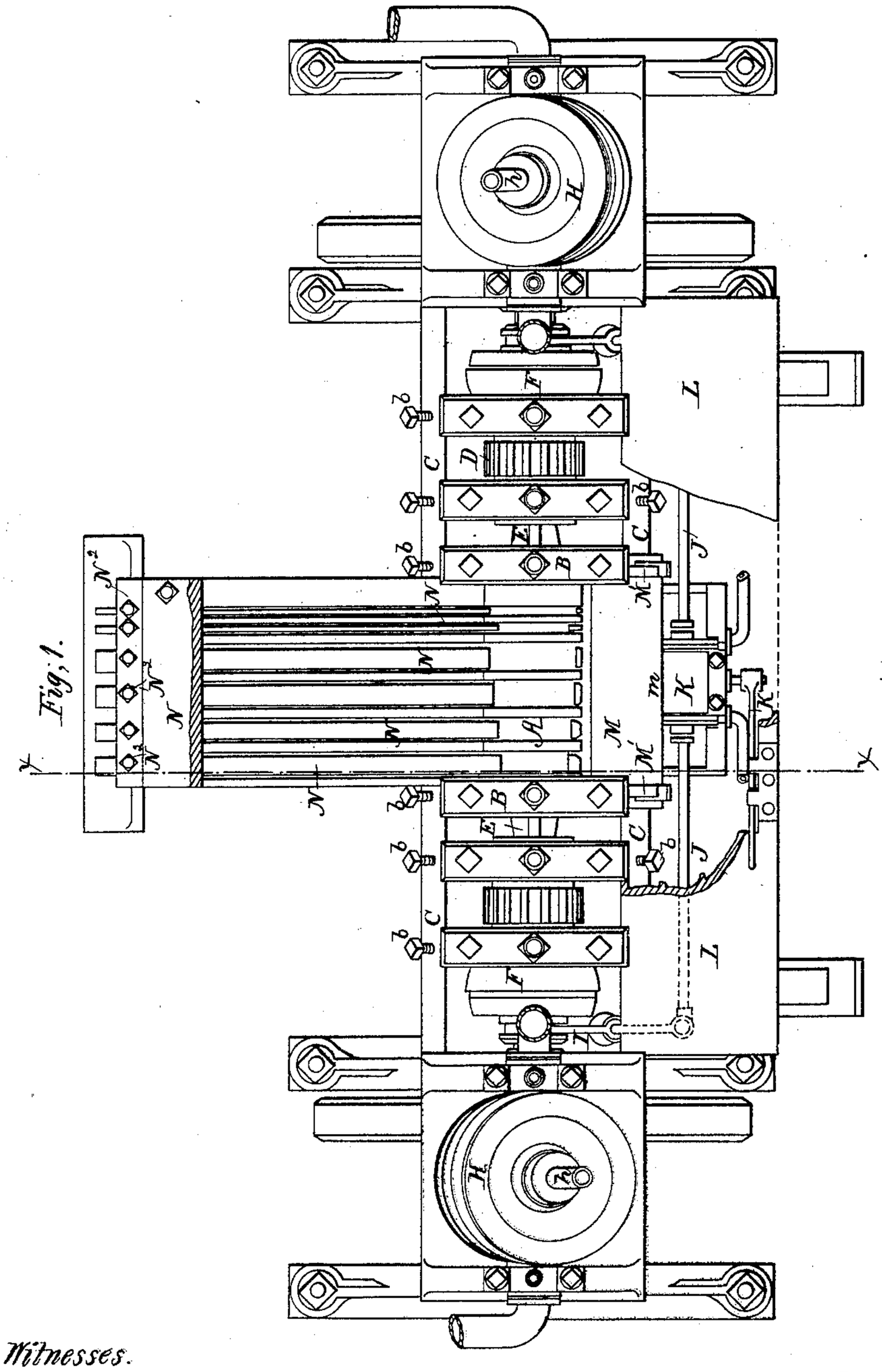
3 Sheets—Sheet 1.

J. MONTGOMERY

ROLLING MILL.

No. 86,314. Patented Jan. 26, 1869.



Witnesses.
J. E. M. Bowen.
W. B. Deming

Inventor.
James Montgomery

3 Sheets—Sheet 2.

J. MONTGOMERY.

ROLLING MILL.

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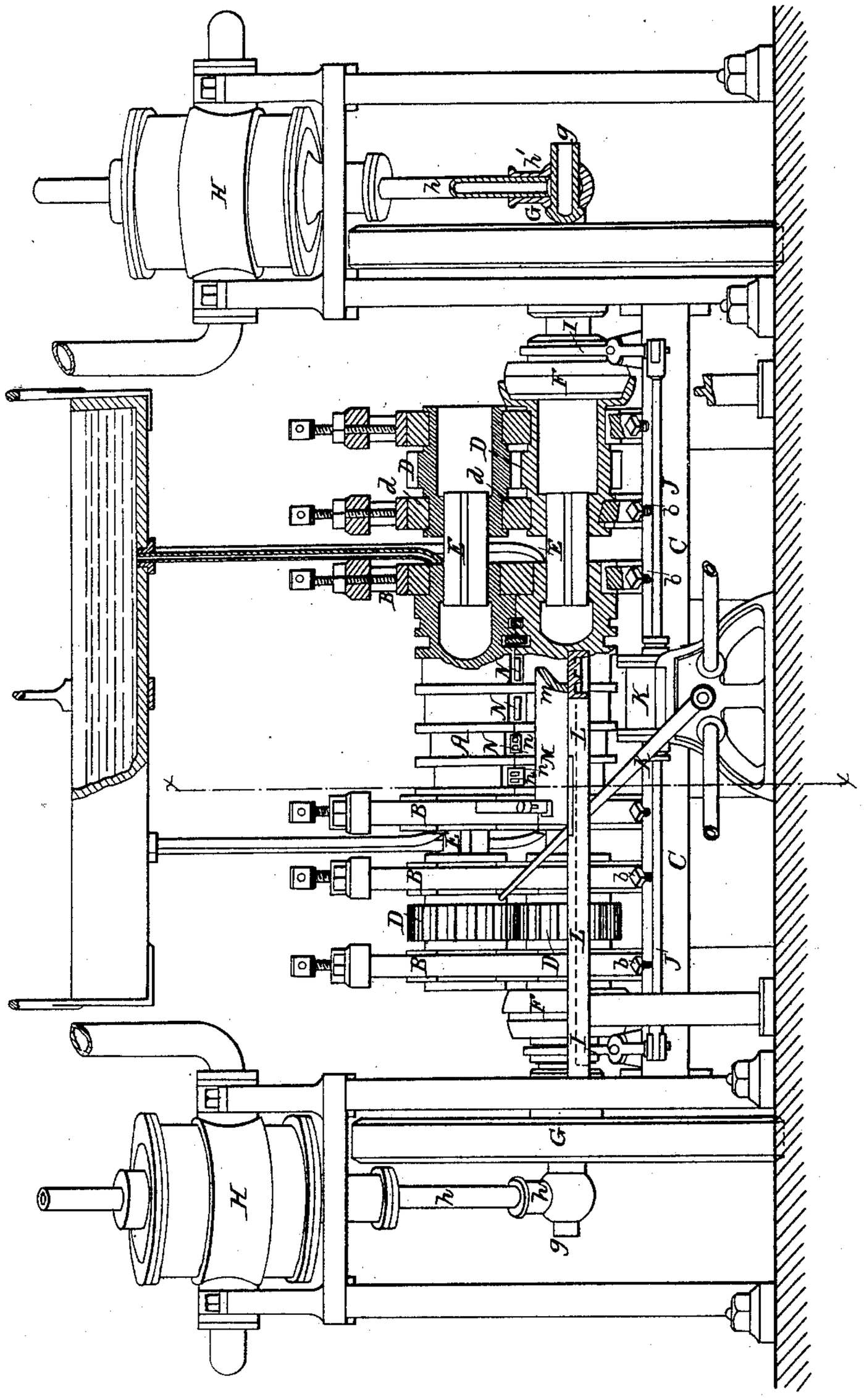

Fig. 2.

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3 Sheets—Sheet 3.

J. MONTGOMERY.

ROLLING MILL.

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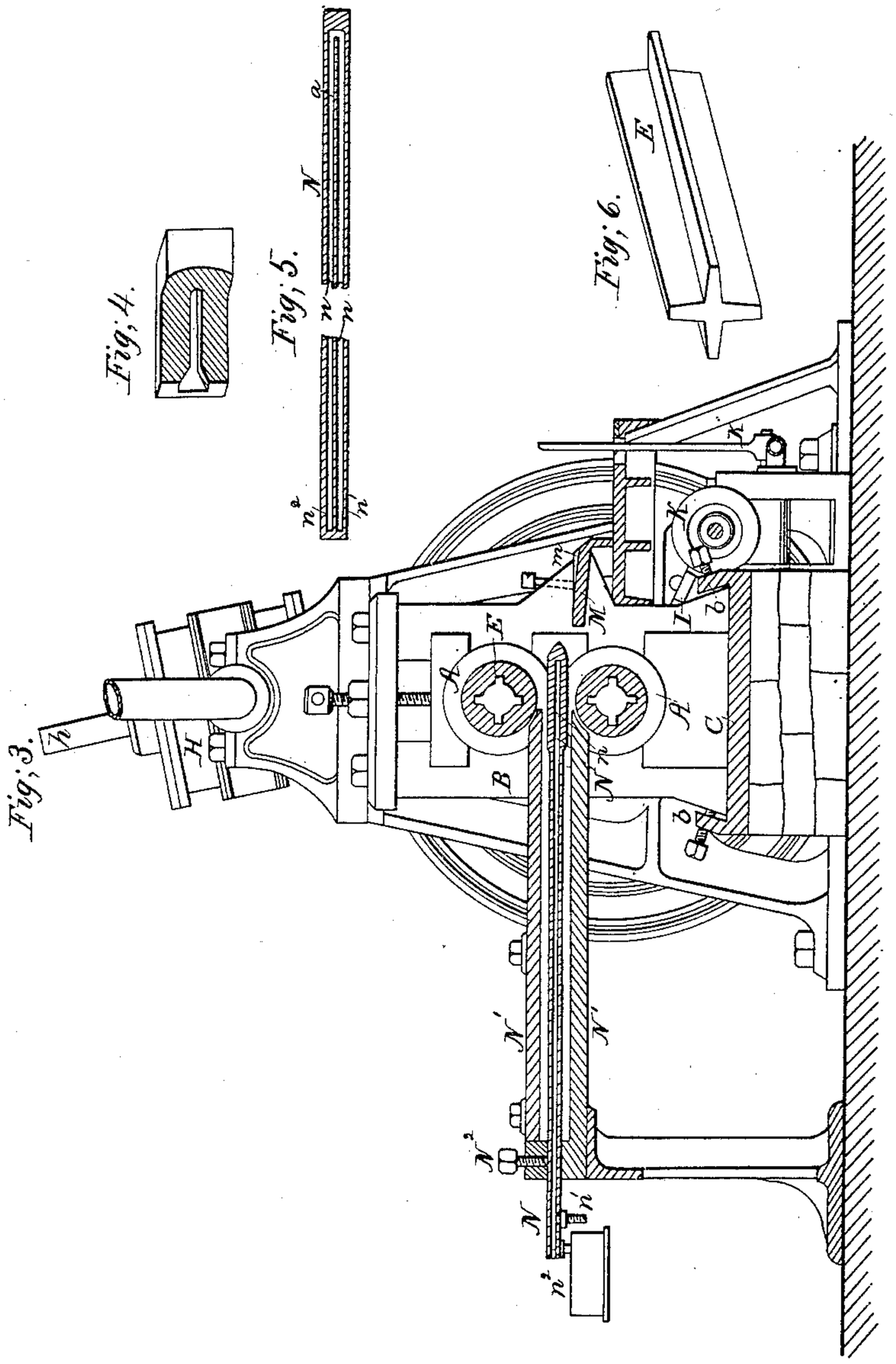

Witnesses.
J. & M. Bowen.
W. B. Deming.

Inventor.
James Montgomery

United States Patent Office.

JAMES MONTGOMERY, OF CROTON LANDING, NEW YORK.

Letters Patent No. 86,314, *dated January* 26, 1869.

IMPROVEMENT IN ROLLING-MILLS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, JAMES MONTGOMERY, of Croton Landing, in the county of Westchester, and State of New York, have invented a new and useful Improvement in Rolling-Mills; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, which are made part of this specification.

My invention consists—

First, in constructing the rolls hollow, and driving them by frictional clutching-apparatus, as hereinafter explained.

Second, in an improved construction of coupling-shafts for connecting the rolls and their driving-pinions.

Third, in an improved construction and arrangement of hollow mandrels, upon which hollow articles may be rolled, and within which water may be circulated, to keep the mandrels cool, as hereinafter described.

Fourth, in improved modes of constructing and supporting the fore and rear plates upon which the blooms or ingots are fed to the rolls.

Fifth, in an arrangement, in connection with a rolling-mill steam-engine, of a hollow piston-rod and crank-pin, as hereinafter explained.

In the drawings—

Figure 1 is a plan or top view of a rolling-mill, illustrating my invention.

Figure 2 is a front elevation of the same, partly in section.

Figure 3 is a vertical transverse section at *x x*, figs. 1 and 2.

Figure 4 represents a longitudinal section of one of my hollow mandrels.

Figure 5 represents a longitudinal section of one of my hollow mandrels.

Figure 6 represents a transverse section of the X-formed coupling-shaft, hereinafter described.

A A represent a pair of hollow rolls, mounted in bearings B B, and grooved upon their peripheries, in any suitable manner, according to the form of the article which they may be intended to produce.

By making them hollow, the said rolls would be protected from rapid heating by the circulation of air within them, but, as a complete and permanent protection against heating, I prefer to pass a constant current of water through the rolls.

The water may be introduced at one end of the rolls by a pipe, P, leading from a customary water-trough, T, and discharged at the other end.

The journals of the rolls are likewise hollow, and have their bearings in housings, B B, mounted in grooves, or otherwise fitted to slide upon the bed-plate, C, and adjusted and secured by screws, *b b*, for the purpose of setting them in or out, so as to bring the bearings of the rolls accurately in line.

D D are the connecting-pinions of the rolls, the necks or journals, *d d*, of which are also made hollow, for the object before stated.

The connections between the rolls A A and the driving-necks *d d* are formed by X-shaped coupling-shafts, E E, fitting corresponding grooves within the journals, as represented in fig. 3.

F F represent friction-clutches, of any suitable form, for communicating motion to the driving-necks from the crank-shafts G G of engines H H, which engines are to be kept constantly running.

The water to supply the rolls may be conducted from a common trough, T, by pipes P P, or in any other suitable manner.

The clutch-levers I I are moved simultaneously by a connecting-rod, J, so that the advancing of one clutch will retract the other, and the parts are so arranged and operated that the respective engines will turn the rolls in opposite directions.

The rod J passes through an auxiliary steam-cylinder, K, and is attached to the piston thereof, so as to be thrown in either direction, under control of the roller-man, who stands on the platform L, and operates the valve-lever *k* of the said engine K with his hand or foot.

The crank-pins *g g*, piston-rods *h h*, and all other parts of the mill which are exposed to heavy friction, are made hollow for the objects hereinbefore set forth, and, in addition to this, the hollow vertical piston-rods *h h* being partially filled with cotton or other capillary material, and plentifully supplied with oil, will furnish lubrication for a month for their boxes *h' h'*, and the crank-pins *g g*, upon which they work.

While describing this invention as used with a vertical piston-rod, I do not limit myself thereto, as the capillary filling will supply the oil to the pin, if the hollow rod be in a horizontal, oblique, or even an inverted position.

The fore plate M, I support without legs in front, in order to avoid any obstruction to the clearing away of scale or other refuse.

For this purpose I employ brackets M' M', arranged in pairs, so that the ends of the plate may be introduced between them, and there held by wedges m^1.

Screws m^2 are then passed through the upper brackets, to firmly hold the wedges m^1.

The said fore plate is formed in front with a downward curve, as shown at *m*, in order to facilitate the passage of the blooms on to and over it, and prevent it making an indentation in the heated metal, or catching splinters or projections thereon, which (in mills as now commonly constructed) cause serious obstruction and difficulty in introducing the metal to the rolls.

Both of these improvements are of course to be applied to the rear plates also, in mills where rear plates are used.

N N represent adjustable hollow mandrels, fitted with diaphragms *n*, around which water is caused to pass from end to end within said mandrels, to keep them cool.

For rolling hollow articles, such as tubular rans, or

beams, or pipes, for any purpose, I employ hollow ingots, of steel or iron, such as represented in fig. 4, which are drawn and pressed around the mandrels N by the action of the rolls, and, when rolled to a sufficient length, are drawn off the mandrels by the backward rotation of the rolls.

In many cases it will be expedient to subject the metal to a number of passes back and forth, before withdrawing it from the rolls.

The reversibility of my rolls, thus enables the operator to roll and reroll the metal a number of times with great rapidity. This is a matter of very great importance in rolling tubular articles, owing to the thinness of the metal, and consequent liability to rapid cooling.

The casings N^1, around the mandrels N, serve to support and keep them to their work, and also to prevent any deflection of the tubes in the act of rolling long tubular articles.

N^2 represents screws, by which the mandrels may be secured and adjusted endwise.

n^1 and n^2 are pipes, for the introduction and discharge of water.

My mill may be used very advantageously for rolling solid iron, without the mandrels.

The reversibility enables me to do with a "two-high" mill, with less time and labor, all that can be done with a "three-high" mill of ordinary construction.

I have described my mill as furnished with a pair of constantly-running engines, either of which may be instantaneously connected or coupled to the rolls, so as to reverse the motion of the latter, when desired.

The practical roller will readily understand that the power of these engines, though not always exerted in driving the central pair of rolls herein described, may be utilized to run other rolls or machinery necessarily connected with every large rolling-mill.

If, however, it be preferred to use only a single engine, a suitable train of gearing may be used to reverse the rolls at will, and a clutch to stop and start them, as required, without stopping the engine.

The clutch-couplings may be made of disk, or cup, or other suitable form. Their important function is to arrest and reverse the motion of the rolls, without danger of injury to any of the parts, and as rapidly as the workmen can possibly re-enter the metal.

Another great advantage of the friction-connection is, that, in the event of an unyielding obstruction entering between the rolls, the friction-clutch will slip before any part of the machinery can be injured.

At times, when special power is required, one of the engines may be reversed, so that both will act in unison to drive the rolls in one and the same direction. For this purpose the simultaneous closing of both the friction-clutches may be effected by having the rod J in two parts, connected to separate pistons in the engine K, or by elongating it by a slot-connection, or in any suitable way.

Having thus described my invention,

The following is what I claim as new therein, and desire to secure by Letters Patent:

1. The combination of the hollow rolls and frictional clutching-apparatus, substantially as described.

2. The X-formed torsion coupling-shafts, fitting within the hollow journals of the rolls and pinions, and transmitting motion from one to the other.

3. The combination of a set of rolls with the torsional coupling and the frictional clutching-apparatus, substantially as described.

4. The arrangement, substantially as described, of the hollow mandrels N N and longitudinal diaphragm with the rolls, by virtue of which water may be passed from the rear to the front end and back again, and discharged at or near the rear end, for the purpose of keeping the mandrels cool.

5. The fore or rear plate, formed on its outer edge with a downward curve, *m*, and arranged in relation to the rolls substantially as shown, for the purpose specified.

6. Securing the rounded-edged fore or rear plate M on brackets M′ M′, by means of wedges m^1 and screws m^2, or their equivalents, all substantially as set forth.

7. The arrangement of the steam-cylinder H, hollow piston-rod *h*, and crank-pin *g*, substantially as and for the purposes set forth.

Witnesses: JAMES MONTGOMERY.

OCTAVIUS KNIGHT,

J. E. M. BOWEN.