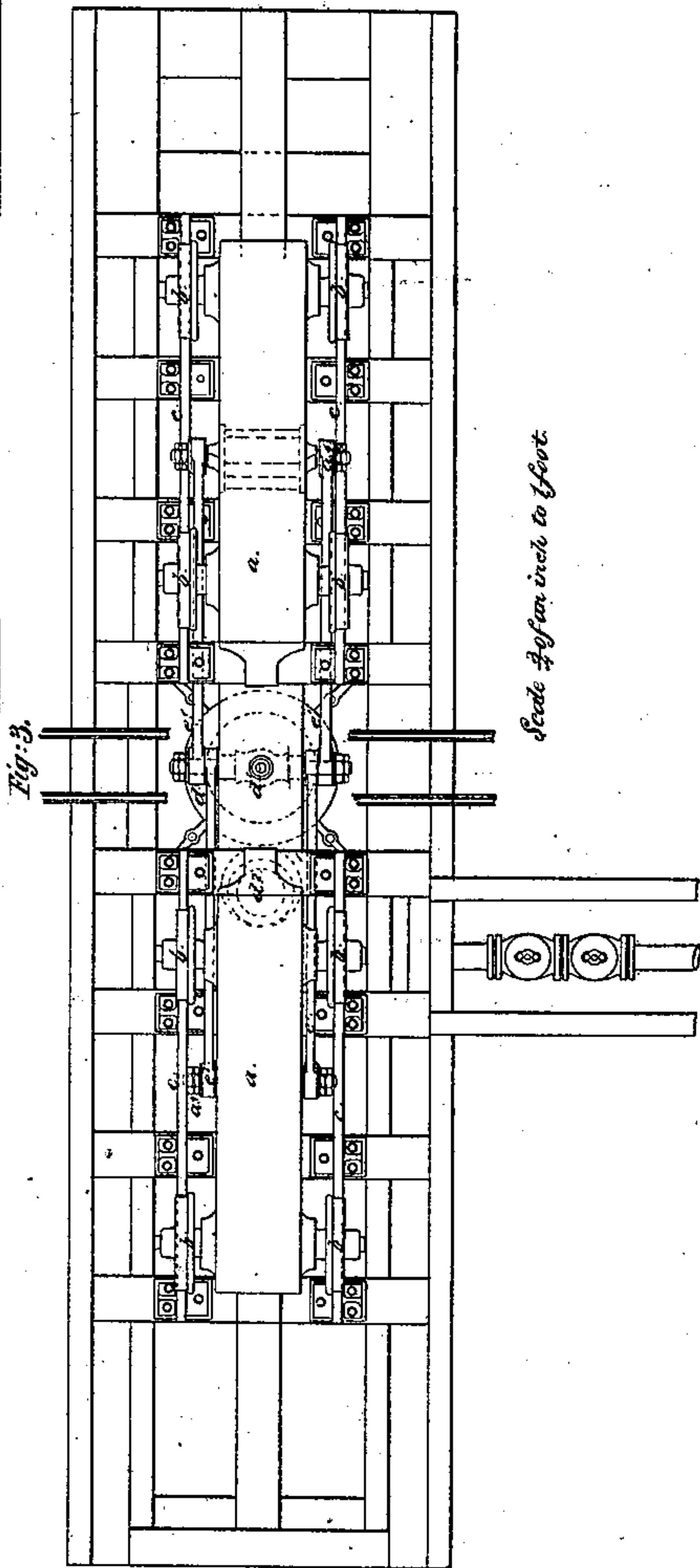
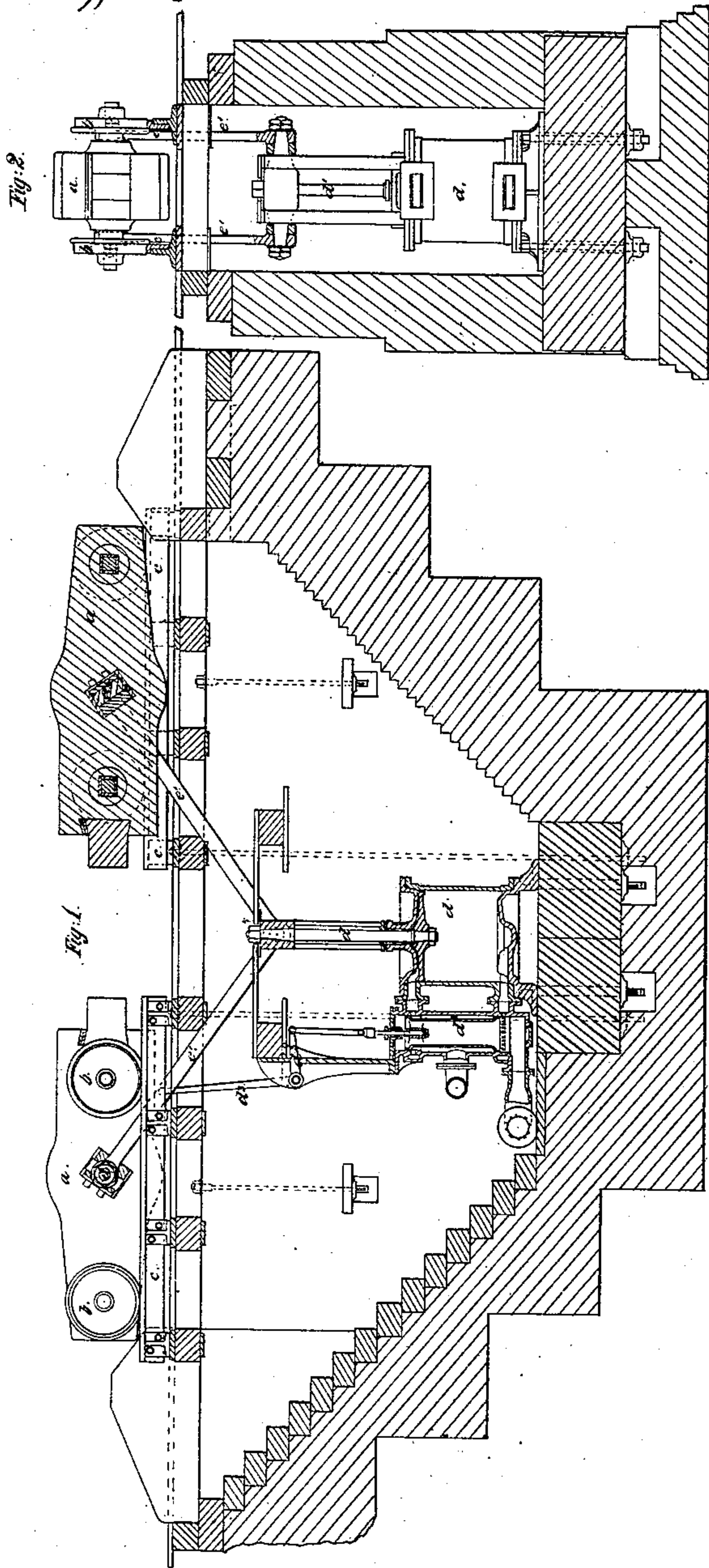


*J. Ramsbottom,
Power Hammer,*

N^o 49,058.

Patented July 25, 1865.



Scale 4/10 from inch to foot.

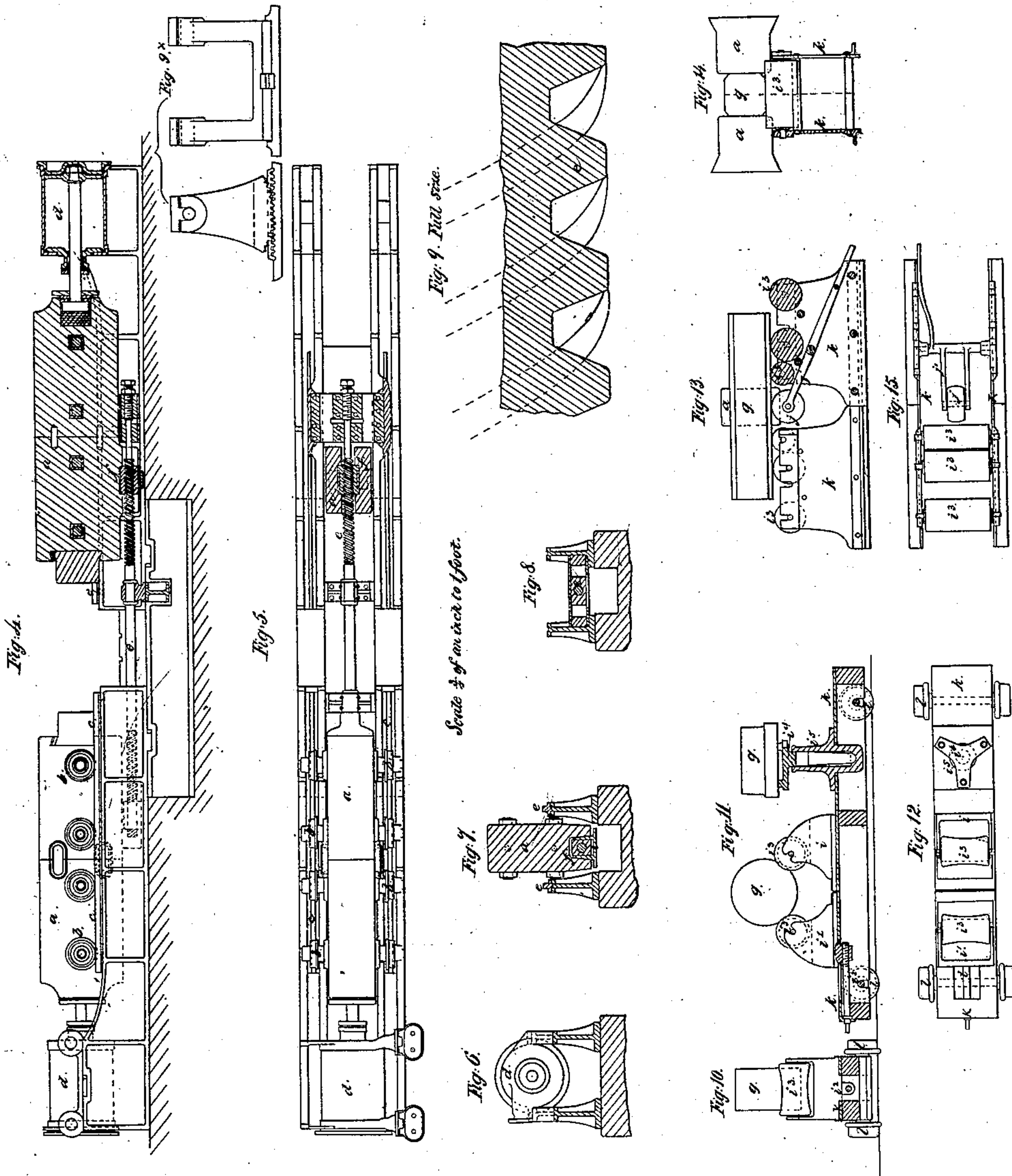
*Witnesses
H. B. Parker
John Perkins*

*Inventor:
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N^o 49,058.

Patented July 25, 1865.



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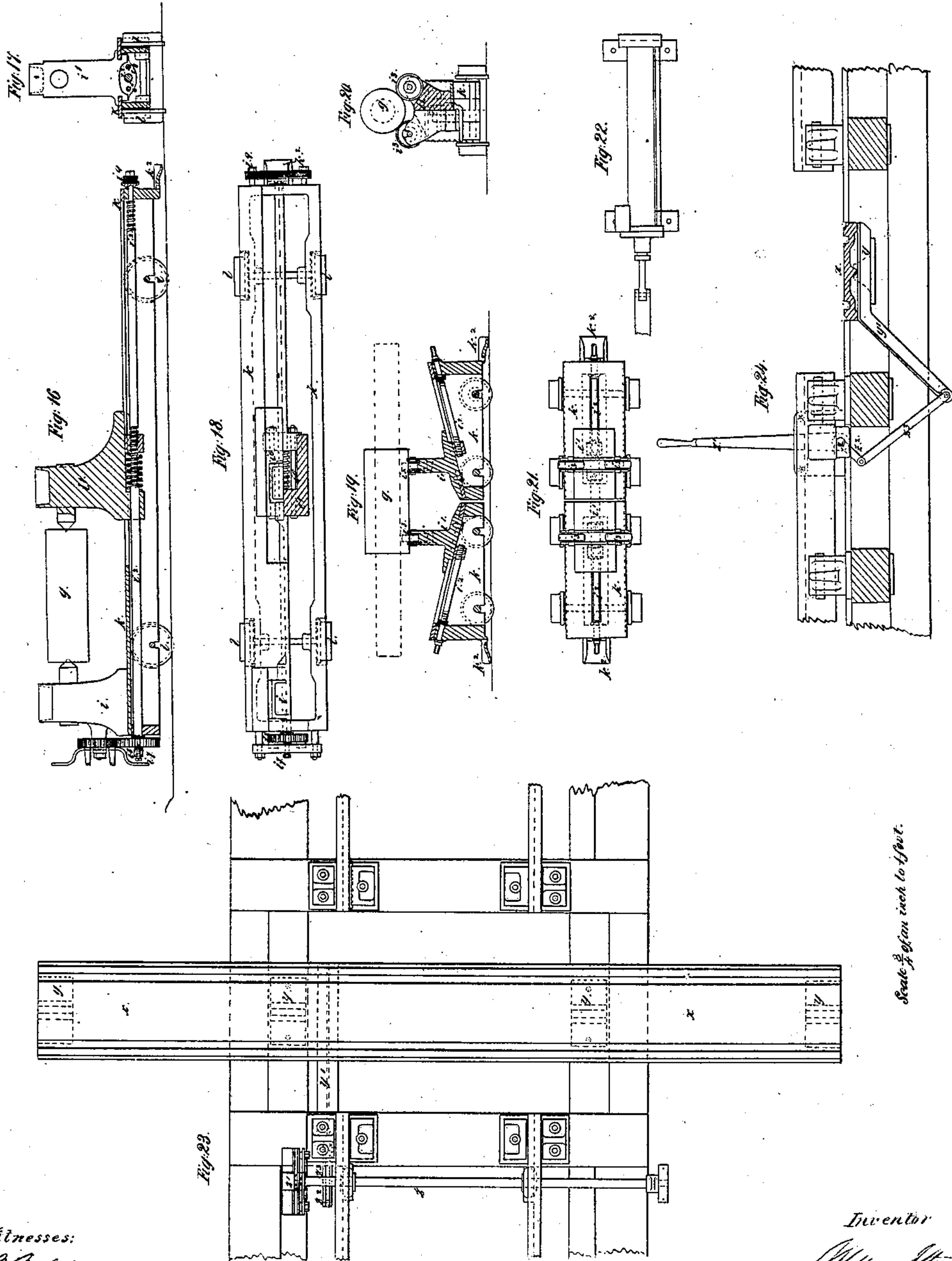
Inventor:

J. H. Munroe

J. Ramsbottom, Power Hammer,

No. 49,058.

Patented July 25, 1865.



Scale $\frac{1}{2}$ of an inch to 1 foot.

Witnesses:
W. B. Parker
John Perkins

Inventor
J. Ramsbottom

UNITED STATES PATENT OFFICE.

JOHN RAMSBOTTOM, OF CREWE, ENGLAND.

IMPROVED MACHINERY FOR HAMMERING METAL.

Specification forming part of Letters Patent No. 49,058, dated July 25, 1865.

To all whom it may concern:

Be it known that I, JOHN RAMSBOTTOM, of Crewe, in the county of Chester, England, engineer, have invented certain new and useful Improvements in Machinery for Hammering Metals; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the annexed five sheets of drawings, forming part of this specification.

The object of my invention is to facilitate the operation of hammering heavy masses of iron, steel, and other metals; and the nature thereof consists, first, in certain improvements in or applicable to duplex or compound steam-hammers having two or more hammer-blocks moving in opposite directions toward the metal to be operated upon, in such wise that the acting forces may counteract each other, and so avoid the use of an anvil; and, secondly, in certain improved combinations of machinery for supporting or holding ingots and other pieces of metal during the operation of hammering.

On Sheet 1, Figure 1 is an elevation, partly in section, of a compound or duplex steam-hammer constructed according to my invention. Fig. 2 is an end view; and on Sheet 2, Fig. 3 is a plan of the same.

In Figs. 1, 2, and 3, *a a* are the hammer-blocks, supported on the wheels *b b*, which run upon the rails or guides *c c*. These rails are bolted to chairs secured to sleepers, as clearly shown in the drawings, or the rails or guides may be otherwise formed and fixed. The hammer-blocks *a a* are caused alternately to approach and recede from each other simultaneously by the reciprocating motions of the piston *d'* in the steam-cylinder *d*.

To the rod of the piston *d'* is fixed a cross-head guided in suitable slides. To the trunnions of the cross-head are jointed the inner ends of the links *e'*, the outer extremities of which are jointed to the trunnions on the cross-bars *a'*, which pass through slots in the hammer-blocks. On each side of these cross-bars is a packing of thin layers of kamptulicon and woolen cloth, or other suitable materials; and these packings are tightened by a metal plate and cotters. The object of these packings is to avoid concussion. The steam is admitted alternately to each side of the piston in the cylinder *d* by the circular slide-valve *d'*, (or any

other suitable valve may be employed in its stead,) which is worked by the lever *d'*.

To the cross-head fixed to the rod of the piston *d'* is attached a stud, which, when the piston is near the top of its stroke, comes in contact with a lever and raises the valve *d'*. By this means the steam is shut off below the piston *d'* and admitted above it, thus limiting the outward range of the hammer-blocks *a a*; but, as a further security against accidents, stop-blocks are placed between the rails or guides *c c*, against which the hammer-blocks *a* would strike if their outward range were not arrested by reversing the valve *d'*. When the piston *d'* arrives at the bottom of the cylinder *d* the position of the valve *d'* is reversed by the attendant actuating the lever *d'*; or, if desirable, an adjustable stud or tappet may be made to act upon the lever *d'*, thus making the hammer self-acting.

It is evident that by means of the hand-lever *d'* the range of the to-and-fro motion of the hammer-blocks can be varied to any portion of the entire stroke of the piston.

The ingot or other article under operation is held in position between the hammer-blocks by any convenient means, or by any of the apparatus hereinafter described.

The blows of both hammer-blocks *a a* being simultaneous, the forces counteract each other, thus avoiding the necessity of an anvil, which in hammers of large dimensions of the ordinary construction must be of great weight, and requires a corresponding foundation. Another important advantage is that these improved hammers work without causing the injurious vibrations produced by hammers of the ordinary construction.

On Sheet 3, Fig. 4 is an elevation of a duplex steam-hammer constructed according to my invention and suitable for very heavy forgings, as the hammer-blocks may be of great weight and may be conveniently made in pieces. Fig. 5 is a plan. Fig. 6 is an end view. Figs. 7 and 8 are transverse sections of the same, and Fig. 9 is a section drawn full size of part of the screw *e*. *a a* are the hammer-blocks put together in two parts, connected by bridles, supported by or mounted on eight wheels, *b b*, running on and guided by the rails and bed-plates *c c*. The requisite to-and-fro motion

in opposite directions is given to the hammer-blocks *a* by the direct action of two steam-cylinders placed at *d d*. The piston-rods of these cylinders are connected to the hammer-blocks, as described in reference to Fig. 1, and the valves of both cylinders are worked simultaneously by a sliding bar or rod, which may be actuated by a steam-piston fixed upon it near the middle of its length, or by hand when the force required is not too great. The simultaneous to and fro motion of the hammer-blocks is governed or regulated by the right and left handed screws *e e*. These screws are of such a pitch that the to-and-fro motion of the nuts *f* causes them to rotate. These nuts are connected to the hammer-blocks, and a packing made of thin layers of kamptulicon and woolen cloth or other suitable substances is or may be placed on each side of the nuts, to prevent concussion. As the hammer-blocks approach or recede from each other, the nuts *f*, acting on the right and left handed screws *e*, cause them to rotate alternately in contrary directions, and as both screws are cut on the same shaft any irregularity that might occur in the relative motions of the hammer-blocks is prevented.

I wish to be understood that, instead of the wheels *b*, the hammer-blocks may be supported in sectors or rockers, as shown in Fig. 9*. The two rockers for one end of the hammer-block may be cast together and bear upon a foundation-plate extending from side to side. In order to prevent these sectors or rockers slipping, toothed segments cast upon them take into racks fixed to the foundation-plates; or the sectors or rockers may be cast separately, each being furnished with a toothed segment and rack. The object of these sectors or rockers is to prevent the unequal wearing of the rails which takes place when the wheels skid or slip on the rails at the moment when the blow is struck.

On Sheet 4, Figs. 10, 11, and 12 represent an end view, a side view, and a plan, of a truck for supporting steel ingots or other articles, and holding them while they are being operated upon by my improved duplex hammers. *k* is the body of the truck, formed by a strong plate of iron connected by cross-beams and supported on the wheels *l*, which run on cross tram-rails placed on about the same level as the rails *c* in Fig. 1. To the plate *k* is fixed the block *i*, and the block *i'* is capable of being slid to and fro on the plate *k* by the screw *i²*, to increase or diminish the distance between the rollers *i³*, supporting the cylindrical tire-ingot *g*. By this means the ingot can be held at the same level as the hammer-blocks, or the level of the ingot can be varied according to its diameter, or according to the portion that requires to be hammered. The swivel-spindle or turn-table *i⁴* is for supporting the ingot while being hammered circumferentially. The spindle *i⁴* is supported in a socket, *i⁵*, fixed to the plate *k*.

Fig. 13 is a side elevation, Fig. 14 an end

view, and Fig. 15 a plan, of another of my improved apparatus to support ingots or other pieces of metal while being hammered. *i³* are the supporting-rollers, mounted in bearings in the frames *k*. The roller *j*, supported in the forked lever *j'*, is for the purpose of supporting short ingots when passing across from one set of rollers *i³* to the other. *a* represents the hammer-faces, acting on the ingot.

Fig. 16 is a side elevation, Fig. 17 an end view, and Fig. 18 a plan, of another modification of my invention. *k* is the body of the truck, connected by cross-beams and supported on the wheels *l*. To one end of the truck is fixed the head-stock *i*, and the head-stock *i'* is capable of adjustment by means of the screw *i²*, which is turned round, when required, by the handles and spur-wheels shown. To the head-stocks *i*, and *i'* are fixed centers, between which the ingot or shaft *g* is supported. The nut of the screw *i²* is connected to the head-stock *i'* by two bolts, *i⁶*, and a spring is placed between the nut and the head-stock. The object of this spring is to allow the head-stock *i'* to yield when the ingot or shaft becomes elongated by the blows of the hammer. *i⁷* is a brake, acting on the face of the wheel *i⁸*, and *i⁹* is a tail-spring, bearing upon the end of the screw *i²*. The pitch of the screw must be such that it will be turned round by the pressure of the nut when the screw together with the wheel *i⁸* has been forced out of contact with the brake *i⁷*, and this occurs whenever the pressure upon the head-stock *i'* is in excess of the adjusted strain of the tail-spring *i⁹*.

On Sheet 5, Figs. 19, 20, and 21 are three views of another modification of my invention. *k k* are two trucks beveled at the top, and each provided with a movable block, *i'*, screw *i²*, and supporting-rollers *i³*. When the ingot or other article to be hammered is short and thick, as shown in full lines in Fig. 19, the trucks and blocks are close together; but as the ingot increases in length but decreases in diameter the distance between the blocks *i'* is increased by turning the screws *i²* to support the ingot and keep it level with the line of action of the hammer-blocks.

Fig. 22 represents the apparatus for traversing any of the above-described trucks to and fro between the hammer-faces, and each truck is provided with a bracket, *k²*, to which may be attached the bar for connecting it to the traversing apparatus, consisting of a small hydraulic cylinder with piston and rod furnished with a four-way cock to regulate the traversing of the ingot or forging under operation; or the truck may be traversed by friction-rollers, or by a rack and pinion with suitable reversing-gear.

Fig. 23 is a plan, and Fig. 24 is an end view, of my improved apparatus for keeping the ingot or other article midway between the hammer-heads. *x* is a table or platform, cast with rails for supporting the truck with the ingot or other article to be hammered. This plat-

form is supported on the chairs y , and is at liberty to rock in them. The shaft z is furnished with the handle z' , and to it is fixed the lever z^2 , connected by the link z^3 to the lever y' , which is secured to the under side of the platform. By this arrangement the attendant, by moving the lever z' , can cause the truck to tilt over in either direction, and thus keep the ingot midway between the hammer-faces.

Having thus stated the nature of my invention and described the manner of performing the same, I declare that what I claim as my invention, and desire to secure by Letters Patent of the United States of America, is—

1. The improvements in and applicable to duplex or compound steam-hammers, as described and shown in Sheets 1, 2, and 3 of the accompanying drawings.

2. Supporting the hammer-blocks on sectors, as shown and described in reference to Fig. 9.*

3. The improved apparatus described and shown in Sheets 4 and 5, for supporting or holding ingots and other pieces of metal during the operation of hammering.

4. The apparatus described in reference to Fig. 23 for traversing the truck with the ingot or other article to and fro during the operation of hammering.

In testimony whereof I have hereunto set my hand, before two subscribing witnesses, this 30th day of March, in the year of our Lord one thousand eight hundred and sixty-five.

J. RAMSBOTTOM.

Witnesses:

H. B. BARLOW,
Patent Agent, Manchester.

JOHN PERKINS,
Draftsman, Manchester.