

No. 636,005.

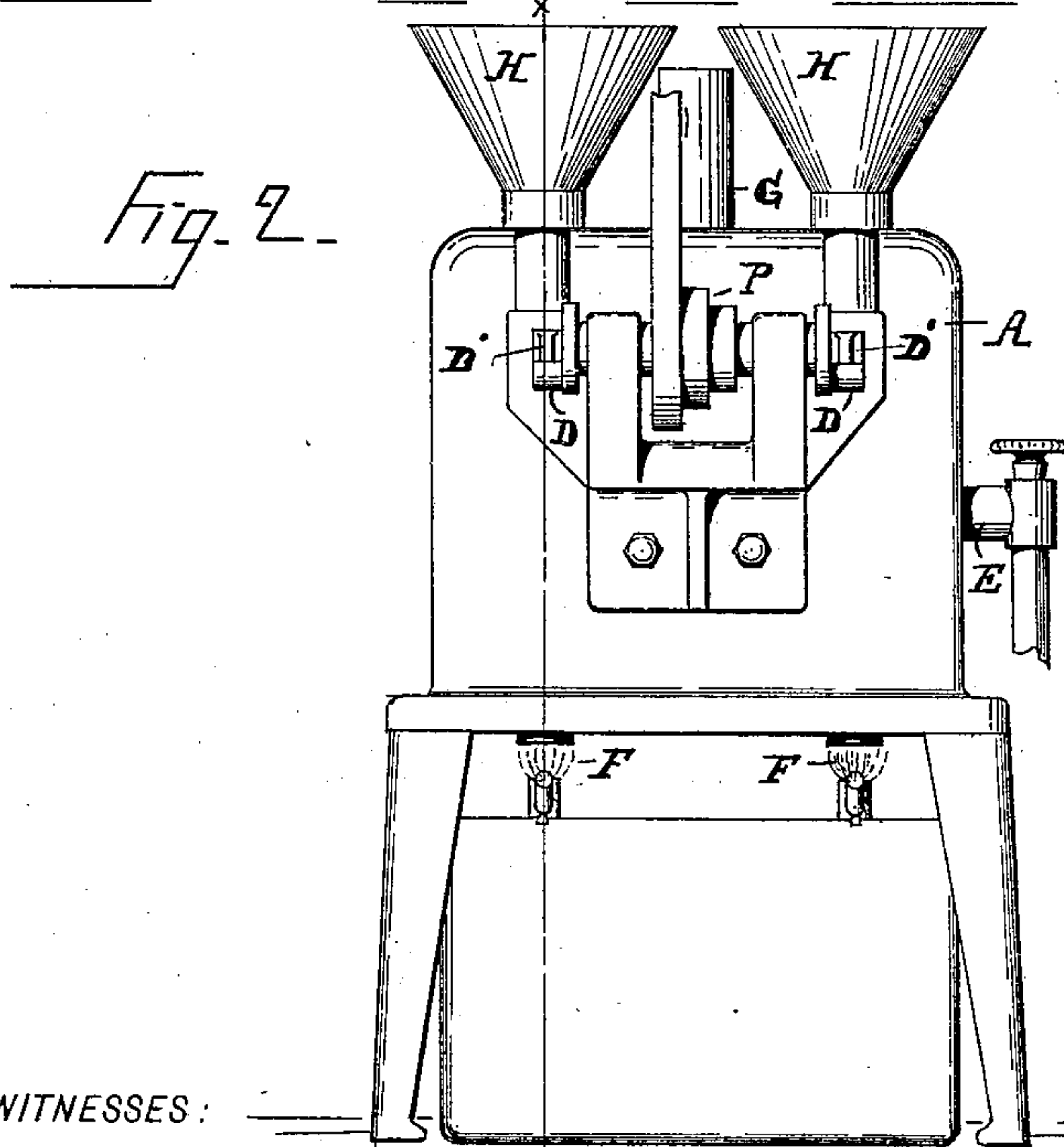
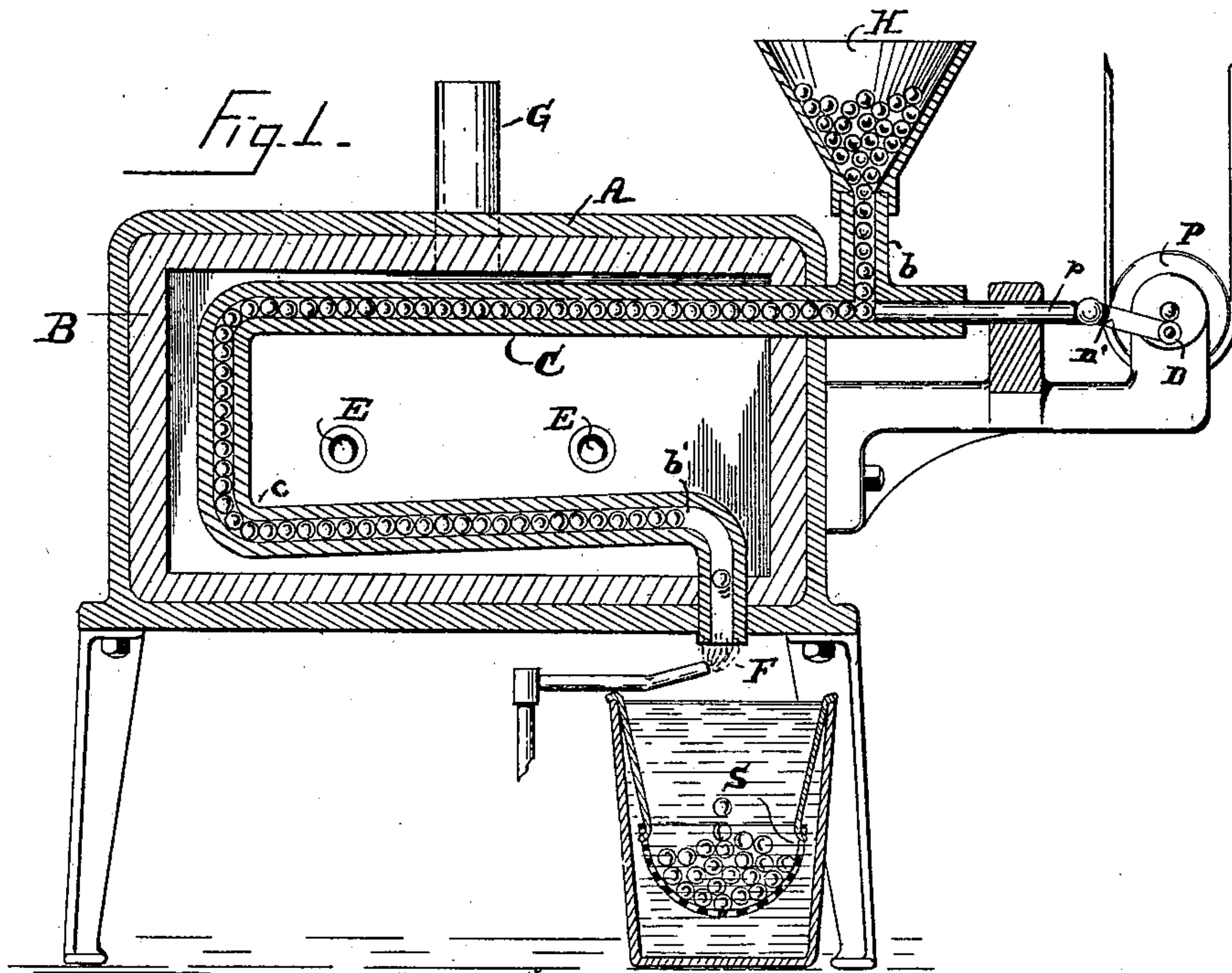
Patented Oct. 31, 1899.

L. F. SCHULZE.

APPARATUS FOR HEATING AND HARDENING METALLIC ARTICLES.

(Application filed Sept. 12, 1898.)

(No Model.)



WITNESSES:

Arthur R. Bullock
John Ramage.

INVENTOR

Leon F. Schulze,
BY Bernh. F. Eibler
ATTORNEY.

UNITED STATES PATENT OFFICE.

LEON F. SCHULZE, OF CLEVELAND, OHIO.

APPARATUS FOR HEATING AND HARDENING METALLIC ARTICLES.

SPECIFICATION forming part of Letters Patent No. 636,005, dated October 31, 1899.

Application filed September 12, 1898. Serial No. 690,761. (No model.)

To all whom it may concern:

Be it known that I, LEON F. SCHULZE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a new and Improved Apparatus for Heating and Hardening Metallic Articles of Manufacture, of which the following is a full and true specification.

My invention consists in an improved furnace adapted for heating metallic articles, particularly "machined" ones—such as balls, rivets, chain-links, screws, &c.—in continuous order and the means which enable the hardening of said articles in an expedient, reliable manner.

The objects of my invention are, first, to obtain by said improvement a high degree of uniformity in the heating and hardness of said articles, and, second, to adapt simple and positively, as well as economically, operating means to attain such results.

That the invention may be fully understood and seen, reference will be had to the accompanying drawings, of which—

Figure 1 illustrates a longitudinal vertical sectional view of a combined heating, feeding, and hardening apparatus on line *xx*, Fig. 2; and Fig. 2 represents an end elevation of same.

Like letters of reference denote like parts in the drawings and specification.

Certain and many machined, as well as cast, stamped, or formed, metallic articles for various uses have become standard articles of manufacture, and there are many establishments engaged exclusively in the making of balls for antifriction-bearings, pins, screws, links, rivets, &c. Generally such articles are machined from rolled soft-steel bars, rods, or sheets and subsequently hardened. With articles so manufactured it is preëminently essential that the hardening process should be executed not only in an expedient, but also careful, manner, since large quantities have to be treated and each and every part thereof should have the same degree of hardness. In order to meet such conditions and to obtain such results, I adapt the rational mode of heating the articles in continuous string array and of submerging same in the hardening liquid successively either individually or in controllable numbers. For an apparatus

which enables such mode of treatment I employ a furnace constructed and equipped substantially as shown in the drawings. The furnace proper consists of a fireproof-lined casing of parallelepipedon or any other suitable form, A denoting said casing, and B the lining. Any suitable fuel may be consumed in such furnace for heating the contents thereof. In this instance the source of heat is introduced by the burners E E and the products of combustion are carried off through flue G. As shown, there are placed a pair of conduits or tubes C within the combustion-chamber of said furnace. The upper terminal of each of said conduits is arranged in operative connection with a feeding device, (presently described,) and the lower terminal protrudes at or near the bottom of said furnace. It is preferred to extend said conduits horizontally along the upper portion of the furnace well-nigh to the rear end thereof, thence downward well-nigh to the bottom, and forward, substantially as shown.

The feeding device, as shown, comprises a power-operated plunger *p* and a hopper *h*, which is arranged in open relation with the branch *b*, projecting from each of said conduit-terminals. (See Fig. 1.) Reciprocating motion may be imparted to said plunger by any suitable means. As shown, there is a shaft provided with crank-pins D at the terminals and a step-pulley P between the bearings of said shaft. Connecting-rods D' serve as intermediate members between plungers and crank-pins. Articles placed in the hopper descend by gravitation to the conduit, wherein they are pushed forward one by one, or more of them, at every inward stroke of the plunger. The lower forwardly-extending portion of the conduits ascends in a sufficient degree in order to render the discharge of the articles solely dependent upon the action of the plunger or other similarly-operating mechanism.

It is obvious that articles arranged or distributed in strings can be heated at a minimum expense of fuel, the well-nigh continuous commotion to which they are subjected by a power-operated feeding device assuring their becoming thoroughly and uniformly heated. Furthermore, they can be discharged either individually or in controllable numbers

at any desired speed. Directly underneath the discharge end of the conduit or conduits is placed the vessel containing the hardening liquid, solution, or substance. A basket S, depending into said vessel, is provided for collection and convenient removal of the articles which are dropped or submerged in the contents of the vessel for the purpose of being hardened.

10 In allowing only one or a limited number of the articles to drop into the hardening vessel at successive intervals there is afforded to each of the articles alike an equal opportunity of becoming hardened, and as a result

15 they will have a uniform degree of hardness. To prevent oxidation of the heated articles, as well as cold air from entering the discharge end of the conduits, there is directed right into said conduits a forced flame of an auxiliary burner F, which serves the purpose of preventing premature cooling of the articles and of shutting out air from the conduits when and where the exit of the conduits and the bath underneath are relatively situated,

20 substantially as shown in the drawings. Oxidation of the articles could also be excluded by extending the lower terminals of the conduits below the surface of the hardening solution. From the foregoing it is obvious that

30 the conduits, as well as the hopper and feeding device, may be modified in number and in many other respects, to suit particular ar-

ticles, without departing from the nature of my invention.

What I claim, and desire to secure by Letters Patent, is—

1. A heating apparatus comprising a furnace, one or more tubes, and a feeding device, each of said tubes extending approximately in a rearward, downward and inclined forward direction in and through said furnace and the feeding device comprising a hopper arranged in open relation with a branch of said tube or tubes and a power-operated, reciprocating plunger guided in the extension thereof all constructed and arranged substantially as and for the purpose set forth.

2. A heating and hardening apparatus comprising a furnace, a plurality of tubes extending in and through said furnace substantially as shown, a hopper and a reciprocating plunger arranged in operative relation with the intake of each of said tubes, burners located adjacent the discharge-terminal of said tubes and a hardening-substance-containing tank arranged below said burners all constructed and arranged substantially as and for the purpose set forth.

In witness whereof I hereunto set my hand in presence of two subscribing witnesses.

LEON F. SCHULZE.

Witnesses:

BERNH. F. EIBLER,
ALFRED P. ELTEN.