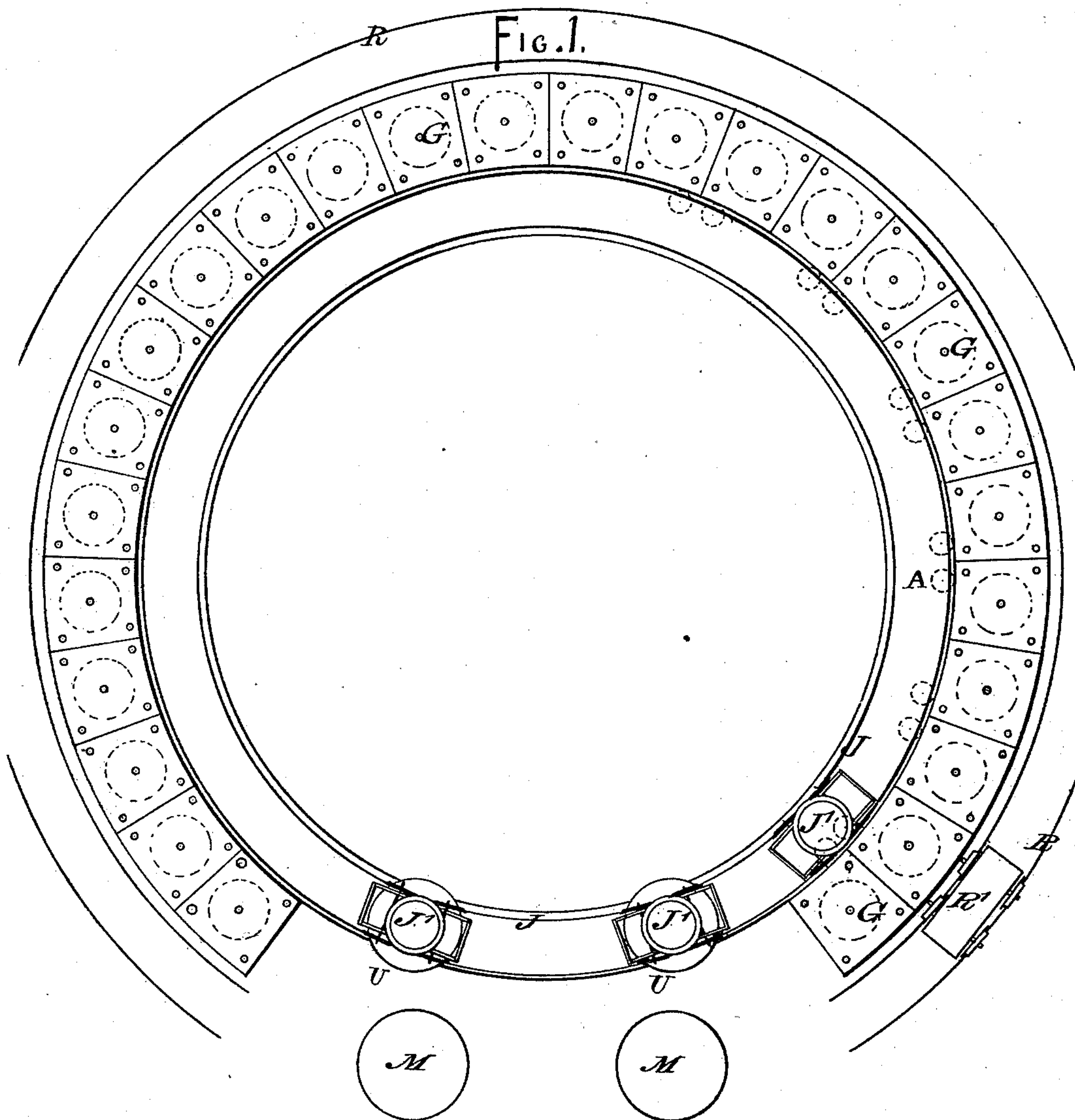


G. WEBB.
Apparatus for Forming Molten Metal into Ingot, &c.
No. 223,562. Patented Jan. 13, 1880.



WITNESSES:—

W. Colborne Brookes
Albert B. Bolton

INVENTOR:—

George Webb
by his attorney
Thomas D. Bolton

G. WEBB.
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FIG. 4.

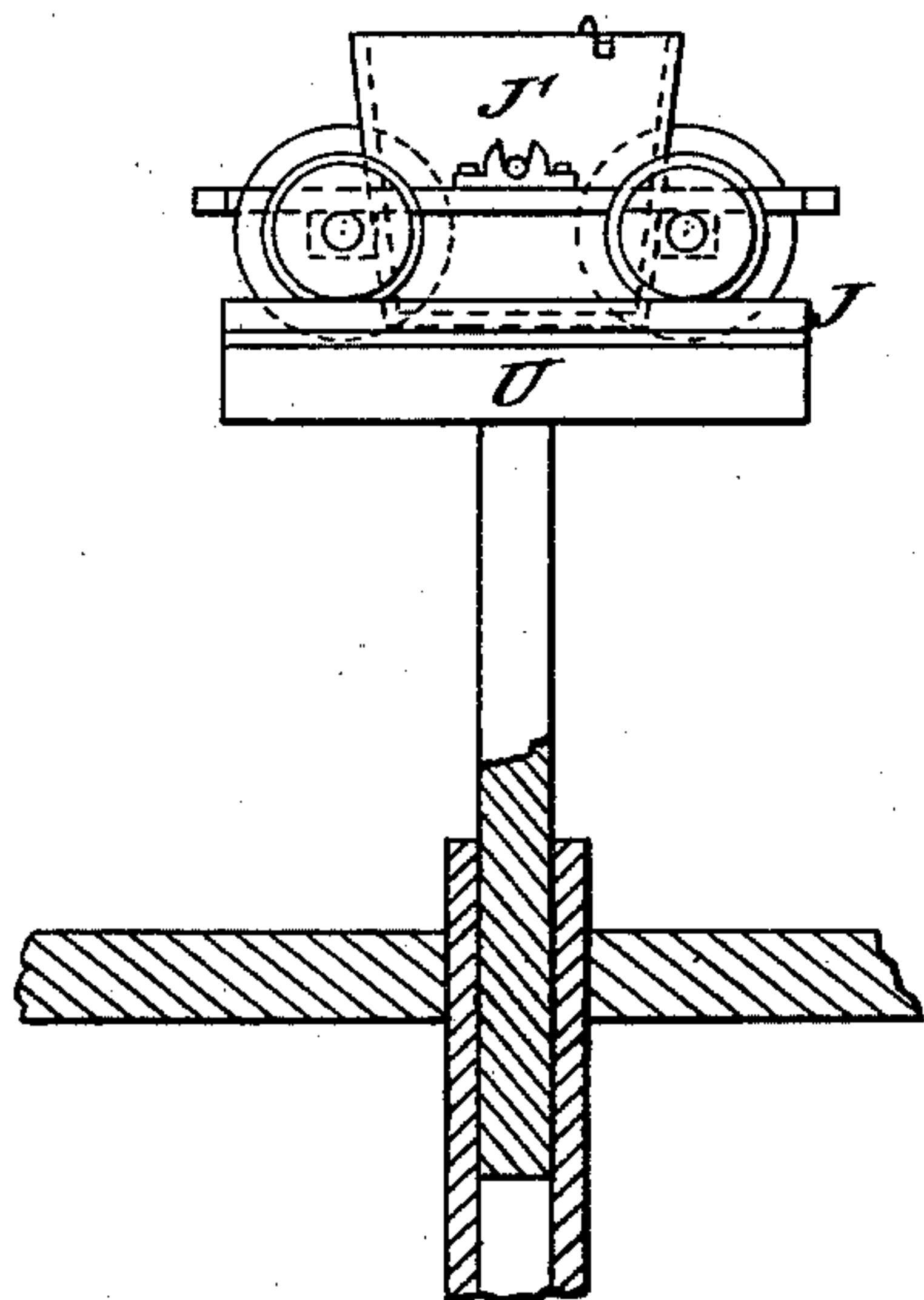


FIG. 3.

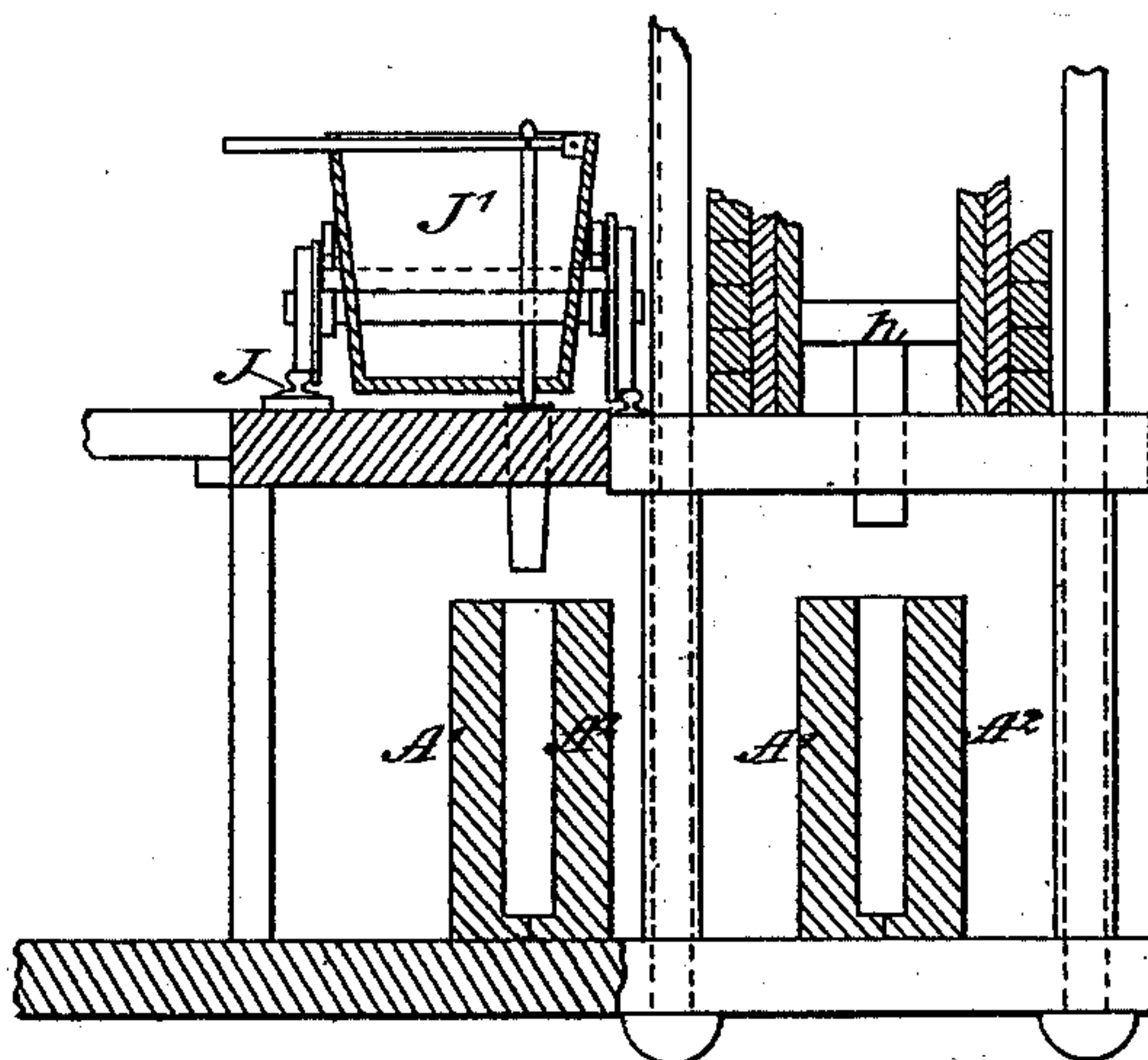
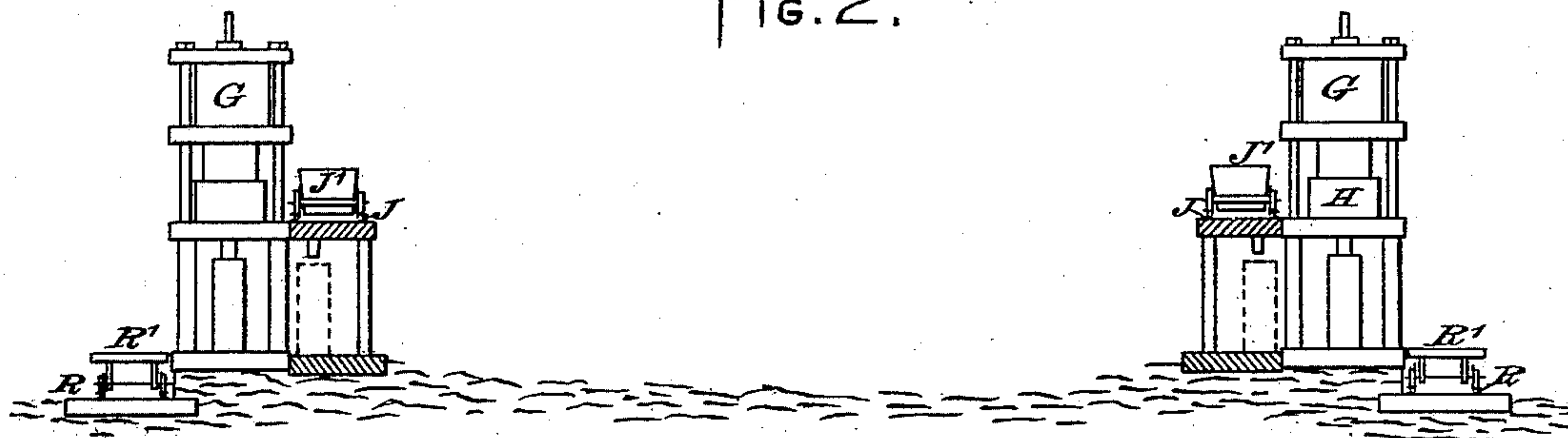


FIG. 2.



WITNESSES:—

W. Colborne Brooks
Elbert B. Bolton.

INVENTOR:—

George Webb
by his attorney J. L. Stetson

G. WEBB.
Apparatus for Forming Molten Metal into Ingot, &c.

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FIG. 5

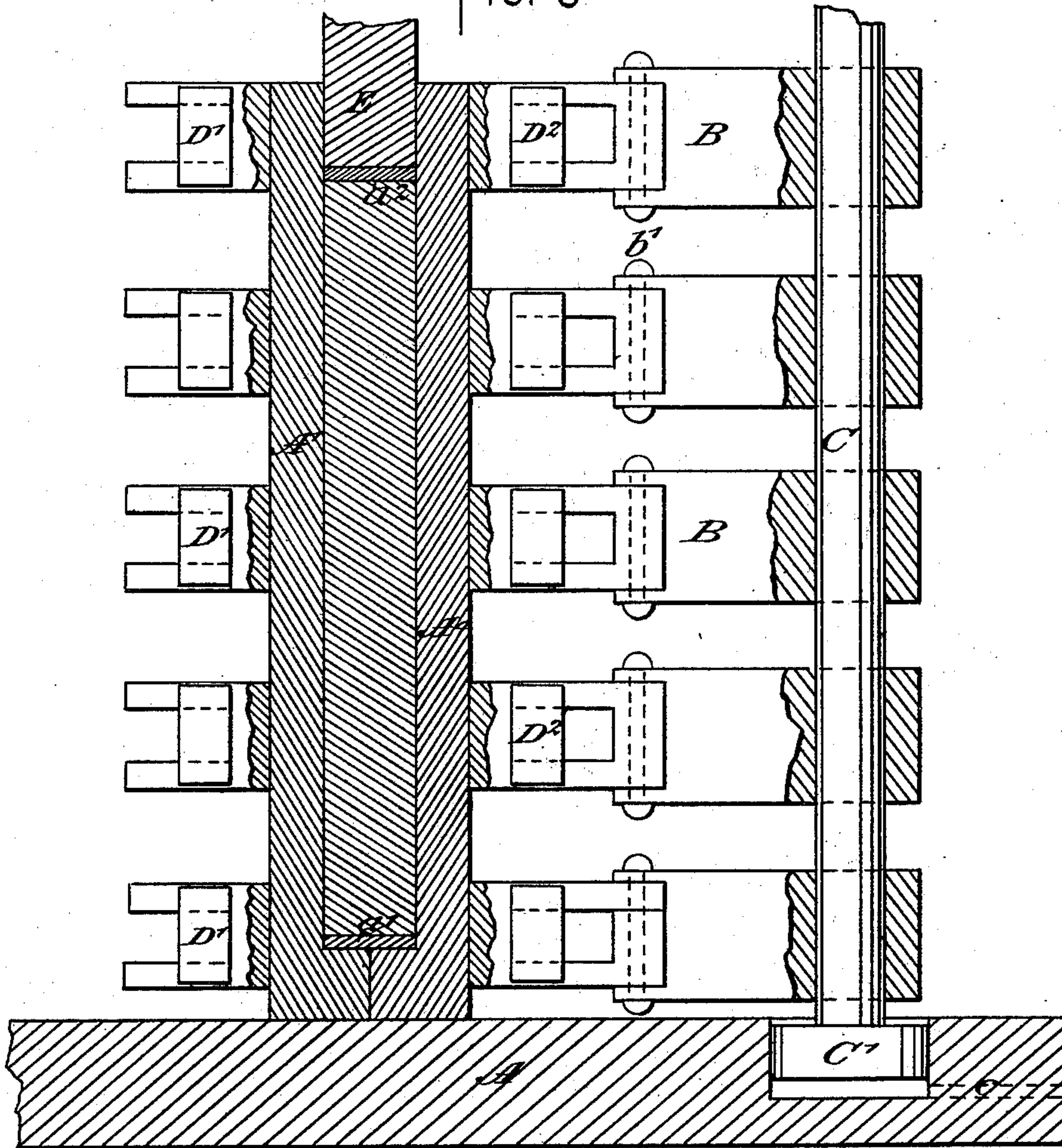
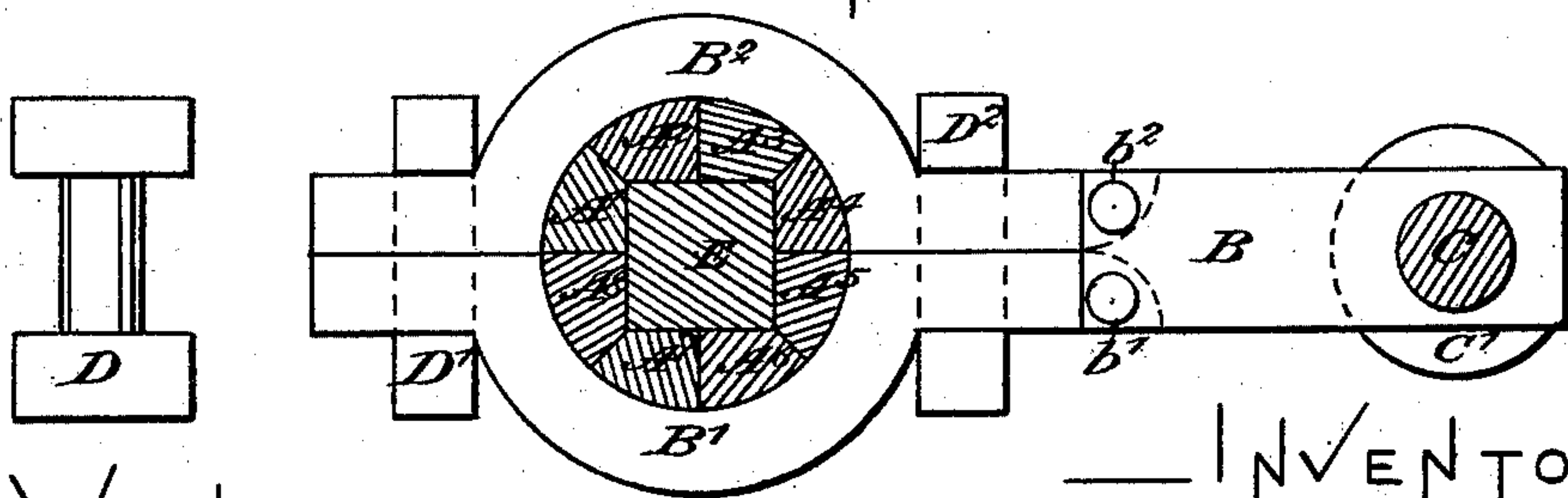


FIG. 6



WITNESSES:

W. Colborne Brookes
Charles C. Stetson

INVENTOR:

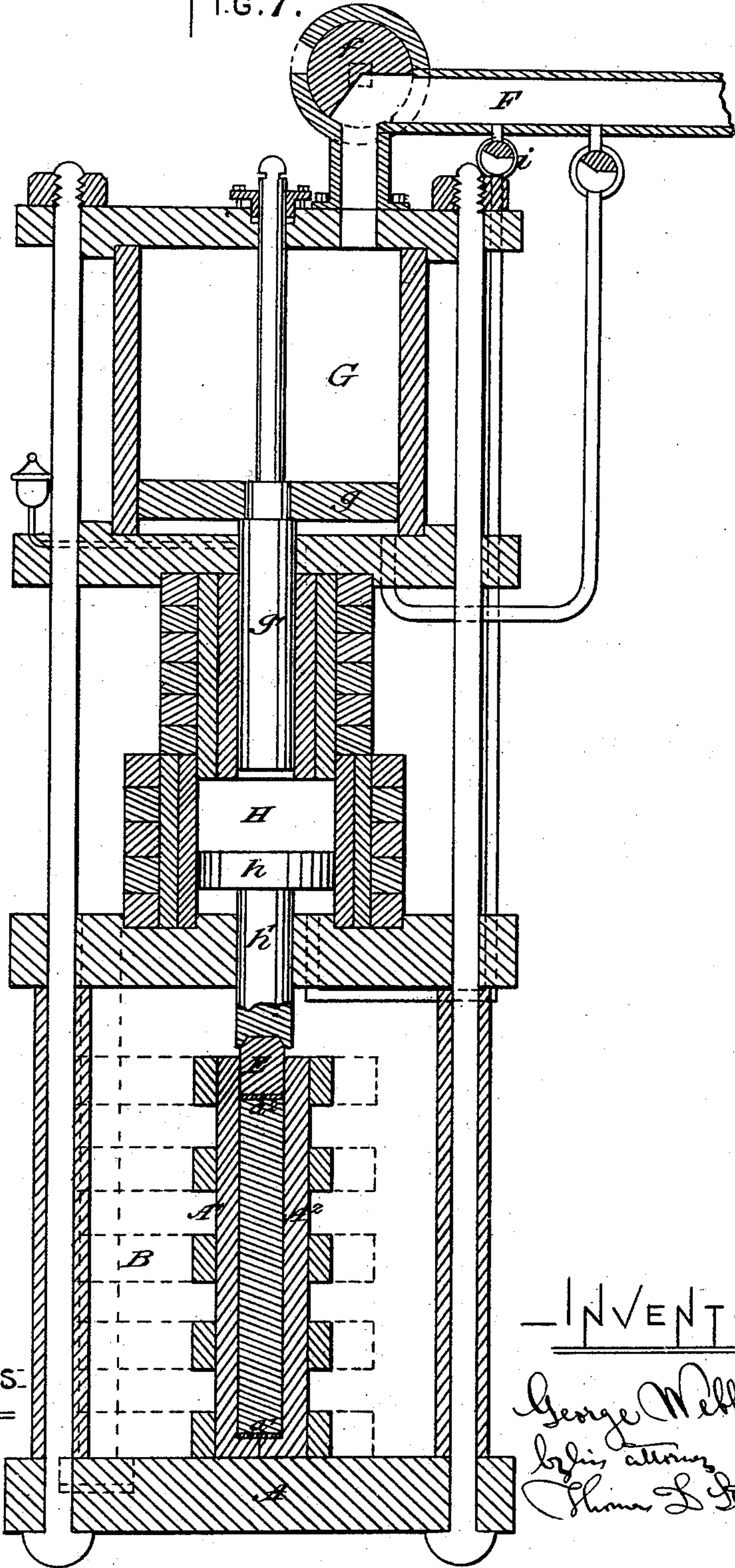
George Webb.
By his attorney C. Stetson.

G. WEBB.
Apparatus for Forming Molten Metal into Ingot, &c.

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Patented Jan. 13, 1880.

FIG. 7.



WITNESSES

W. Colburn Brooks
Charles C. Stetson

INVENTOR

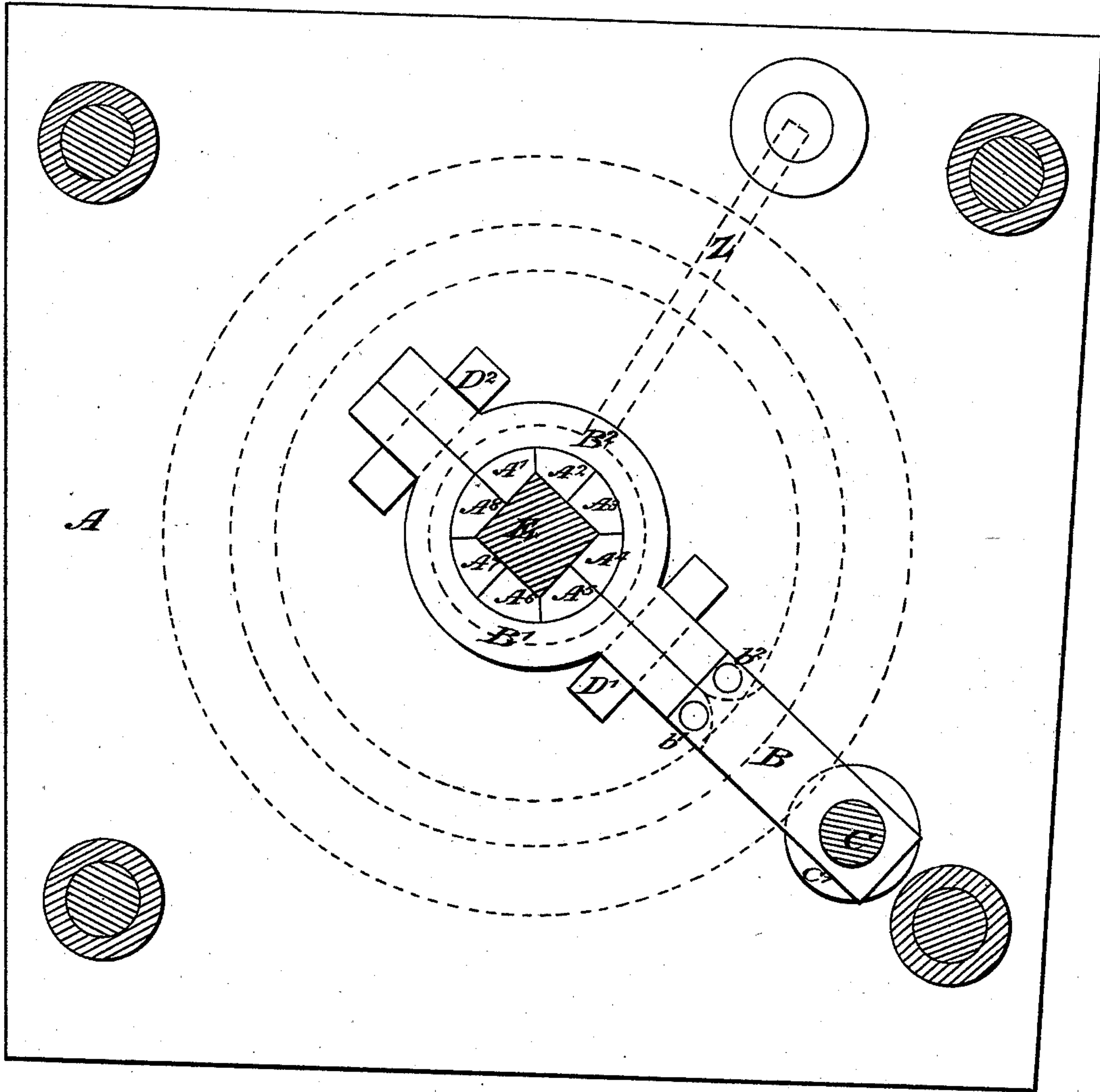
George Webb
by his attorney
Thos. L. Stetson

G. WEBB.
Apparatus for Forming Molten Metal into Ingot, &c.

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Patented Jan. 13, 1880.

FIG. 8.



— WITNESSES: —

W. Colborne Brookes
Charles C. Stetson

— INVENTOR: —

George Webb,
by his attorney
Thomas S. Stetson.

G. WEBB.
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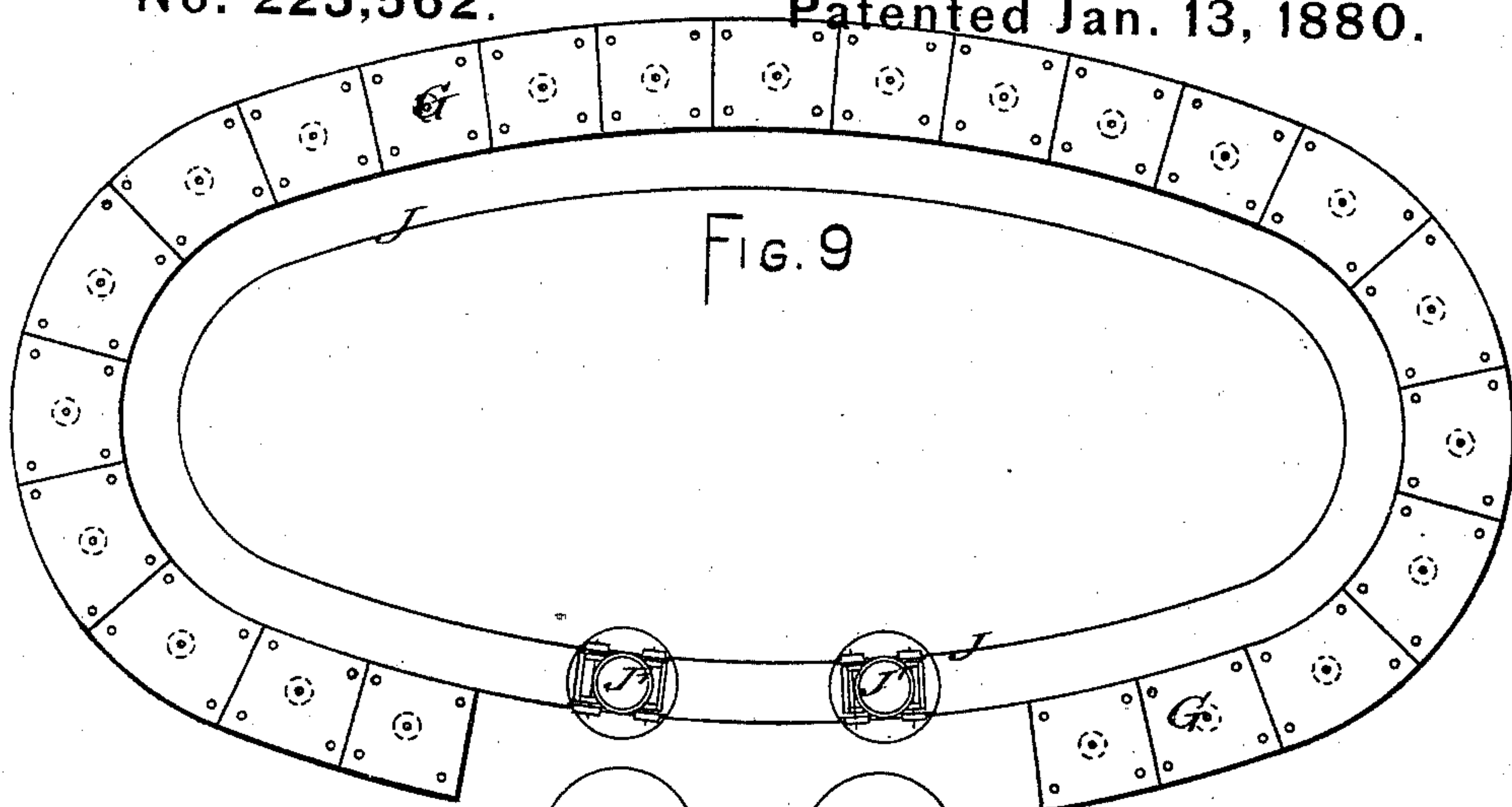


Fig. 9

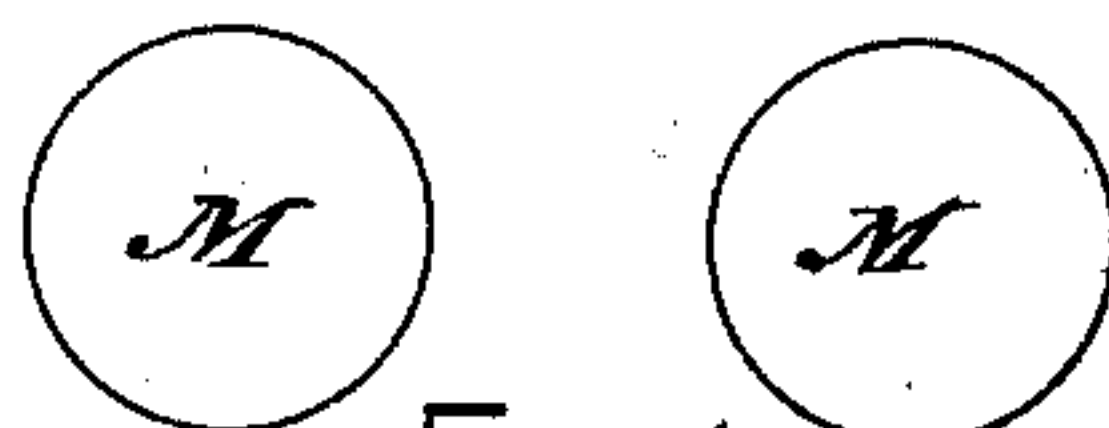


Fig. 10

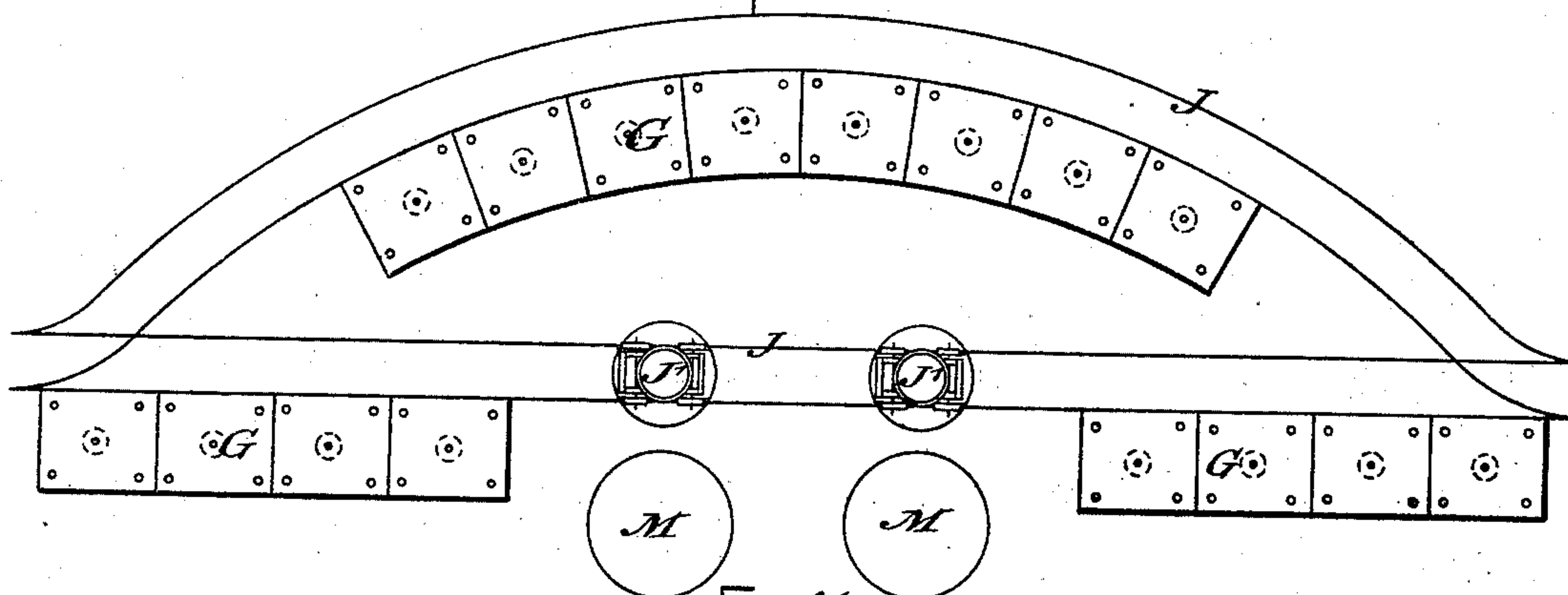
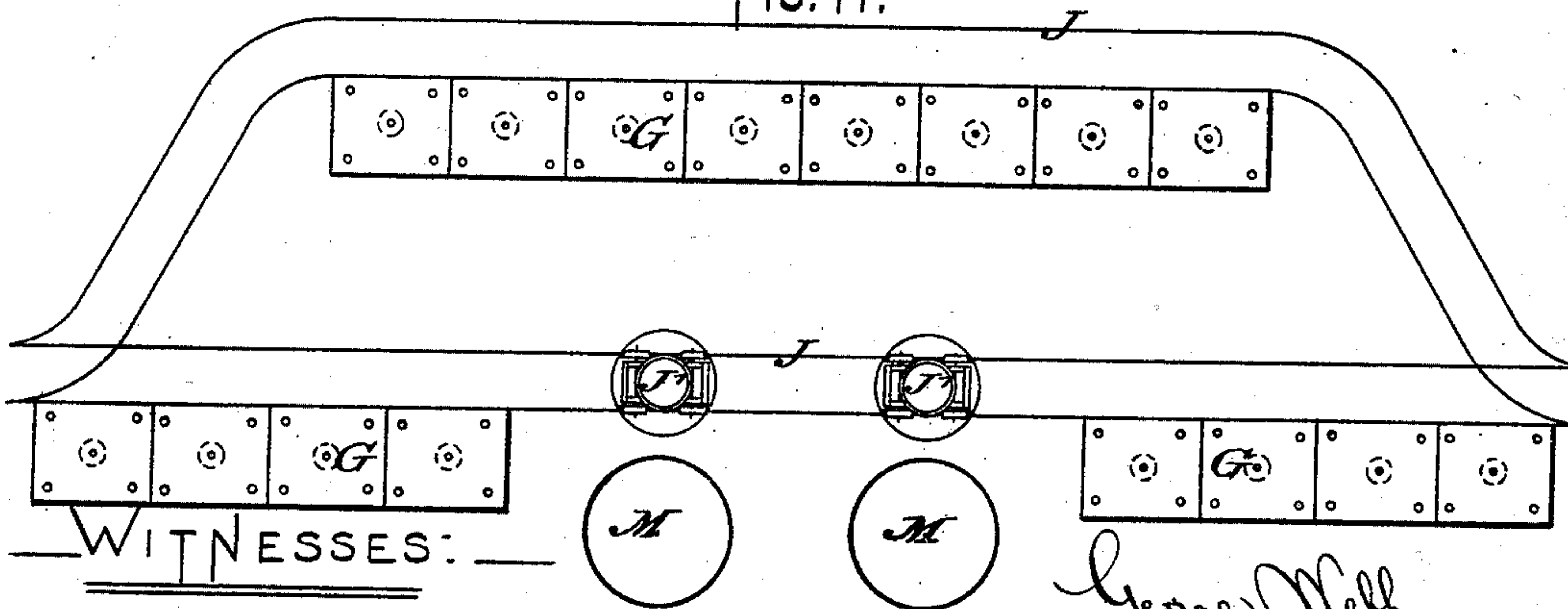


Fig. 11.



WITNESSES:

W. Colborne Brooks
E. B. Bolton

George Webb.
By his attorney
Thomas L. Gorton.

UNITED STATES PATENT OFFICE.

GEORGE WEBB, OF JOHNSTOWN, PENNSYLVANIA.

APPARATUS FOR FORMING MOLTEN METAL INTO INGOTS, &c.

SPECIFICATION forming part of Letters Patent No. 223,562, dated January 13, 1880.

Application filed July 24, 1879.

To all whom it may concern:

Be it known that I, GEORGE WEBB, of Johnstown, Cambria county, in the State of Pennsylvania, have invented certain new and
5 useful Improvements relating to Apparatus for Forming Molten Metal into Ingots or other Castings, of which the following is a specification.

I subject the melted steel to strong compression, which is rapidly applied and maintained until the metal has set. I have devised a system for conveniently and effectively operating on quantities made in the large way in modern practice.

15 My invention is intended to overcome the difficulties, and to adapt the work to successful and economical manufacture on a large scale, with repetitions rapidly conducted and continued indefinitely.

20 I employ gas-discharging sectional ingot-molds, which are or may be used repeatedly without any preparation beyond a thin wash. The molds are rapidly filled with liquid metal. They are in long, narrow sections, strongly
25 united. Provision exists for the escape of gases from all the joints. A great pressure is applied and maintained on the liquid metal immediately after it is poured; and all the movements may be effected easily at the right
30 periods. Large charges may be disposed of with rapidity, and the charges may succeed each other indefinitely.

I employ hydraulic pressure in a form of mechanism very powerfully working and adapted for treating a single ingot at a time by one
35 press. I can use a number of presses together.

Hydraulic presses and accompanying mechanism for receiving and holding the ingot-molds are arranged in a circular series, with a
40 railroad-track extended around just within the circle, and another with various switches and branches lies just outside the circle.

Each press is provided with means for holding the ingot-mold first in a position near the
45 press, but not under it, to receive the melted steel, and immediately afterward in a position under the press to receive the pressure.

Suitable cars, moved by hand or otherwise on the inside track, carry large ladles of melted
50 steel and supply two molds at once. Ready

means move each mold into place and give it pressure. Cars on the track or tracks outside the circle carry the ingot-molds with their contents away, and bring empty molds to be placed in position and receive the melted material. The circular series should be sufficiently
55 long to allow an ingot to be filled while another place in the series is being supplied with a fresh mold, and another place is having the filled mold taken away, with its contents sufficiently cooled to retain its condition, and each may hold the metal under strong pressure until it has slowly cooled to the required consistency. The molds may be, as usual, of
60 cast-iron.

The accompanying drawings form a part of this specification, and show the invention as applied in connection with a pair of Bessemer
65 converters.

Figure 1 is a plan view, representing the
70 general arrangement of the parts on a small scale. Fig. 2 is a vertical section through the center of the general arrangement. Fig. 3 is a section of part of Fig. 2 on a larger scale. Fig. 4 is a detached view of the ladle and lift,
75 partly in section. Fig. 5 is a vertical section through one of the ingot-molds and the associated parts on a larger scale. Fig. 6 is a corresponding plan view. Fig. 7 is a vertical section of the hydraulic press and parts immediately connected therewith. Fig. 8 is a plan
80 view of parts on a larger scale. Figs. 9, 10, and 11 are outline plans of some of the many modifications which I esteem practicable.

Similar letters of reference indicate like parts
85 in all the figures.

A' A², &c., are the sections of an ingot-mold, of cast-iron, adapted, when applied together, to present a smooth and cylindrical
90 exterior and a smooth cavity of uniform rectangular section on the interior, which cavity receives the melted steel and forms the ingot. The surfaces of the ingot-mold A' A² which abut together are marked *a*. They are accurately fitted together, but instead of being
95 left absolutely smooth are left with fine scores running across their surfaces, such as result from filing with a coarse file.

The sections A' A², &c., are held together by clamps B' B², which are provided in suffi-
100

cient numbers, and with peculiar locking pieces or gibs $D' D^2$, and embrace the ingot-mold at short distances apart along its length.

On sufficiently raising the mast C and the 5 connected clamps and ingot-molds and their contents, the whole may be swung around clear of the bed, to allow the ingot-mold to be moved into the proper position to receive its charge of melted steel, and to be moved back 10 into the central position under the press to receive the compressive strain.

The peculiarities of the ingot-molds and their immediate attachments are made the subject of a separate application for Letters Patent.

15 $M M$ are converters, of any ordinary or suitable construction, and J is a circular railroad-track, extended around just within the circular series of presses and ingot holding and moving devices. I will designate each press by 20 the single letter G when required.

Opposite each converter M is a hydraulic lift, U , equipped with suitable rails, on which a car, J' , may ride, carrying a large ladle adapted to receive a charge of steel in a melted 25 condition from the converter. The lift-power may be the ordinary hydraulic with means for controlling it, as required, to raise or lower the car to the level of the circular track J . The lift allows the ladle to be held at the changing 30 levels required for the pouring from the converter as it is rapidly emptied.

The converters may be worked and emptied independently, care being taken to have as many cars J' as there are converters, and to 35 have a car ready with an empty ladle to receive the metal from each converter so soon as each charge is ready.

I have shown three cars, J' , for two converters, M . The number of both may be further 40 increased if necessary.

So soon as a ladle on a car, J' , is filled it is rapidly moved along by hand or by power on the circular railway J , and stopped in the required positions to supply the melted steel to 45 two of the presses G . As each car is moved step by step along the track J it is stopped at the proper points and tapped at two places, to supply the proper quantity to each ingot-mold, which latter is, by the lifting and turning 50 of the proper mast $C C'$, presented in the proper position to receive it, and on being filled is promptly returned to its position under the press and its contents subjected to the required pressure, and held so.

55 Cars R' move back and forward on the track R , bringing fresh ingot-molds and placing them in position, returning loaded with the filled molds previously cooled under pressure to a point below that at which pipings form, 60 to be taken care of at a distant point. (Not represented.)

I employ a press which is compound, using, in effect, two hydraulic presses, one of which receives the steam, water, or other fluid from 65 a boiler, accumulator, or other source, and by the motion of its plunger induces a greater pressure in another mass of fluid, which acts

in a second cylinder to apply a still greater pressure on the plunger of the second press. This latter plunger acts on the steel in the 70 ingot.

The peculiarities of my compound hydraulic press are made the subject-matter of a separate application for Letters Patent.

When the pressure has been maintained for 75 a sufficient time the steam or other fluid under pressure is shut off from the cylinder G , and the fluid above the piston g is allowed to escape by any suitable device. (Not represented.) Then both the pistons $g h$ and their 80 connections are raised and the ingot is relieved from pressure.

To remove the mold with the solidified ingot the locking-pieces $D D'$ are removed, the clamps $B' B^2$ thrown open, and the sectional 85 mold $A' A^2$ and its contents will be seized by properly-shaped tongs, (not represented,) which are adapted for the purpose, and may hang from a traveler moving on a straight or curved or a swinging overhead way. Z 90 represents a mast or upright shaft for a swinging way for this purpose. The sectional mold $A' A^2$ and its contents are thus brought to and deposited on a car, R' , on a track, R , which track is located on the opposite side of 95 the press from where the melted metal was poured into the mold.

After release from the clamps $B' B^2$ the sections of the mold may be held together by slight bands, (not represented,) which bands 100 are afterward to be removed when the car and its load have been hauled away a convenient distance. The fresh mold is to be held together by the same small bands and brought 105 in by the same route and appliances by which the filled molds are removed, and thus delivered to the clamps $B' B^2$.

The ingot, on being liberated from the sectional mold, is ready to be further treated by rolling or hammering, either at the same or a 110 subsequent heat, to induce the desired form of a steel rail or other article, while the sections $A' A^2$ of the mold may be treated with water and partially or entirely cooled, ready to be returned to the position for use, fresh sets of 115 sectional molds being used in the interim.

Figs. 9, 10, and 11 represent some of the modifications of which the invention is susceptible. In Fig. 9 the track J is an approximate ellipse, the presses being arranged in a corresponding 120 manner. The cars are traversed around and deliver the metal in a manner identical with that where the track and series of presses are perfectly circular.

In Fig. 10 the track J is formed with an 125 outward extension and a switch at each end. It is preferable, with this arrangement, to have the track pass on the outside instead of the inside of a part of the series of presses, as this allows the ladle to deliver to all the molds 130 from the same side.

Fig. 11 shows a still further modification. I esteem them all substantially equivalent in effect.

Instead of Bessemer converters, I can use open hearths, crucibles, or any suitable mode of producing the melted steel.

5 I prefer, for steel rails, to make the ingots about seven inches square and of a length from four to six feet—sufficient to serve for only one rail, with a minimum wastage at the ends.

10 When the series of presses are, as I prefer, arranged in a perfect circle, I can use a crane with one or more arms as a substitute for the circular railway-track J, to carry the ladles from the sources of metal-supply M to the several molds A.

15 With either means of supporting the ladles I can make a smaller number of presses serve by providing means for strongly locking the sets down in the molds and relaxing the pressure and removing the mold without necessarily waiting until the surface of the ingot has hardened.

20 I claim as my invention—

1. In combination with one or more sources of melted metal, the lift or lifts U, railway-

track J, cars J', and a series of presses and a corresponding series of gibs provided with 25 clamps for moving and holding the molds, as herein shown and described.

2. A series of presses, each provided with a gib having clamps, as described, for moving 30 the molds out to receive the molten metal and in to subject it to compression, arranged in a line or lines at a uniform distance from the railway-track J, the latter being continued around in a complete circuit, so as to allow the cars J', carrying the ladles, to move to and 35 from the vicinity of the metal-supply in a continuous circuit, in the manner and for the purposes herein specified.

In testimony whereof I have hereunto set my hand this 28th day of June, 1879, in the 40 presence of two subscribing witnesses.

GEO. WEBB.

Witnesses:

A. MONTGOMERY,
GEO. H. WEBB.