2 Sheets—Sheet 1.

J. R. GROUT.

Metal-Testing Machine.

No. 210,252. Patented Nov. 26, 1878.

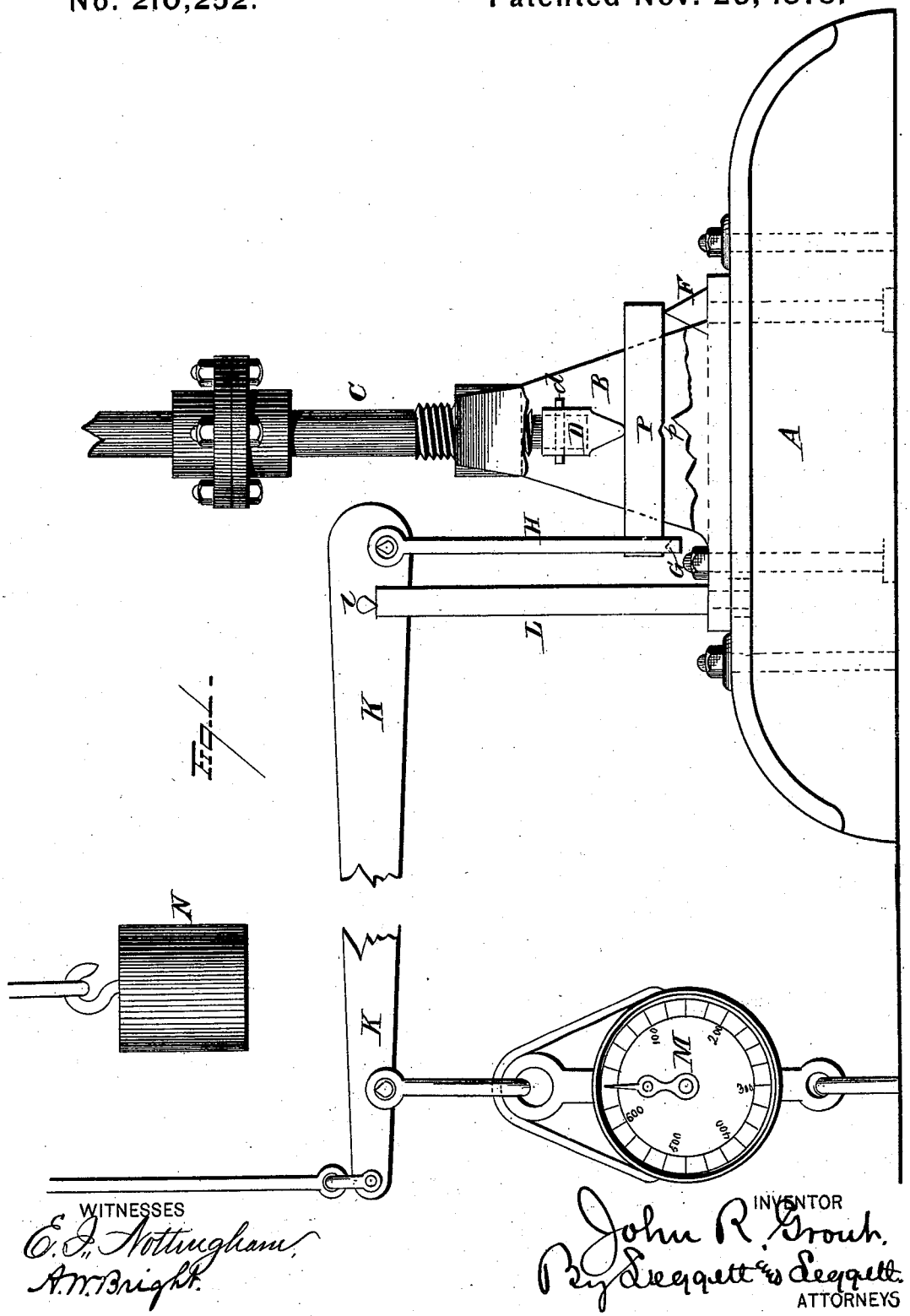

Fig. 1.

WITNESSES

E. J. Nottingham,

A. M. Bright.

INVENTOR

John R. Grout.

By Dewey & Dewey

ATTORNEYS

2 Sheets—Sheet 2.

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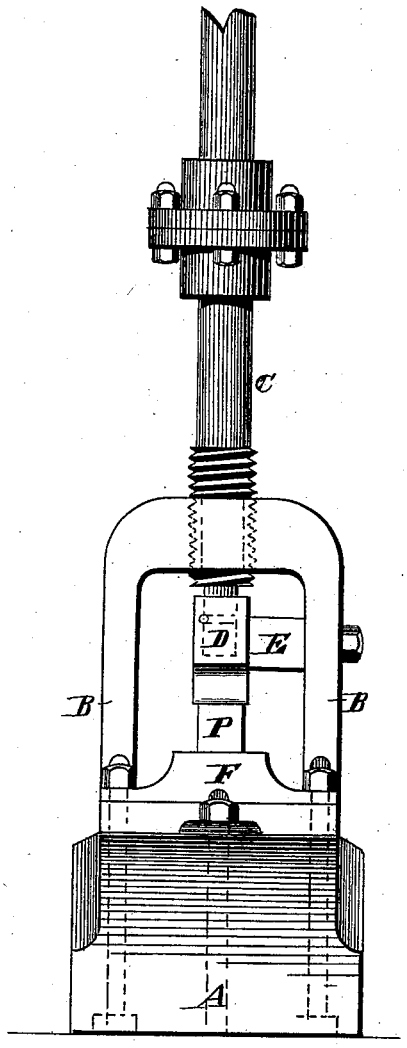
Fig. 2.



WITNESSES

E. S. Nottingham

A. W. Bright.

INVENTOR

John R. Grout.

By Leggett & Leggett.

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN R. GROUT, OF DETROIT, MICHIGAN.

IMPROVEMENT IN METAL-TESTING MACHINES.

Specification forming part of Letters Patent No. **210,252**, dated November 26, 1878; application filed September 27, 1878.

To all whom it may concern:

Be it known that I, JOHN R. GROUT, of Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Metal-Testing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to a testing-machine adapted to bend and break bars of metal by the application of a uniformly-increasing force.

The machine indicates the extent to which the metal will bend in the act of breaking, together with the amount of power required to effect such breakage, the steadily-increasing force to which the bar is subjected thereby producing the natural fracture of breakage. The breaking is a test of the quality of the metal as regards its malleability, its strength, and its uniformity of texture. The bars or pieces of the given metal should be of the same form and dimensions for the tests; and the whole is so adapted that the variations in the points governing the tests will indicate the treatment to which the metal must be submitted in order to produce the perfect quality desired.

The machine is designed, primarily, for testing copper metal in the process of refining, but is equally well adapted for testing other metals in any use of the same.

The invention consists, first, in the combination, with a scale-beam and suitable supports adapted to horizontally suspend the test-piece by engagement with its opposite ends, of a fuller or equivalent device, together with mechanism for forcing the same transversely against said test-piece at a point intermediate between said end supports; secondly, in the combination, with a scale-beam and supports adapted by engagement with opposite extremities of the test-piece to horizontally suspend the same, of a fuller or equivalent device, together with a screw-shaft, which adjusts the latter, with any degree of pressure, transversely against said test-piece at a point between the end supports; thirdly, in the combination, with a scale-beam and suitable mechanism supporting the opposite ends of the test-piece, of a fuller or equivalent device capable of being adjusted transversely against the latter, together with a vertical guide, in which the fuller works, and which is adapted to maintain it in right-angular bearing against said test-piece.

Referring to the drawings, Figure 1 is a view, in side elevation, of a machine embodying the invention. Fig. 2 is a view, in end elevation thereof, the same representing the machine as testing an ingot-bar.

The foundation A may be any suitable base-work, but preferably is a block of timber. Upon the same is secured an arch, B, preferably made of iron, and firmly bolted thereto. Through a threaded opening in the top of the latter a screw-shaft, C, passes, which also I prefer to be iron. This shaft may be rotated in any desired way, by human or other power, though my preference is to use machine-power for this purpose, as the same is more steady and efficient.

To the lower end of the shaft a fuller, D, or other equivalent device is secured, which, though it might be otherwise connected therewith, I engage to the shaft by a pin or key, *d*.

A horizontal arm, E, is secured to the arch, having its free extremity formed with a slot, which provides a vertical guide for the fuller, as the same is adjusted toward the test-piece, the same being adapted to maintain said fuller in right-angular bearing against the test-piece.

The piece or bar to be tested is horizontally suspended beneath the fuller, so that the latter bears transversely against the same at a point intermediate between the supports F and G, which engage with opposite extremities of the test-piece.

Supports F and G are preferably made movable, so as to accommodate themselves to the elongation of the test-bar under pressure.

Support G is secured to lower extremity of a suitable metallic link, H, which latter engages with the short arm of the scale-beam K. This scale-beam is pivoted upon a metallic stanchion, L, by means of a horizontal rod or bar, *l*.

The end supports of the test-piece, together with the pivot and other connecting parts of the scale-beam, are all formed with knife-edges,

so as to provide bearings for the same which will cause most delicate and accurate test in the operation of the machine. Said stanchion is formed with a vertical slot in its upper body, so as to admit of free vibration of the scale-beam, the long arm of which latter is provided with any suitable scale attachment. Preferably I use a pointer spring-balance, M, which has its upper body connected with said scale-beam, while its lower body is connected with mechanism adapted to prevent it from being moved upwardly. I graduate this spring-balance into divisions, representing twenty pounds each, and so adapted that a complete revolution of the pointer indicates six hundred and forty pounds of force imposed upon the test-piece.

The pointer is preferably provided with a teller, which moves with the forward movement of the pointer, and immovably retains its position when the pointer turns backward, thus registering the extreme pressure indicated by the pointer before its retrograde movement.

A balancing-weight, N, suspended by a rope from a pulley above, and which connects with the end of the long arm of the scale-beam, serves to sustain the latter and the spring-balance in position.

The application of the machine in test of a metal bar is as follows: A bar, P, preferably provided with a slight central cross-cut or wedge-shaped recess, *p*, is placed in equal bearing upon supports F and G. Downward motion at rate of two and a half revolutions per minute is given to the screw-shaft, which causes the fuller to bear against the metal bar in perpendicular line above said central cut.

At the given rate of speed the fuller continues its pressure, bearing transversely against the metal bar until the latter is sufficiently bent for the test, or is fractured in part or broken in two. The pressure thus imposed upon the test-bar is communicated to the spring-balance, and there read in pounds from the pointer or teller. Such registered amount of pressure multiplied by forty-eight is the breaking pressure or strain upon the metal bar.

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

1. In a metal-testing machine, the combination, with an upright rotating screw-shaft adapted to have vertical movement, of a fuller suitably secured to the lower extremity of the same, substantially as set forth.

2. In a metal-testing machine, the combination, with a fuller suitably secured to the lower extremity of a vertical shaft, adapted to be uniformly moved downward, of two supports for the test-bar, located below and respectively on opposite sides of said fuller, substantially as set forth.

3. In a metal-testing machine, the combination, with a fuller suitably secured to an upright rotating shaft, adapted to have a uniform vertical movement, of two knife-edged supports for the test-bar, located below and respectively on opposite sides of said fuller, substantially as set forth.

4. In a metal-testing machine, the combination, with two supports for the test-bar, of an upright rotating screw-shaft, having a fuller suitably secured to its lower extremity, which is located above and centrally between said supports, together with a guide-arm formed with an opening, through which the fuller works in vertical movement, substantially as set forth.

5. In a metal-testing machine, the combination, with a rotating vertical shaft having screw-threaded engagement with a supporting device, and provided with a fuller at its lower extremity, which is thereby adapted to be gradually forced downward with a uniform movement, of two supports for the test-bar, located below and respectively on opposite sides of said fuller, substantially as set forth.

6. In a metal-testing machine, the combination, with a fuller or equivalent device which is vertically adjustable, of supports located respectively below and on opposite sides thereof, together with a scale-beam which connects with one of said supports and is adapted to indicate the degree of pressure transversely imposed upon the test-bar, substantially as set forth.

7. In a metal-testing machine, the combination, with a vertically-adjustable fuller, of supporting devices adapted to provide bearing for the opposite extremities of a test-bar as the latter is transversely suspended thereby, said supports being movable, so as to accommodate themselves to the elongation of said test-bar under pressure, substantially as set forth.

8. In a metal-testing machine, the combination, with a scale-beam whose short arm indirectly connects with one of the test-bar supports, and whose long arm is provided with a spring-balance, of a counterbalancing-weight suspended by a connection passing over a pulley or equivalent device located in horizontal plane above said scale-beam and connecting with the long arm of the latter, substantially as set forth.

9. In a metal-testing machine, the combination, with a fuller, suitably secured to a screw-shaft, and two supports for the test-bar, located below and on opposite sides of the fuller, of a vertical link, to which one of said supports is connected, and a scale-beam connecting with the link, the long arm of said scale-beam being provided with a spring-balance exerting pressure downward, and a counterbalancing-weight exerting force in the opposite direction, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 20th day of September, 1878.

JOHN R. GROUT.

Witnesses:
T. B. HALL,
A. W. BRIGHT.