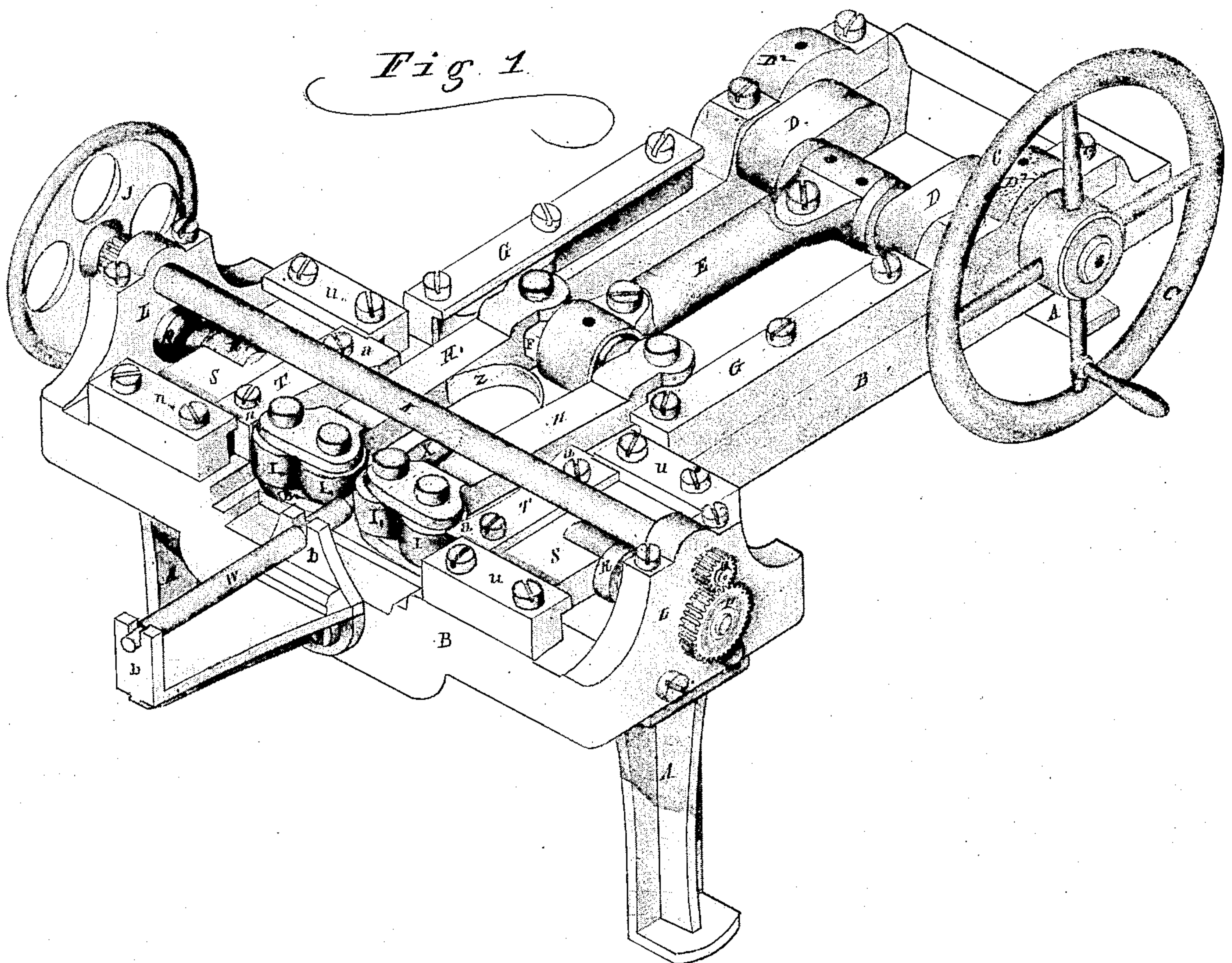


No. 9,471.

W. FIELD.  
MACHINERY FOR FORGING METALS, &c.

PATENTED DEC. 14, 1852.  
3 SHEETS—SHEET 1.



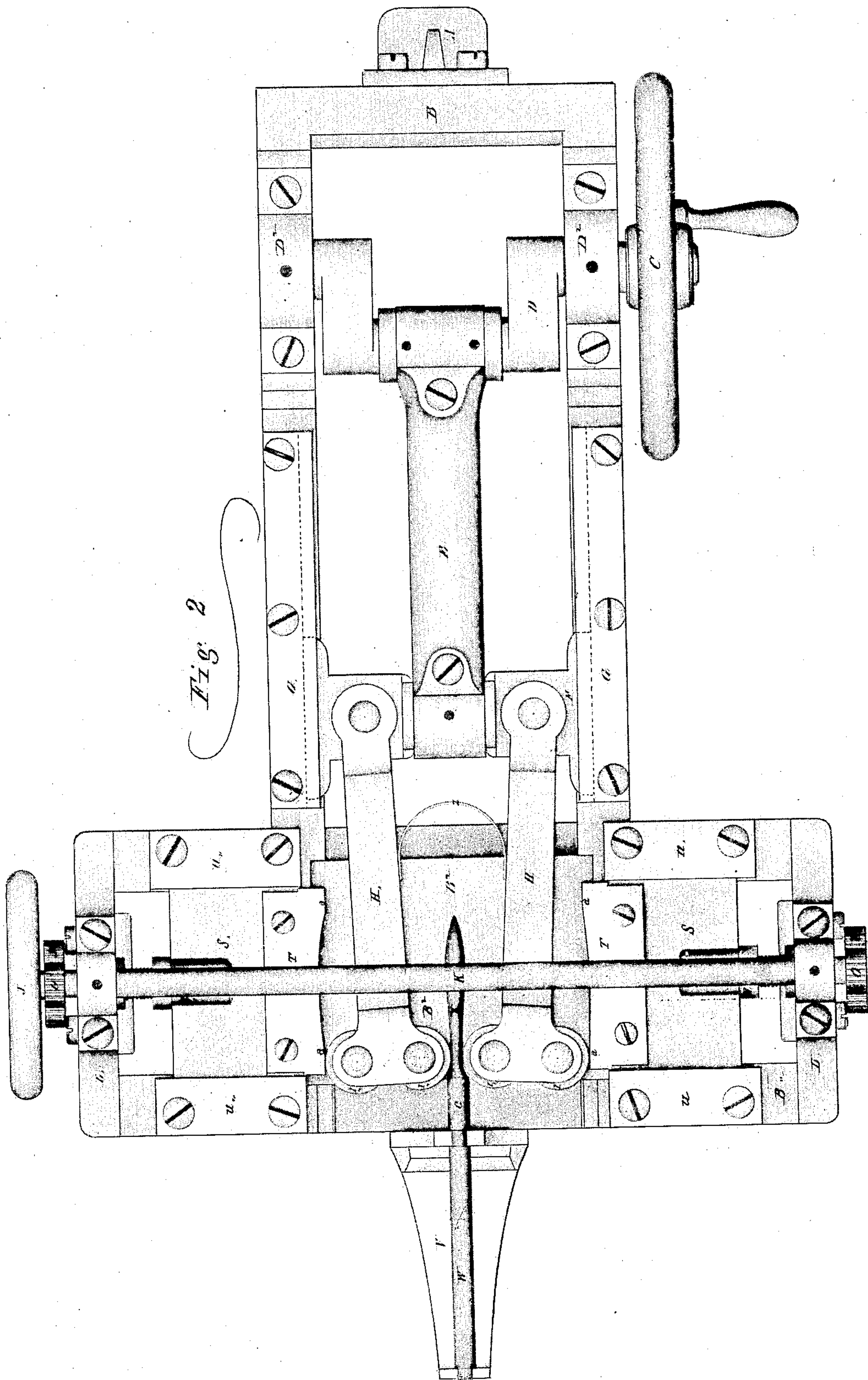


W. FIELD.  
MACHINERY FOR FORGING METALS, &c.

No. 9,471.

PATENTED DEC. 14, 1852.

3 SHEETS—SHEET 2.

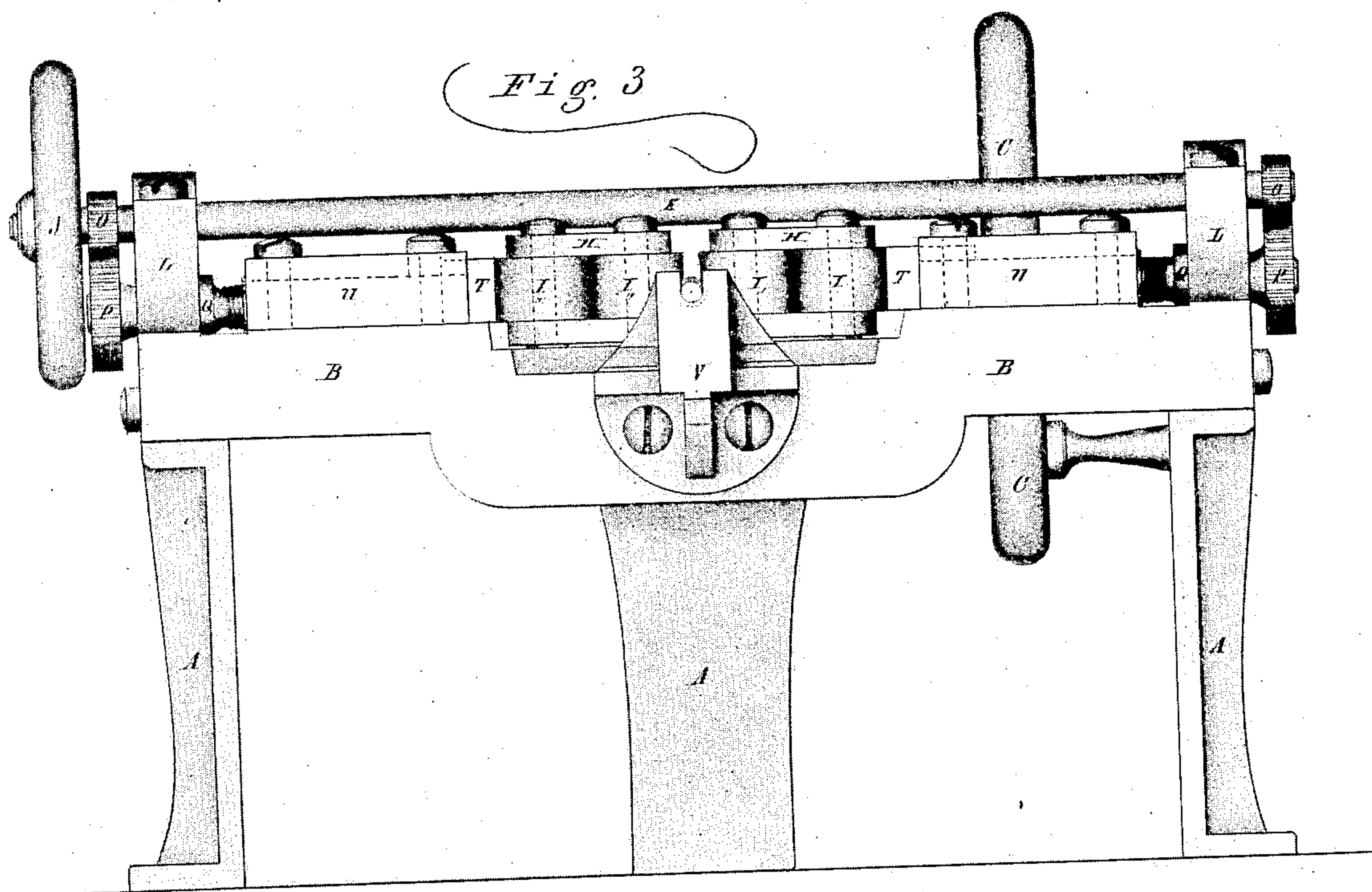


W. FIELD.  
MACHINERY FOR FORGING METALS, &c.

No. 9,471.

PATENTED DEC. 14, 1852.

3 SHEETS—SHEET 3.





# UNITED STATES PATENT OFFICE.

WM. FIELD, OF PROVIDENCE, RHODE ISLAND.

## MACHINERY FOR FORGING METALS, &c.

Specification forming part of Letters Patent No. 9,471, dated December 14, 1852; Antedated June 14, 1852.

*To all whom it may concern:*

Be it known that I, WILLIAM FIELD, of the city and county of Providence, in the State of Rhode Island, have invented a new and useful Machine for Forging Metals into Various Forms, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which make part of this specification, and in which—

Figure 1 represents a view in perspective of my said machine; Fig. 2, a plan of the same, and Fig. 3 a front elevation.

My invention and improvement consists in forging a piece of properly heated metal into shape by subjecting it to the action of a pair of traversing rollers, which run against pattern guides the counterpart in shape of the longitudinal outline of the thing to be forged, the metal itself being supported between the rollers by a mandrel and turned on its axis to present different sides of the piece in succession to the action of the rollers, whenever this is required.

My invention further consists in arranging the pattern guides and connecting them in such manner that while the machine is in operation they can be caused to approach gradually to change in a corresponding manner the position of the rollers for the purpose of drawing out the metal by degrees when passed a number of times over it or for the purpose of bringing the rollers nearer together while shaping some of the sides than while shaping others, in order to produce flattened prisms, or pieces with an oval section, or the section of a parallelogram, and other irregular or regular forms, or for the purpose of determining the shape of the piece being forged partly by the pattern guides and in part by moving the guides while the machine is in operation.

The machine represented in the accompanying drawings consists of a strong bed-frame (B) standing on four legs (A) and of the several parts mounted thereon. The motion of this machine is equalized by means of a fly-wheel (C) secured to a crank-shaft (D) which turns in bearings (D<sup>2</sup>) on the bed frame. A cross-head (F) lies parallel to the crank-shaft and slides on guides (G) bolted to the top of the bed frame. The cross-head receives a reciprocating motion on its guides from the crank (D), with which it is connected by a shackle bar (E).

A pair of equal arms (H) are jointed to the cross head, one at each end of it, and in such manner that they are free to vibrate in its plane of motion, but cannot rise and fall at right angles thereto, or turn on their own axis. The free or front extremity of each of these arms is supported on a plate (B<sup>2</sup>) lying across the front of the frame, and is formed into a pair of flat prongs, between each of which a pair of rollers (I, I) are mounted in suitable bearings, in such manner that the peripheries of the two will meet, and run in contact, and on either side extend beyond the prongs of the fork, so that rollers on the inner sides of the two arms may meet, while those on the outer sides may run against guides (T), against which they are held by the constant tendency of the arms to diverge under the pressure of a spring (Z) placed between them. The arms (H) with their rollers (I) are carried back and forth by the reciprocating movement of the crosshead (F) and as the rollers run in contact with the inner side of the pattern guides (T) the front ends of the arms (H) will be caused to approach, diverge, or run at a fixed distance apart, according as the inner surfaces of the guides are shaped and placed with respect to each other. When the outer rollers (I) as they are carried back and forth press against the pattern guides (T) they are turned by the friction against the latter, and in turn communicate motion in an opposite direction to the inner rollers by contact with the periphery thereof, and if some substance, over which the inner rollers were passing, should be tightly squeezed between them they would from this cause tend to turn in the same direction in which the outer rollers tend to turn them. Therefore however hard the pressure to which these rollers are subjected, while the arms are vibrating, it only tends to insure their rolling, as they reciprocally tend to turn each other.

The pattern guides (T) are each mounted on a carriage (S) which is placed between a pair of guides (u u) that allow it to move toward and from the rollers (I). Each carriage has a nut (R) fitted to its outer end, the thread in one being a left hand and that in the other a right hand screw and the thread in both being of the same pitch. Each of these nuts receives the inner end of a corresponding screw (Q)



whose outer end has a journal formed on it that turns in a box secured to or formed in a standard (L) on the end of the bed frame. The outer end of each screw carries a spur-wheel (P) which gears with a pinion (O) on a cross-shaft (K) that rests in bearings on the tops of the standards (L), one end of the shaft being fitted with a hand wheel (J) to turn it by. It is plain from this arrangement that when the hand wheel (J) is turned in one direction the screws (Q) through the wheels (O, P) will be turned one way and draw the carriages (S) and the pattern guides (T) back simultaneously from each other toward the standards (L), and when the motion of the hand wheel is reversed the motion of the screws (Q) will also be reversed and the pattern guides (T) be forced toward each other, and as the power of the screws is great the guides can be made to approach even when the inner rollers have a piece of heated iron compressed between them in the act of reducing it to shape.

A bracket (V) is secured to the front of the bed frame (B) and supports two standards (b, b), on the upper ends of which bearings are formed to support a mandrel (W) of any convenient construction, to which the article to be forged may be chucked or secured by clamps or other suitable means as articles are secured to handles or mandrels for other analogous purposes. The axis of the mandrel (W) is in a line with the middle of the space between the arms (H) in order that the piece of metal to be shaped may be held, while being operated on, as near as may be in a central position between the inner rollers (I, I).

The bearings for the mandrel in the standards (b b) are open at the top, so that it may readily be taken out and put in place again to facilitate the attachment and removal of the piece of metal to be shaped.

Motion may be communicated to the machine by connecting the crank-shaft (D) with a steam engine or other prime mover in any manner that will impart to it continuous rotation. The rotation of the crank-shaft (D) causes the crank (D') to revolve and the latter acting through the connecting rod (E) and crosshead (F) imparts a reciprocating motion to the arms (H) which carry the compressing or shaping rollers (I I) at their forward extremity. If a rod of red hot metal, as shown at (X) in Fig. 2, be secured to the inner end of the mandrel and placed between the rollers (I) and the latter by turning the hand wheel (J) to adjust the guides (T) are pressed against the metal so as to reduce its diameter slightly, the reciprocating motion of the arms (H) will cause the rollers to traverse the metal (X) and squeeze two of its opposite sides throughout the range of their

motion in contact with it into a form the counterpart of the inner side of the pattern guides (T). By turning the mandrel 90° on its axis two other opposite sides of the rod will be shaped like the first, giving to the rod a prismatic or pyramidal contour with sides straight or wavy as the pattern guides (T) are straight or wavy. By now turning the rod 45° two of its corners will be compressed into sides of the same shape as those already formed. Then by turning it 90° the remaining two corners of the original four sided prism will also be compressed into two sides of the same shape as those previously formed and completing an octahedral, prismatic, or pyramidal figure. By containing the compression of its corners the rod will at length become a prism of such a great number of sides that it will appear to be round, and for most practical purposes will be near enough so. By turning the hand wheel (J) to bring the guides closer together while the rollers (I) are acting upon the rod (X) the latter can have its diameter further reduced to any extent required by the repetition of the operations just described; or it may have two of its sides made either quite flat or less convex than other parts of the circumference or perimeter of the rod. So also by turning the hand wheel (J) in alternately opposite directions, while the rollers (I) are running over the rod (X), the latter may be shaped with undulating or wavy sides independent of the pattern guides (T). This feature of the machine adds very considerably to its versatility of application, especially as it may be used in connection with a central stake, mandrel, or former erected upon the top plate (B<sup>2</sup>) of the frame, in a line with the standards (V) that support the mandrel, and between the reciprocating arms (H) to bend or weld rings, hooks and other similar articles upon. The construction and uses of this stake or former and its advantages and manner of using it are too obvious to any competent mechanic to render it necessary to give a detailed description of it here. Suffice it to say, that its outside must be the counterpart in form of the article to be shaped by bending around it, and when it is intended to regulate the movements of the compressing rollers (I) in thus bending or shaping articles upon the stake by the pattern guides (T), they must be the counterpart in shape of the adjacent sides of the stake, or at least as nearly so as will be required to bend the inside of the rod to the stake, while its outside receives the desired shape.

The throw of the crank (D') and the length of the guides (T) must be adjusted for the length of the rod or bar it is required to forge, and the rear end of the guide carriage (S) when it is long enough



should be fitted with at least three set screws like the screws (Q) which should be connected to the latter by gearing, so that all may be turned simultaneously when the  
5 hand wheel (J) is turned.

Whenever it is required to shape the article being operated on by the peculiar shape of the compressing rollers the latter may be grooved on their periphery to suit,  
10 as for example if it be required to forge a rod with a triangular section one of the rollers may be flat and the other fitted with a triangular groove, and so they may be varied for other shapes to any extent which  
15 the constructor or user may deem expedient.

It is obvious that the machine I have herein particularly described and represented to show one mode of carrying my invention into effect may be greatly changed  
20 in construction and arrangement to adapt it to different uses and circumstances without any departure from the principle of my invention.

Having thus described my machine for 25 forging metals what I claim therein specifically is:

1. The mandrel or its equivalent for chucking or gripping the metal to be forged, and holding the same in the proper position, 30 and from time to time changing its position, between the reciprocating rollers, in combination with reciprocating rollers for shaping the metal so held, whose action upon the metal is regulated by a pattern 35 guide substantially as herein set forth.

2. The method of regulating the thickness and shape of the metal being forged without stopping the rollers or withdrawing the metal therefrom, by the simultaneous ad- 40 justment of the pattern guides, substantially as herein described.

In testimony whereof I have hereunto subscribed my name.

WILLIAM FIELD.

Witnesses:

JAMES HUTCHISON.

WILLIAM E. BROWN.