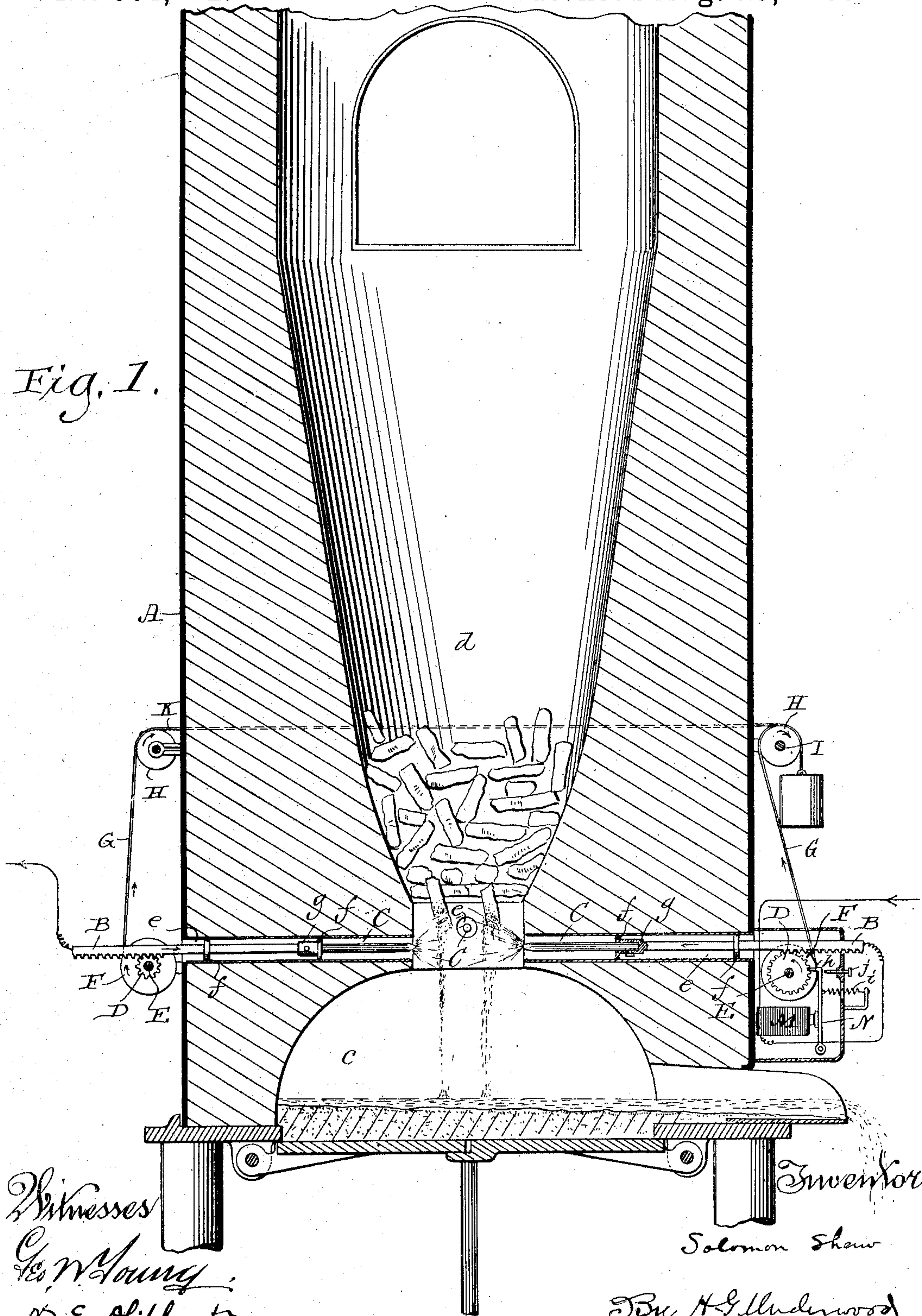


S. SHAW.
APPARATUS FOR MELTING IRON.

No. 504,282.

Patented Aug. 29, 1893.

Fig. 1.



Witnesses
C. W. Young
N. E. Oliphant

Inventor
Solomon Shaw

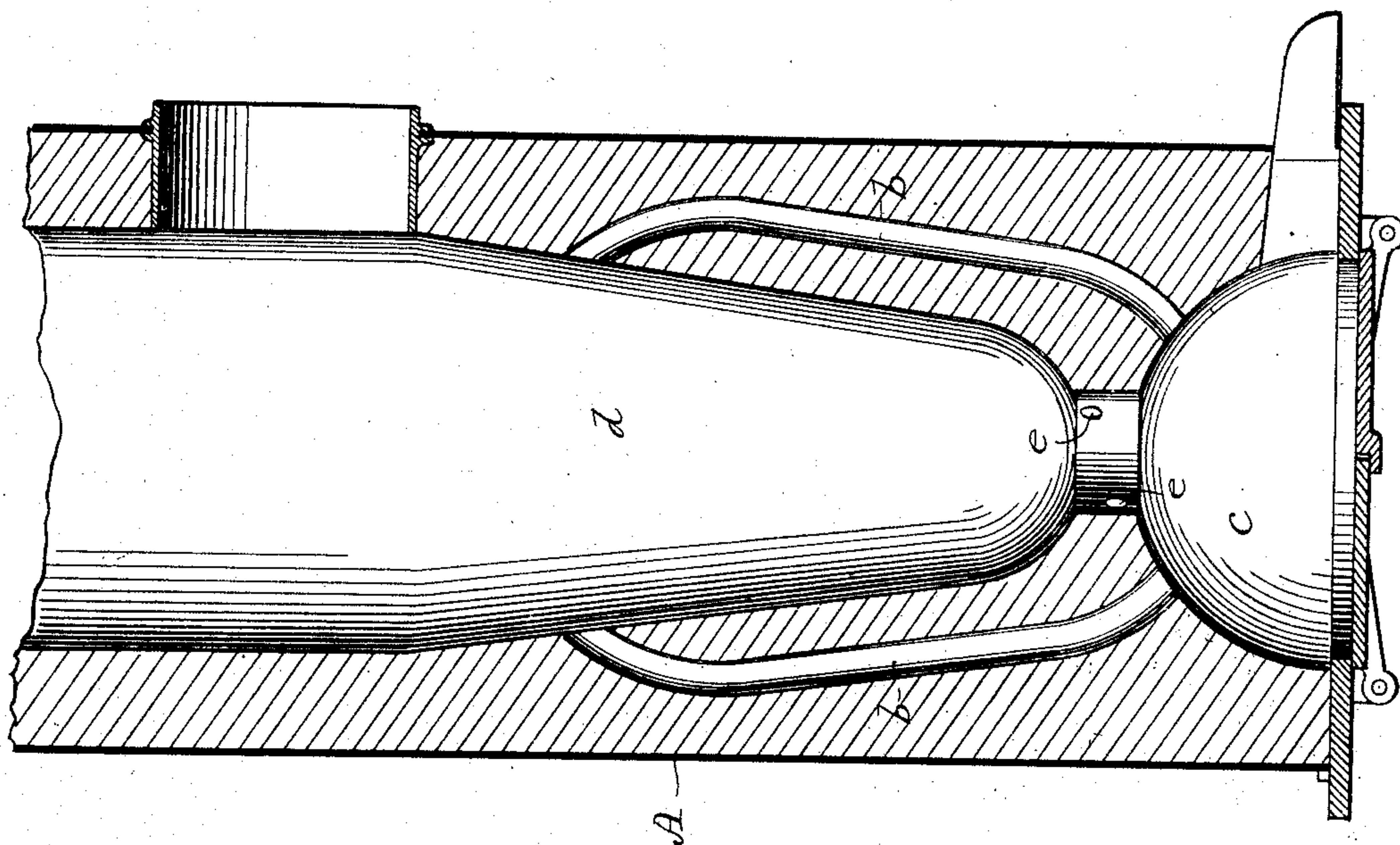
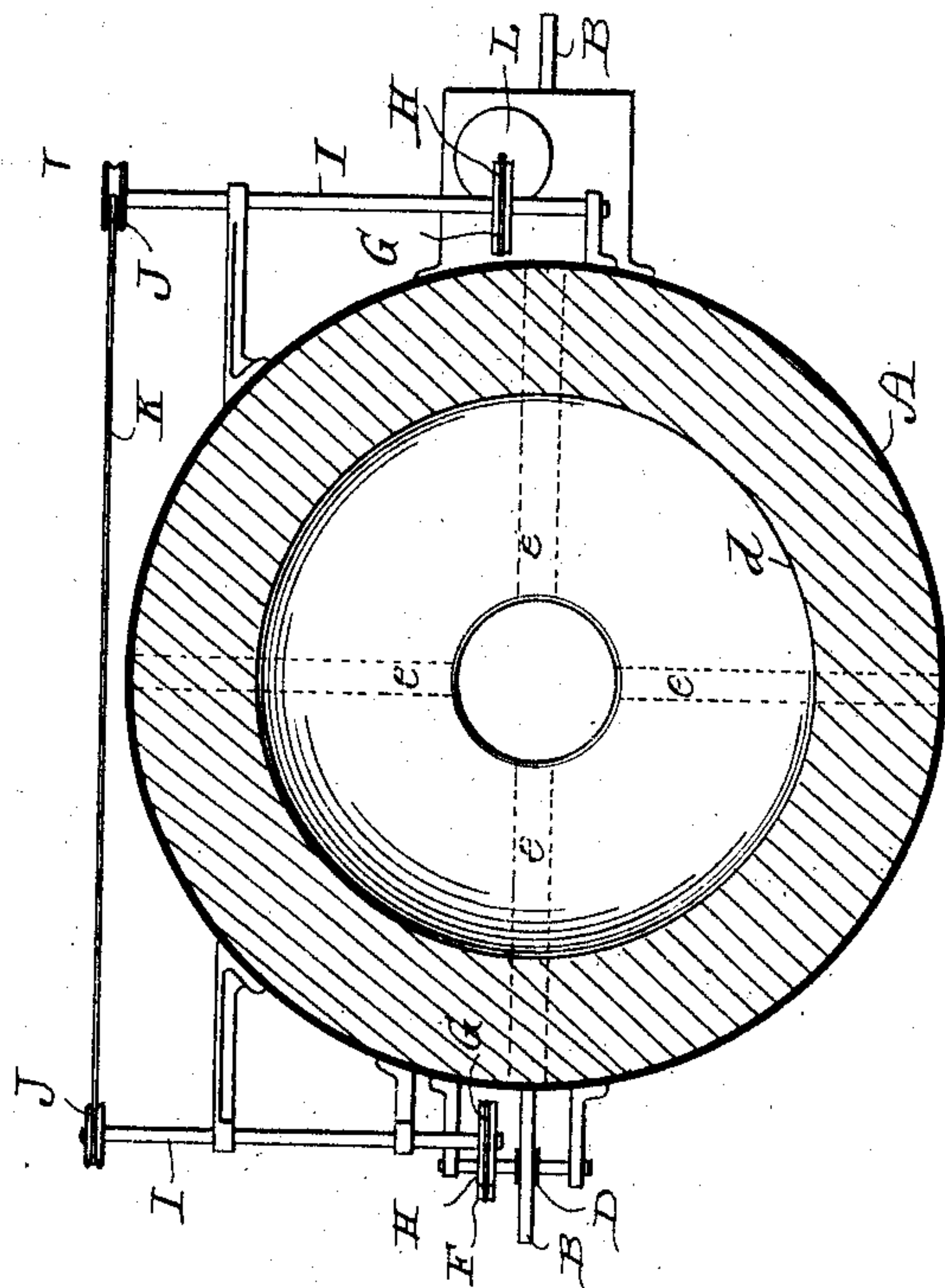
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Fig. 3.



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Fig. 2.

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UNITED STATES PATENT OFFICE.

SOLOMON SHAW, OF MILWAUKEE, WISCONSIN, ASSIGNOR OF ONE-FOURTH
TO THE EDWARD P. ALLIS COMPANY, OF SAME PLACE.

APPARATUS FOR MELTING IRON.

SPECIFICATION forming part of Letters Patent No. 504,282, dated August 29, 1893.

Application filed August 24, 1891. Serial No. 403,512. (No model.)

To all whom it may concern:

Be it known that I, SOLOMON SHAW, a citizen of the United States, and a resident of Milwaukee, in the county of Milwaukee, and in the State of Wisconsin, have invented certain new and useful Improvements in Apparatus for Melting Iron; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to melt iron by means of electricity; and it consists in apparatus substantially such as is hereinafter described with reference to the accompanying drawings and subsequently claimed.

In the drawings: Figure 1 represents a vertical section of a cupola furnace in connection with automatically regulated electrodes arranged to produce a voltaic arc when energized by a current of electricity; Fig. 2, a like view of another form of cupola furnace, and Fig. 3, a horizontal section of the furnace with certain portions of the electrical mechanism (shown in Fig. 1) illustrated in plan.

Referring by letter to the drawings, A represents a cupola furnace, the one shown in Figs. 1 and 3 being of ordinary construction and such as is commonly used in various foundries, while the one shown in Fig. 2, is provided with flues *b* leading from the bottom chamber *c* into the main-chamber *d*, at a certain elevation above what is ordinarily the tuyeres *e*, whereby hot gases, generated by the melting operation, may find their way into said main-chamber to heat the contents thereof.

Loosely arranged within the tuyeres or openings *e*, in the furnace, are rack-bars B having guide-flanges *f*, and fast in sockets *g*, at the inner ends of the rack-bars, are electrodes C of carbon or other suitable material. Each two of the electrodes are in such relative arrangement as to produce a voltaic arc when energized by a current of electricity, this current being generated by any suitable means, the source of production being wired to the rack-bars. When more than one pair of electrodes are employed they are so arranged as not to have their arcs interfere by crossing. Each rack-bar B engages a pinion D on a shaft E loosely arranged in suitable bearings, and fast on these shafts are pulleys F having strap-connections G with other pulleys H fast on

shafts I that are also loosely arranged in suitable bearings.

In addition to the pulleys H, the shafts I carry other pulleys J connected by a strap K, and the strap that is relative to the positive electrode, rack-bar and pinion supports a weight L, as is best illustrated in Fig. 1.

In circuit with the electrodes is an electro-magnet M and opposed to this magnet is a pivoted spring-controlled armature N having a hook-shaped end *h*, and the magnet being sufficiently energized, to cause an attraction thereto of the armature, said hook-shaped end of this armature will engage the pinion that controls the rack-bar carrying the positive electrode, whereby the weight-controlled pulley and strap-mechanism above described are held in check. As the electrodes are consumed and the distance between their points increased to that degree that the electric current will not cross from one to the other, the electro-magnet M is de-energized, and consequently the armature N will be drawn back by its spring *i* to come out of engagement with the adjacent pinion that controls the rack-bar of the positive electrode, this movement of the armature being limited by a stop-screw *j*, shown in Fig. 1. The armature being brought out of engagement with the adjacent pinion, the weight L is free to descend to thus automatically actuate the pulley and strap-mechanism to cause a rotation of the pinions D whereby the rack-bars in engagement therewith are propelled toward each other and the space between the electrodes lessened to a degree sufficient to permit of the electric current passing from one to the other, at which time the electro-magnet is again energized to attract the armature, and, the latter coming into engagement with the adjacent pinion, the automatic feed-mechanism is checked.

The iron to be melted is stacked in the main-chamber of the furnace A and an electric current of sufficient power being let on to the electrodes the lower portion of said iron is reduced to a fluid state, and passes down into the lower chamber of said furnace to be drawn off through the tap-opening. As the lower portion of the iron in the furnace melts and runs down into the lower chamber, the remainder of said iron will by its own gravity

descend toward the energized electrodes to be converted into a fluid mass, more iron being inserted through the charging hole of said furnace as occasion may require.

5 I do not claim herein the matter made the subject of my claims in the application filed by me November 14, 1891, Serial No. 411,859.

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

1. In a cupola furnace constructed as described, and having a narrow passage open above and below, a lower receptacle for the melted material combined with rack bars
15 having guide flanges arranged in openings in the furnace walls, and sockets to contain the electrodes, pinions mounted on shafts loosely arranged in suitable bearings, and meshing with said rack bars, straps passing over pul-
20 leys secured to the shell or outer surface of the furnace, and also over pulleys on the pinion shafts, and having attached counter-balances or weights, said shafts being provided

with ratchet wheels; electromagnets provided with armatures having detents arranged to
25 engage with the ratchet wheels on the shafts, and the electric connections of one of the electrodes adjusted to include in its circuit the electro magnet, all combined and arranged
30 substantially as described.

2. A cupola furnace having flues leading from the lower portion thereof back into the ore chamber of the cupola, at a certain elevation, combined with electrodes arranged to
35 automatically produce a voltaic arc within said furnace intermediate of the termini of said flues, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin,
40 sin, in the presence of two witnesses.

SOLOMON SHAW.

Witnesses:

H. G. UNDERWOOD,
E. SHAW.