J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

APPLICATION FILED APR. 22, 1910.

982,883.

Patented Jan. 31, 1911.

7 SHEETS—SHEET 1.

FIG. 2

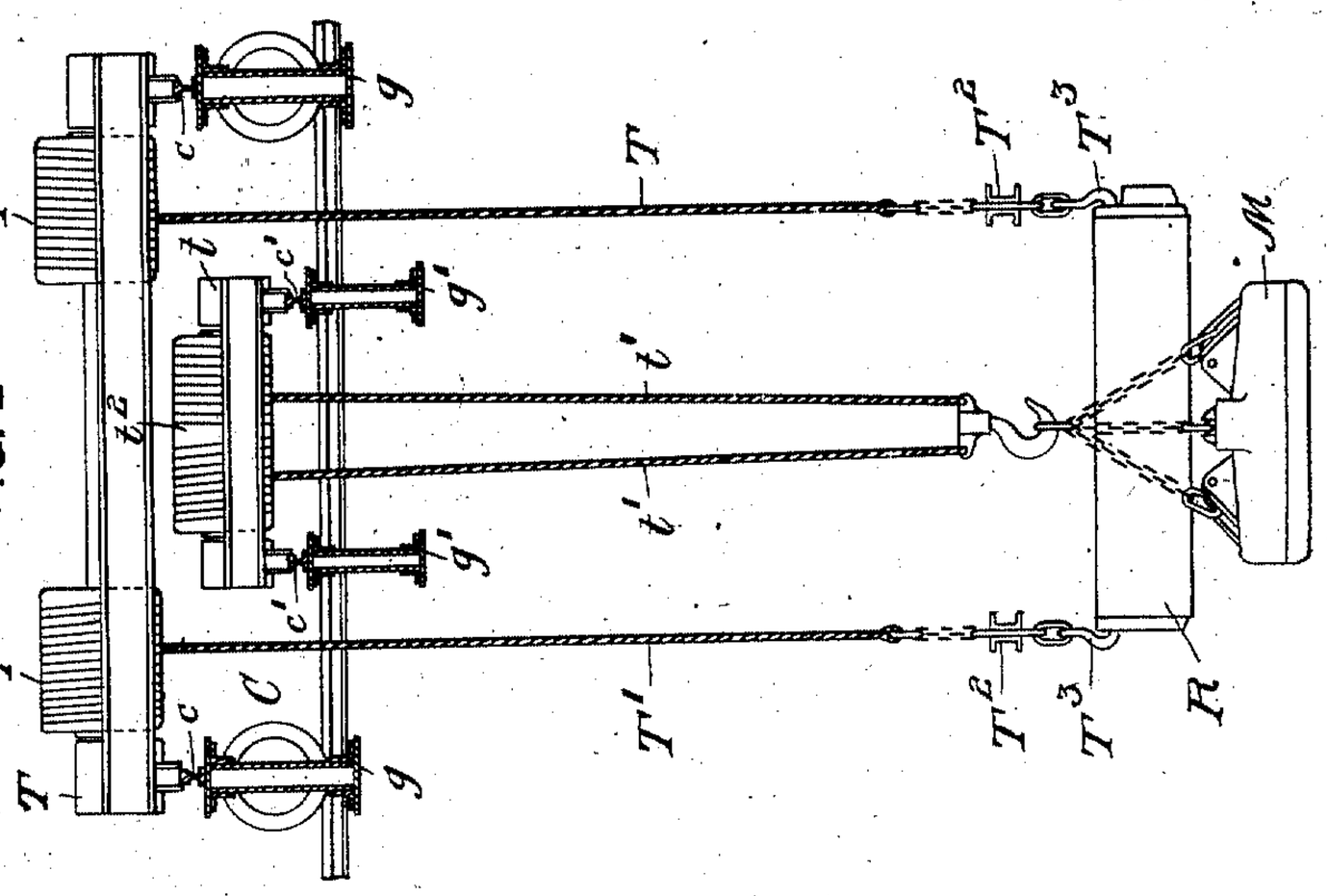
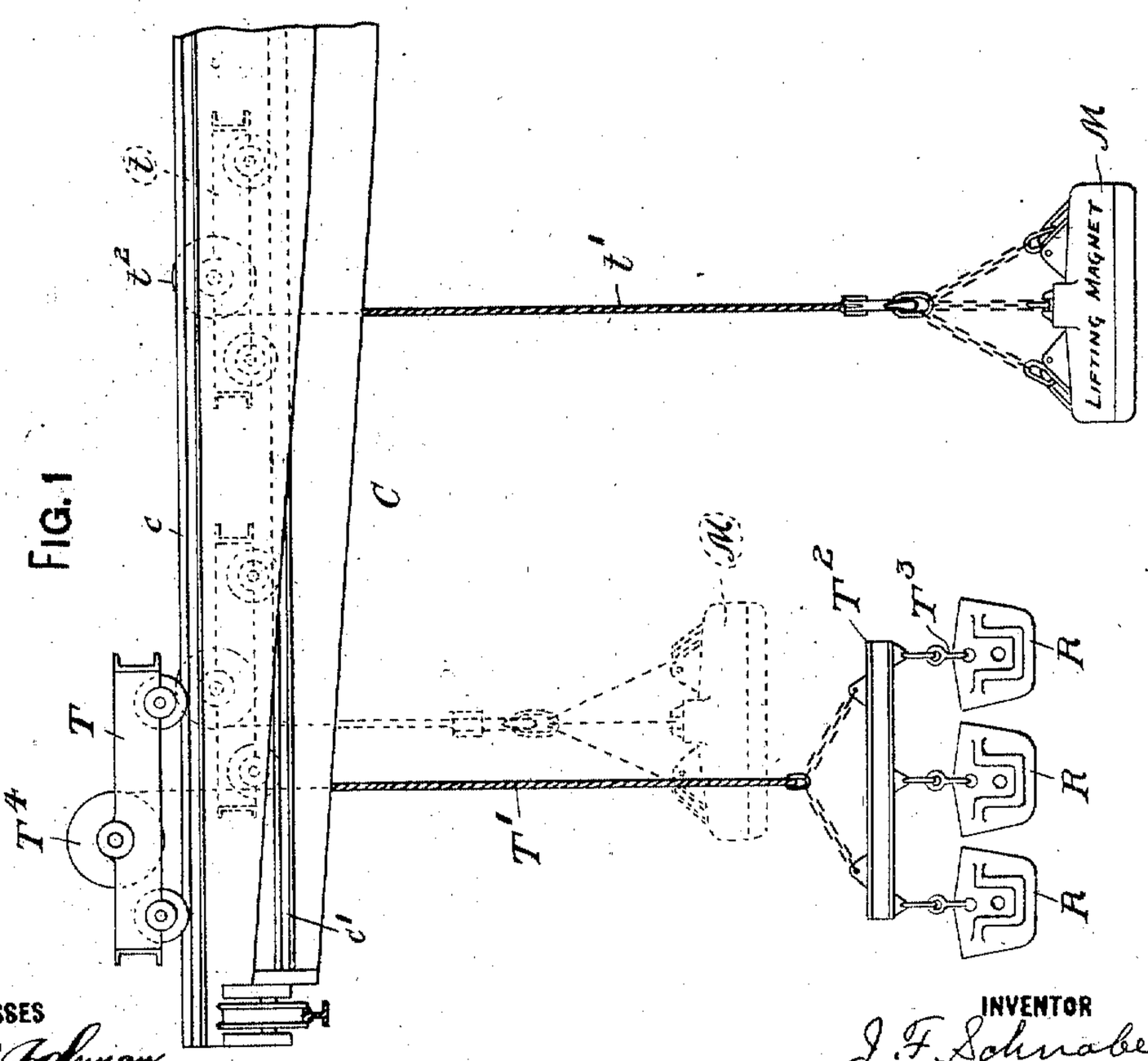


FIG. 1



WITNESSES

J. B. Hoffman,

Elva Stanick

INVENTOR

J. F. Schnabel.

by F. N. Barber,

his attorney.

J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

APPLICATION FILED APR. 22, 1910.

982,883.

Patented Jan. 31, 1911.

7 SHEETS—SHEET 2.

FIG. 4

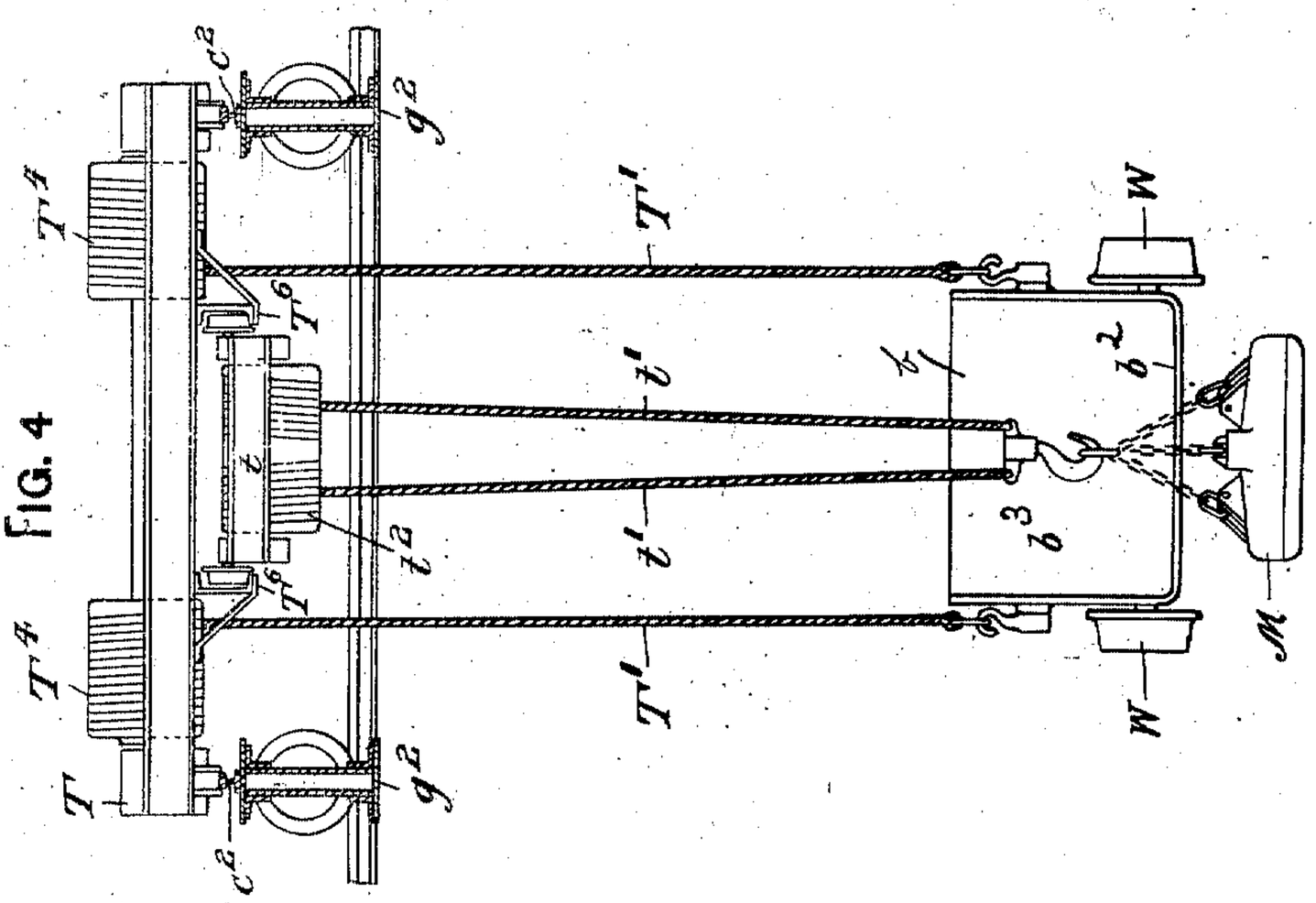
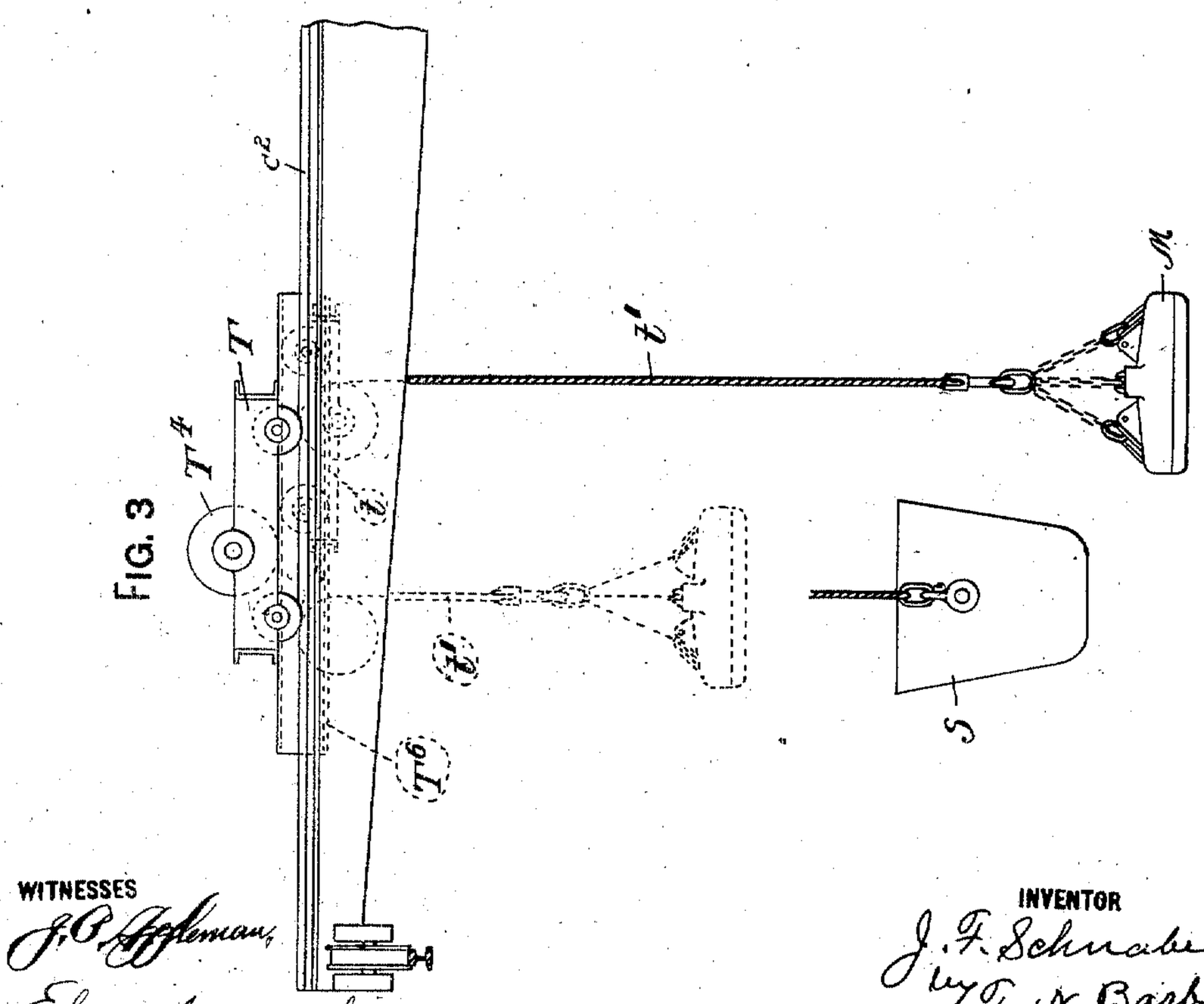


FIG. 3



WITNESSES

J. B. Hoffman,

Elva Stanicek

INVENTOR

J. F. Schnabel,

by F. N. Barber,

his attorney.

J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

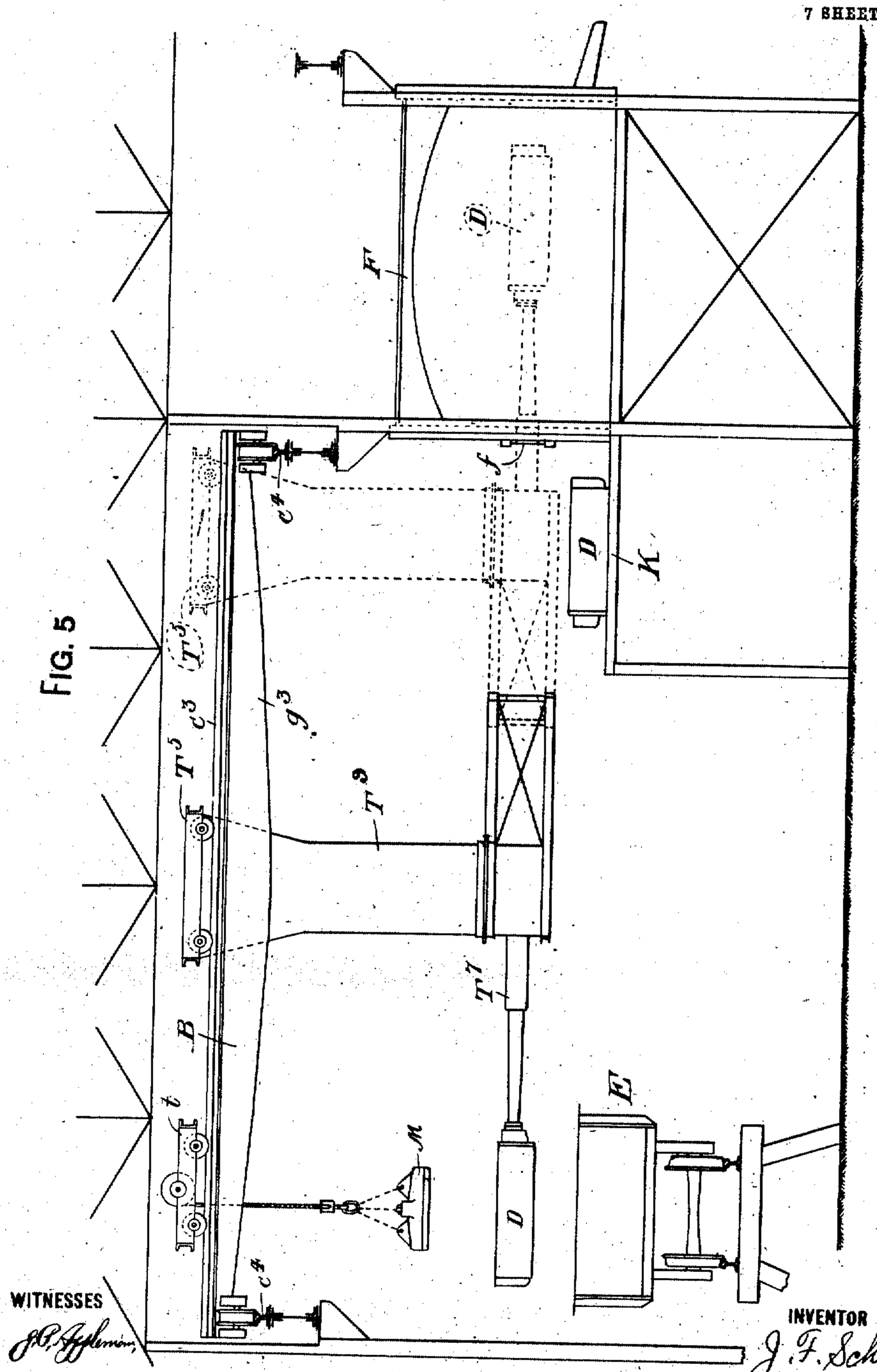
APPLICATION FILED APR. 22, 1910.

982,883.

Patented Jan. 31, 1911.

7 SHEETS—SHEET 3.

FIG. 5



WITNESSES

J. B. Appleman

Elva Staniels

INVENTOR

J. F. Schnabel.

by F. N. Barber,

his attorney.

J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

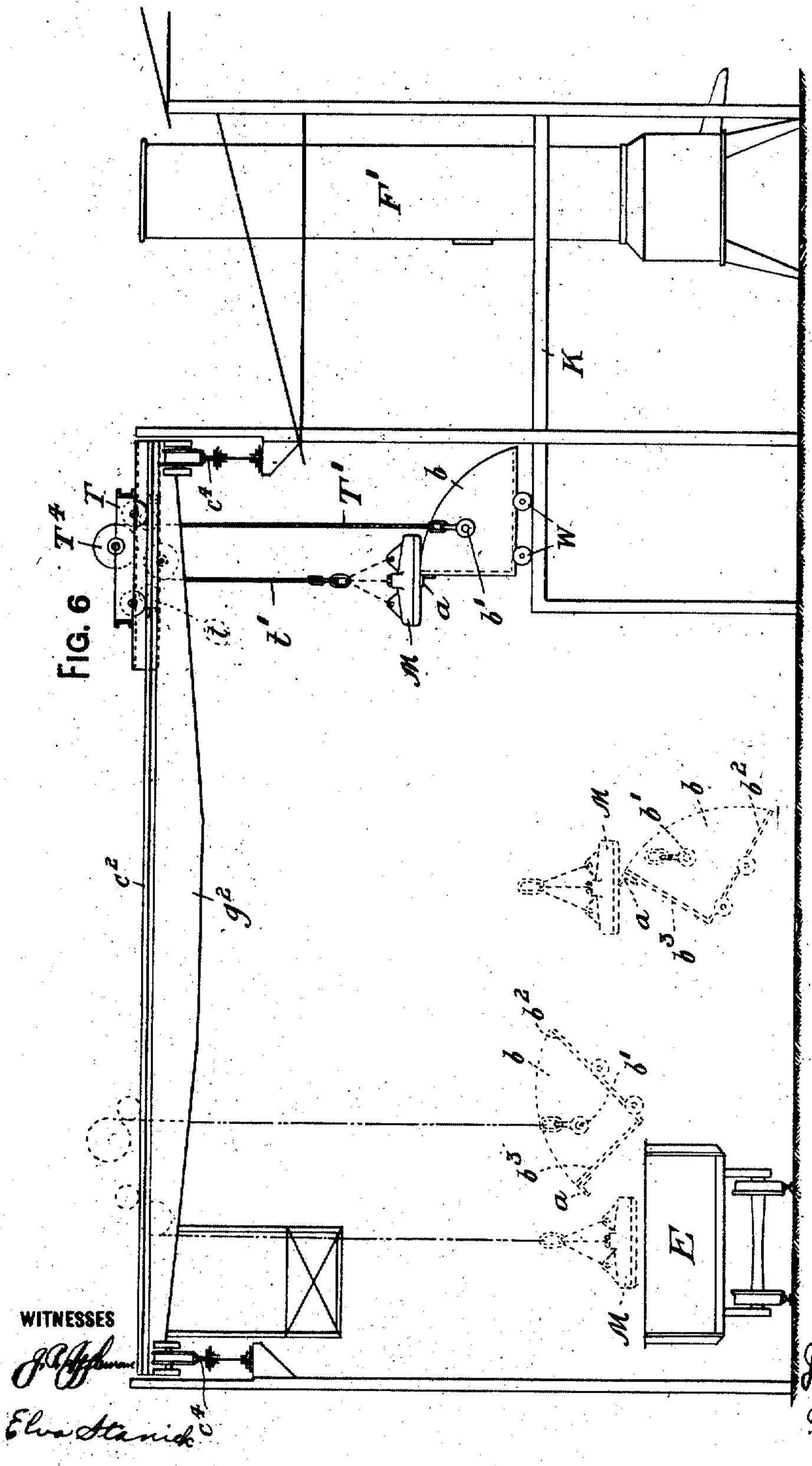
APPLICATION FILED APR. 22, 1910.

982,883.

Patented Jan. 31, 1911.

7 SHEETS—SHEET 4.

FIG. 6



J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

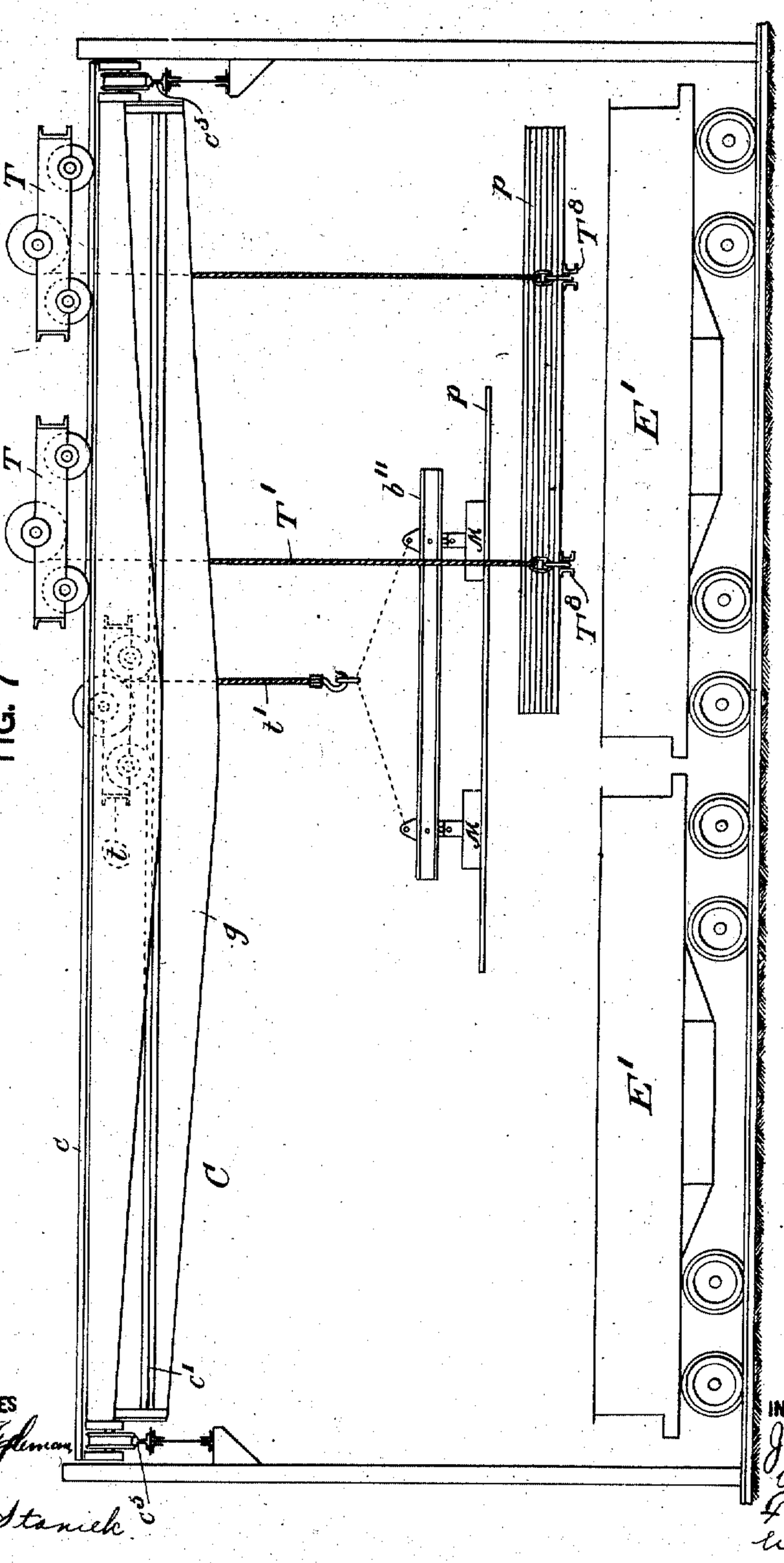
APPLICATION FILED APR. 22, 1910.

982,883.

Patented Jan. 31, 1911.

7 SHEETS—SHEET 5.

FIG. 7



INVENTOR

J. F. Schnabel,

by

F. N. Barber,

his attorney

J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

APPLICATION FILED APR. 22, 1910.

982,883.

Patented Jan. 31, 1911.

7 SHEETS—SHEET 6.

FIG. 9

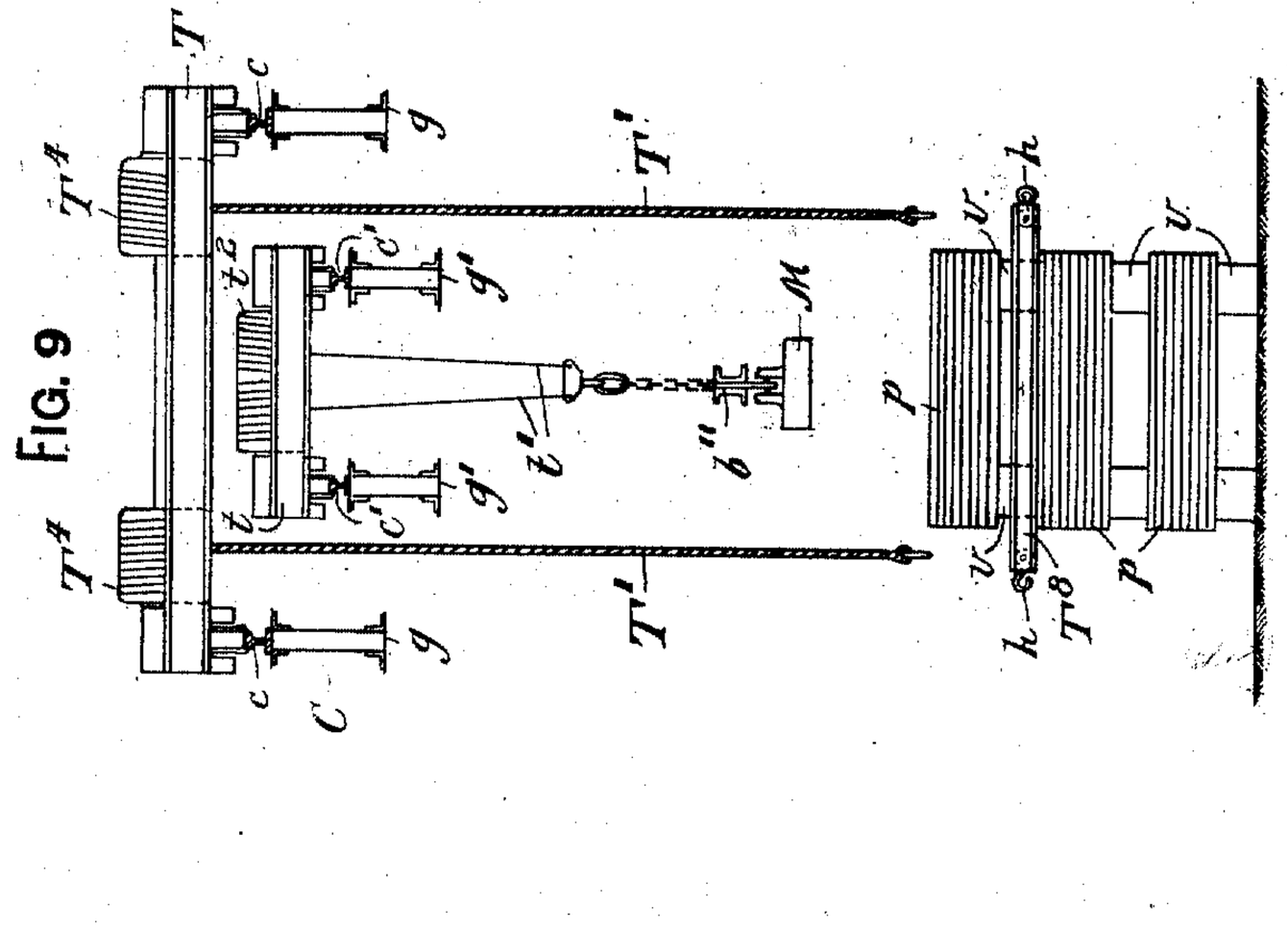
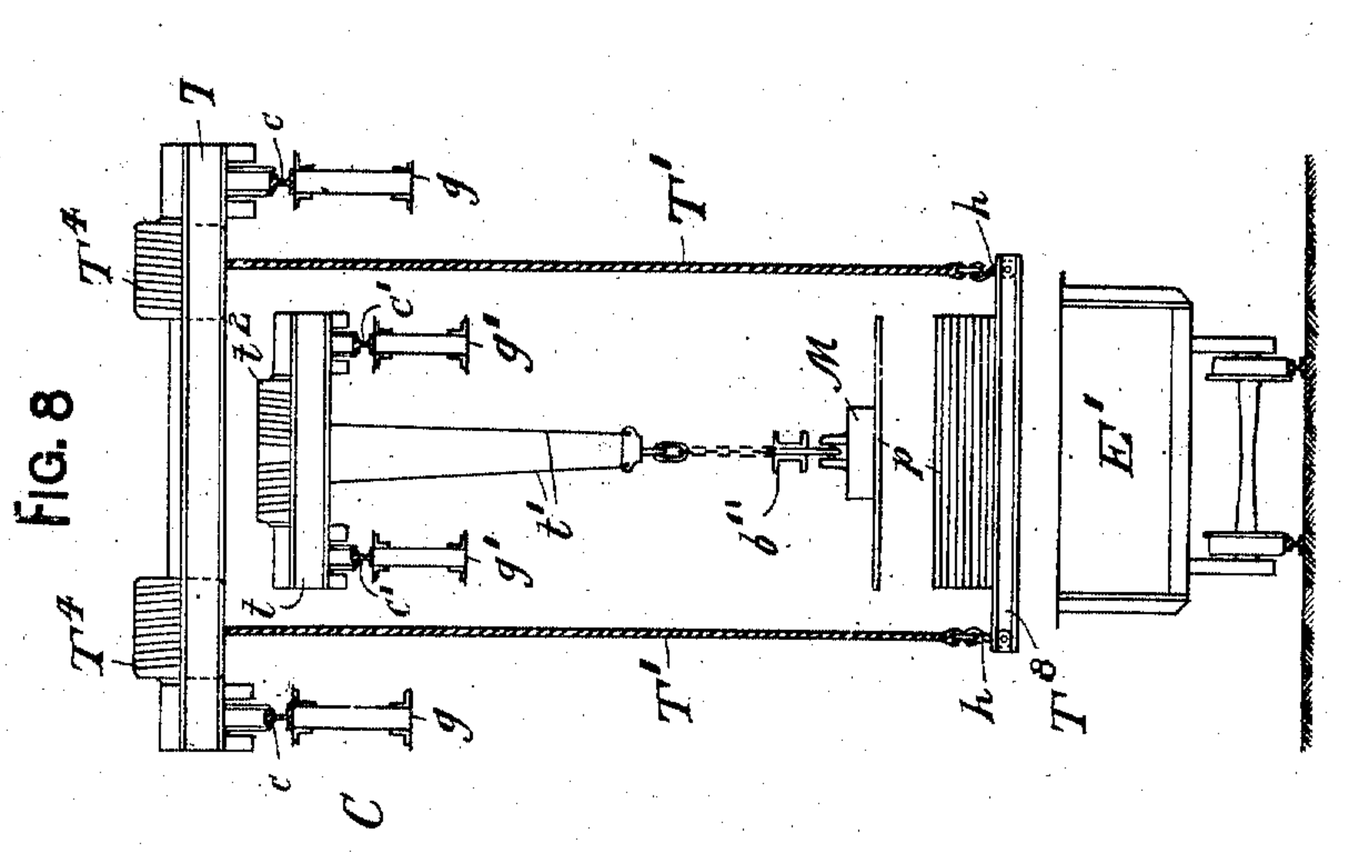


FIG. 8



WITNESSES

J. P. Hoffman

Elva D. Daniels

INVENTOR

J. F. Schnabel.

by F. N. Barber

his attorney.

J. F. SCHNABEL.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

APPLICATION FILED APR. 22, 1910.

982,883. **Patented Jan. 31, 1911.**

7 SHEETS—SHEET 7.

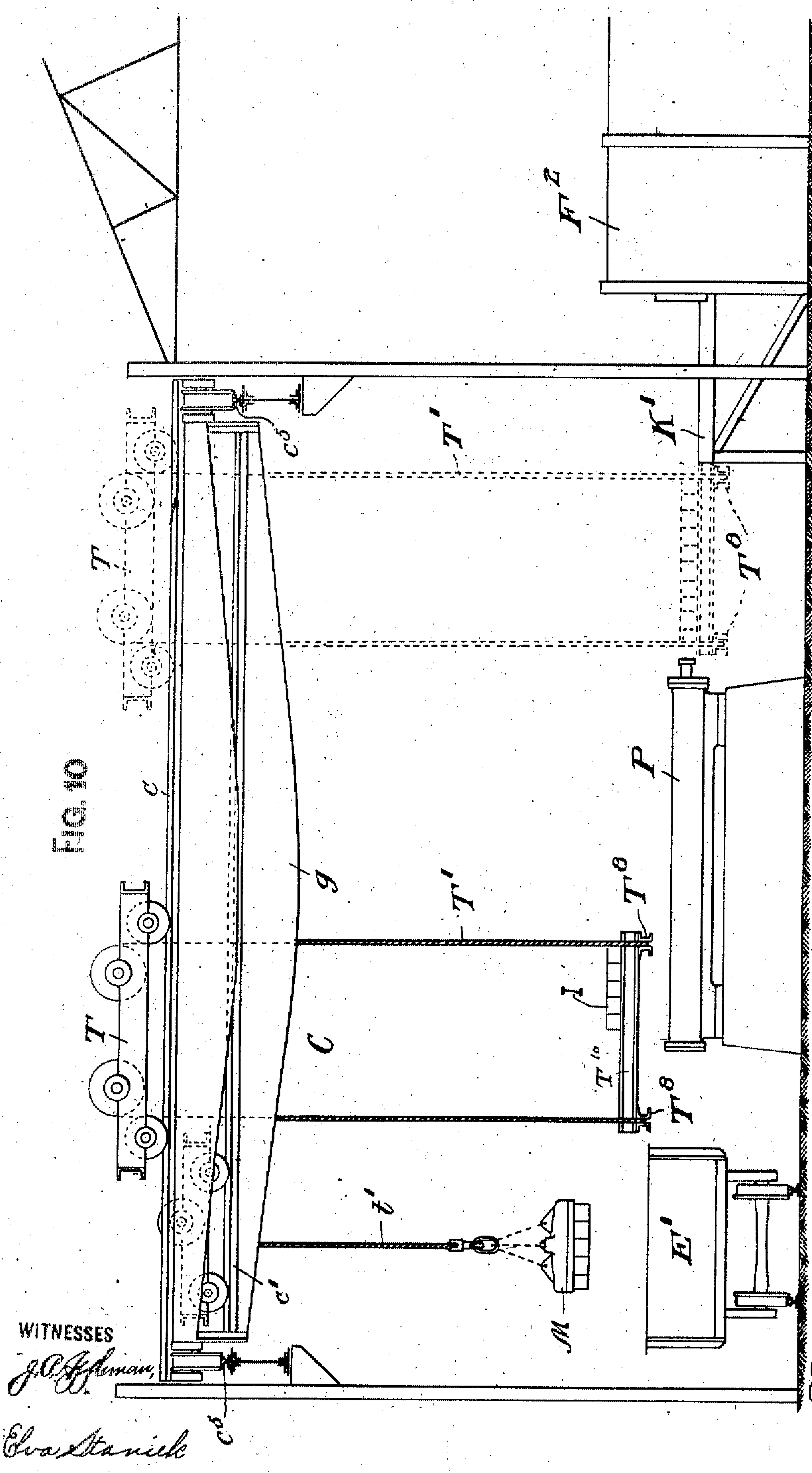


FIG. 10

WITNESSES

J. A. Hoffman,

Elva Stanick

INVENTOR

J. F. Schnabel,

by F. N. Barber,

his attorney.

UNITED STATES PATENT OFFICE.

JAMES F. SCHNABEL, OF CLEVELAND, OHIO, ASSIGNOR TO THE ELECTRIC CONTROLLER AND MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

APPARATUS FOR HANDLING MAGNETIC MATERIALS.

982,883. Specification of Letters Patent. **Patented Jan. 31, 1911.**

Application filed April 22, 1910. Serial No. 556,950.

To all whom it may concern:

Be it known that I, JAMES F. SCHNABEL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Apparatus for Handling Magnetic Materials, of which the following is a specification.

My invention relates to means for economically and safely transporting magnetic materials.

The object thereof is to combine one or more electro-magnets for picking up magnetic materials with one or more suitable receptacles for transporting the said materials and with crane mechanism for handling both the lifting magnet or magnets and the receptacle or receptacles.

The principles of my invention may be embodied in various forms, but I have shown only a few forms thereof in the accompanying drawings, in which—

Figure 1 is a side view of an end portion of a crane fitted with one form of my invention; Fig. 2, a view of the same form of my invention, looking at Fig. 1 toward the left; Fig. 3, a side view of an end portion of a crane provided with the second form of my invention; Fig. 4, a view of the same form of my invention, looking toward the left, the form of bucket being modified; Fig. 5, a side view showing my invention applied to a charging mechanism of an open-hearth furnace; Fig. 6, a side view of my invention wherein the lifting magnet is adapted to dump the receptacles; Fig. 7, a side view of my invention adapted to the handling of plates, billets, rails, etc.; Fig. 8, an end view thereof; Fig. 9, an end view of the invention shown in Figs. 7 and 8, to illustrate one method of piling sheets; and Fig. 10, a side view of my invention in connection with charging mechanism for continuous heating furnaces.

Referring first to Figs. 1 and 2, I show in general the crane C, which may be stationary or traveling, as desired. The crane C has the trolleys T and t, running on separate tracks c and c' on the parallel girders g and g'. The hoist ropes T′, suspended from the widely-spaced hoisting drums T^4 on the trolley T are fixed to the beams T^2, from which are suspended the hooks T^3, capable of being inserted in the end openings of the receptacles R, shown, in this instance, to be charging boxes for furnaces. To the ropes t', suspended from the hoisting drum t^2 of the trolley t, is attached the lifting magnet M, The girders g' g' are placed between the girders g g, the tracks c' are below the tracks c and the drums T^4 are widely spaced apart, so that the trolley t can pass under the trolley T, or the trolley T can pass over the trolley t, with the trolley t between the ropes T′. Consequently, the magnet M may pick up a load of magnetic material in the position shown in full lines on Fig. 1 and lift and convey the same in a well known manner to the position shown in dotted lines, where the magnet M is directly over some of the receptacles R. When the loaded magnet in this position is demagnetized, it drops its load into the said receptacles. The magnet then picks up another load of magnetic material and deposits the same in the receptacles R. The magnet repeats these operations until the receptacles are sufficiently loaded, when they are conveyed by the crane or trolley or both to some predetermined place of deposit where they are dumped or unloaded.

In Figs. 3 and 4, there are two parallel girders g^2, on which the main trolley T runs. On this trolley are fixed the two parallel tracks T^6, on which the trolley t runs, the tracks T^6 being below the tracks c^2, on which the trolley T runs and between the ropes T′ of the trolley T so that either of the trolleys may pass the other and the magnet M may be lifted and brought into vertical alinement with the receptacle S or b, to whose ends the ropes T′ are connected. The tracks T^6 are extended enough at one or both ends of the trolley T, as shown in dotted lines, Fig. 3, to allow the trolley t to be moved so that the magnet M may be lowered past the receptacle S or b. The operation of this second form of my invention is not substantially different from that shown in Figs. 1 and 2. The bucket S is all inclosed except the top. The bucket b has one end also open and is provided with the wheels W. This bucket will be further described in connection with Fig. 6.

In Fig. 5, the trolleys T^5 and t travel on the same track c^3 laid on the girders g^3 (only one shown) of the bridge B, capable of travel on the rails c^4. From the trolley T^5 is suspended the open-hearth charging device T^9, which has at its lower end the arm or mem-

ber T^7 rotatable on the part T^9 in a horizontal plane and carrying at its outer end the charging box D. The trolley *t* carries the lifting magnet M as in the other forms of my invention. The receptacle D can, by movement of the trolley T^5 and the proper rotation of the arm T^7, be brought over or near the railroad car E, or a pile of stock. The magnet is lowered onto the material in the car or pile and, when energized, lifted with its load above the box D, whereupon the box may be swung under the magnet, or the latter brought over the box D so that, when the magnet is deënergized, the box will catch the material released from the magnet. This operation may be repeated until the box D is filled, after which the arm T^7 is swung around and the box D set down on the support K or otherwise disposed of. I have shown an open-hearth steel furnace F, into which the materials in the box D are to be placed, The arm T^7 being brought into line with the door *f* of the furnace by proper movements of the bridge B, and the arm T^7, the trolley T^5 is then operated to thrust the box D into the furnace F, into which it is dumped in a well-known manner. I have not fully described and shown the parts marked T^5, T^7, and T^9, as they are well known.

In Fig. 6, I have shown the trolleys T and *t* as in Figs. 3 and 4, where the trolley *t* travels on tracks on the trolley T. The receptacle *b* is connected at its ends to the ropes T′ pendent from the main trolley T and is rotatable on a horizontal axis, as at *b′*. A front view of the receptacle *b* is shown on Fig. 4. Normally the receptacle *b* hangs, as shown in dotted lines shown at the left-hand end of Fig. 6, with the bottom b^2 and the end b^3 inclined to the vertical. The bottom b^2 is provided with the wheels W so that when tilted down as shown in full lines on Fig. 6, it may be run on the platform K to the furnace F′, into which the materials in the receptacle *b* may be charged in any desired manner. At the left-hand end of Fig. 6 I show the magnet M and the receptacle *b* arranged so that the magnet may remove material from the car E and drop it into the receptacle. In the middle of Fig. 6, I show the magnet M operating on the angle-iron *a* at the top of the back b^3 so as to dump the receptacle by causing the same to tilt on its axis *b′* until the outer end of the bottom is sufficiently below the inner end to cause the materials in the receptacle to slide out. In full lines on Fig. 6, I show the magnet M on the angle *a*, by which the receptacle *b* has been tilted by magnetic action so that the wheels W rest on the platform K. The magnet M may remain deenergized and caused to engage under the angle *a* or other suitable part or projection on the receptacle to cause the latter to tilt or dump its load. I do not limit myself to angle-irons as various other shapes and devices will answer the purpose intended.

In Figs. 7, 8, and 9, I show two pairs of parallel girders *g g* and *g′ g′* as in Figs. 1 and 2. The rope *t′* of the trolley *t* supports the beam *b″* from which any required number of magnets M are suspended. On the rails *c* I have two trolleys T each carrying at the lower end of its ropes T′ a beam T^8, connected to the ropes T′ by the readily disengageable hooks *h*. The parts are arranged as in Figs. 1 and 2 so that the magnets M with their load of plates *p* or other materials may pass between the ropes T′ which are at opposite ends of the beams T^8. I show the magnets M in Figs. 7 and 8 transferring a plate from one of the cars E′ to the piles of plates which have been previously transferred from the car so as to be supported on the beams T^8 which constitute what I call a sling. The beams can be brought to the proper position to support the load.

In Fig. 9, I show three piles of plates *p* superposed, adjacent piles being held separated by the spacers *v*, which are higher than the vertical width of the beams T^8. A pile of plates is deposited on the spacers *v* and the ropes T′ released from the hook *h* on the beams T^8, which may then be removed from beneath the pile. In some cases the beams may be swung from beneath the pile which they have deposited without disconnecting the hook *h*.

In Fig. 10, the parts are substantially as on Figs. 7, 8, and 9, except that I provide the continuous heating furnace F^2 having in front thereof the pusher P arranged to push a series of billets I from the sling onto the platform or track K′ which leads to the furnace F^2. The beams T^8 have thereon the cross-supports T^{10}, on which the magnet M deposited the billets I. After the sling is loaded with billets arranged in a single horizontal row, the trolley T conveys the sling to the right and lowers the same to the position shown in dotted lines where the billets are in line with the pusher P and the top of the billet supports T^{10} are flush with the track K′. Those acquainted with furnace charging devices will understand how the furnace is regularly charged without further explanation.

I do not limit myself to any form of receptacle, as I intend to cover by the word "receptacle" any device on which material may be deposited for transporting it from one place to another.

I claim—

1. The combination of two hoisting mechanisms, a receptacle carried by one of the said mechanisms, and a lifting magnet carried by the other of the said mechanisms, one of the said mechanisms being movable

horizontally as a whole so that the magnet and receptacle may be in such relative positions as to permit the magnet to deliver its load to the receptacle.

2. The combination of two hoisting mechanisms, a receptacle carried by one of the said mechanisms, and a lifting magnet carried by the other of the said mechanisms, one of the said mechanisms being movable horizontally as a whole so that the magnet and the receptacle may be in vertical alinement with the magnet above the receptacle.

3. The combination of a traveling bridge, two hoisting mechanisms carried thereby, one being movable horizontally, a receptacle carried by one hoisting mechanism, a lifting magnet carried by the other hoisting mechanism, tracks for the hoisting mechanisms, and suspensory devices for the receptacle and magnet so arranged and constructed that the magnet may be over the receptacle.

4. The combination of two hoisting mechanisms, hoisting ropes suspended therefrom, a receptacle connected to the hoisting ropes of one mechanism, a lifting magnet connected to the hoisting ropes of the other hoisting mechanism, and tracks for the latter hoisting mechanism arranged between the hoisting ropes of the other hoisting mechanism, whereby the magnet and the receptacle may be brought into vertical alinement with the magnet over the receptacle.

5. The combination of a crane, a receptacle carried thereby, a hoisting mechanism also carried thereby, a lifting magnet carried by the hoisting mechanism, supports for the receptacle arranged to permit the hoisting mechanism as a whole, and with it the magnet to move horizontally above the receptacle and into vertical alinement therewith.

6. The combination of a trolley, a receptacle carried thereby, a second trolley having travel on the first trolley, a hoisting mechanism on the second trolley, a lifting magnet carried by the said hoisting mechanism, and supports for the receptacle arranged to permit the magnet and the receptacle to come into vertical alinement with the magnet over the receptacle.

7. The combination of a bridge, a trolley having travel thereon, a second trolley having travel on the first trolley, a hoisting mechanism on each trolley, a receptacle carried by the hoisting mechanism of the first trolley, and a lifting magnet carried by the hoisting mechanism of the second trolley, the second trolley having travel so that the magnet may be moved into and out of vertical alinement with the receptacle.

8. The combination of a tilting receptacle and a hoisting mechanism having relative horizontal travel, a lifting magnet connected to the hoisting mechanism, means whereby the magnet and receptacle can be brought into vertical alinement with the magnet over the receptacle, and means on the receptacle with which the magnet may be engaged and by which engagement the magnet may tilt the receptacle.

9. The combination of a hoisting mechanism, a lifting magnet carried thereby, and a tilting receptacle bearing magnetic material, said magnet and receptacle being relatively movable so that the magnet may act on the said magnetic material, on relative vertical movement of the magnet and the receptacle, to tilt the latter.

10. The combination of a hoisting mechanism, a lifting magnet carried thereby, and a tilting repectacle, having thereon a piece of magnetic material, by which the magnet may tilt the receptacle by virtue of its attraction to the said magnetic piece.

11. A crane trolley having two independent hoisting mechanisms, one being movable horizontally on the frame of the other.

12. The combination of a hoisting mechanism, a second hoisting mechanism supported on the frame of the first hoisting mechanism, a load carried by each hoisting mechanism, and means arranged to bring the load on the second hoisting mechanism directly over the load on the first hoisting mechanism.

Signed at Cleveland, Ohio, this 20th day of April, A. D. 1910.

JAMES F. SCHNABEL.

Witnesses:
J. H. HALL,
H. M. DIEMER.