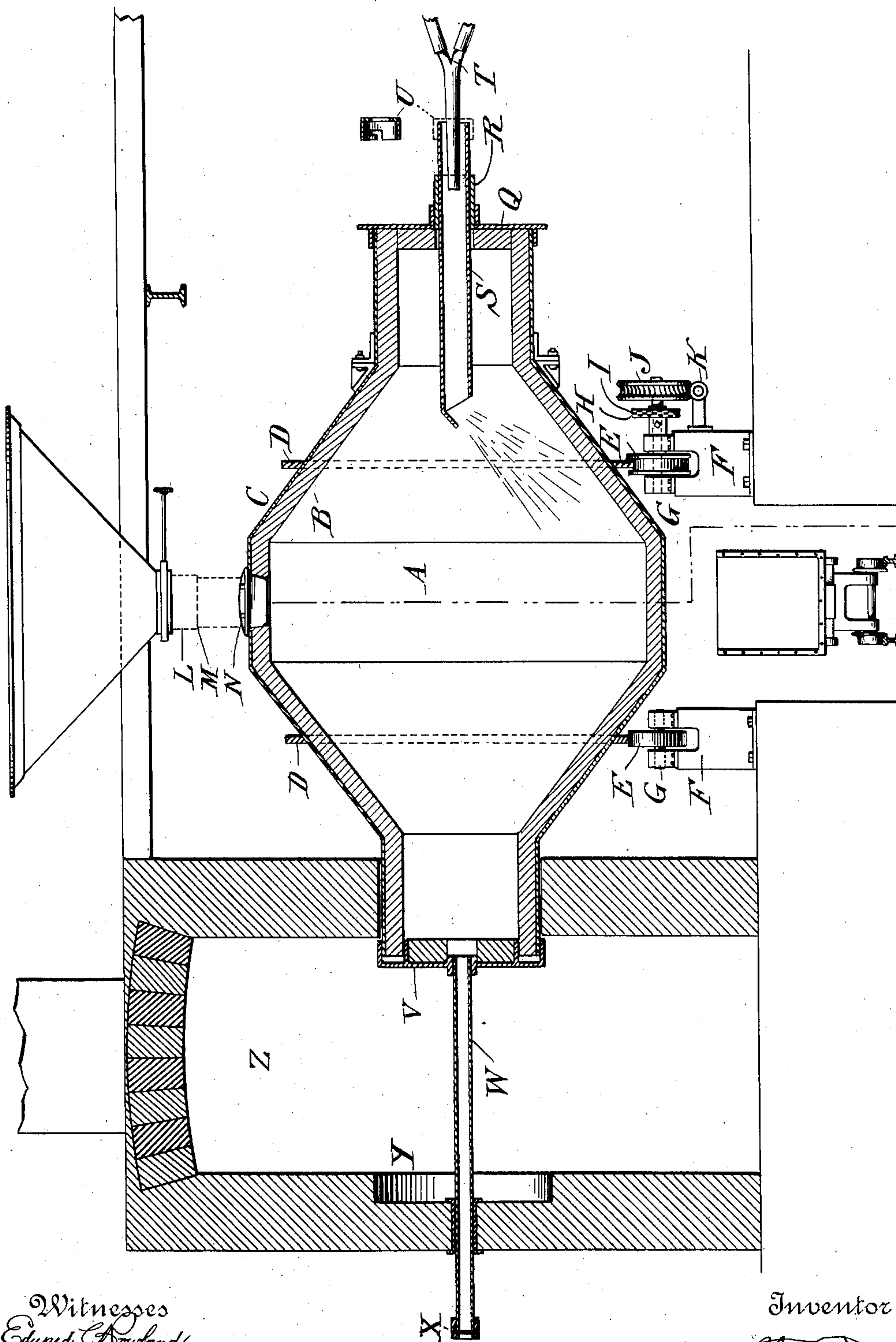


No. 829,575.

PATENTED AUG. 28, 1906.

O. B. DAWSON.  
METALLURGICAL PROCESS.  
APPLICATION FILED OCT. 25, 1905.



Witnesses  
Edward C. Rowland.  
Willard O. Dawson.

By

Attorney

Inventor  
O. B. Dawson



# UNITED STATES PATENT OFFICE.

OLIVER B. DAWSON, OF CALDWELL, NEW JERSEY.

## METALLURGICAL PROCESS.

No. 829,575.

Specification of Letters Patent.

Patented Aug. 28, 1906.

Application filed October 25, 1905. Serial No. 284,383.

To all whom it may concern:

Be it known that I, OLIVER B. DAWSON, a citizen of the United States, residing at Caldwell, in the county of Essex, State of New Jersey, have invented new and useful Improvements in Metallurgical Processes, of which the following is a specification.

This invention relates to the process of reducing mineral in ore to the metal without the use of flux and at a temperature below the temperature of fusion of said metal, the product of the act being metallic particles or masses of metallic particles called "sponge," according to the degree of mechanical division of the ore acted upon, excepting those metals which (like iron) form carbids when heated to incandescence with carbon at such temperature attainable in gas-fired furnaces.

To practically and commercially carry out my process, the mineral-bearing ore to be reduced is charged into a fire-brick-lined rotary furnace similar to the mechanism illustrated in the accompanying drawing, such apparatus being embraced in my pending application for patent, Serial No. 284,382, filed October 25, 1905, in which the figure is a vertical section of the entire machine and lower end and lower part of stack.

A shows in section the cavity or chamber of the fire-brick-lined steel shell C.

B shows refractory fire-brick lining.

C shows steel shell; D, a circular track; E, the wheels on which the circular track revolves; H, sprocket; I, sprocket-chain.

J shows worm gear-wheel; K, worm-shaft.

L shows telescopic tube of hopper; M M, lower end of same.

N shows charging-door of furnace; Q, tight cap of combustion end of furnace; R, removable sleeve for gas-mixing chamber; S, adjustable fuel-gas-mixing chamber; T, conical blow-pipe for fuel-gas and air under pressure; U, tight asbestos-lined cap for excluding oxygen; V, tight removable cap on flue-gas-chamber end for the purpose of emitting flue-gases and to prevent ingress of air or oxygen; W, hollow steel observation-tube; X, mica-covered cap.

Y shows recess for cap V; Z, dust-chamber in lower end of stack.

Having described a furnace that can be internally heated to the temperature of reduction, ground sulfid ores will be first desulfurized by the continuous application of an oxidizing-flame and a limited introduction of heated air-currents, all in direct contact with

the ore being acted on. Metallic oxids will be produced and are in this manner rendered more susceptible of reduction to the metallic state, combustion being now increased until we reach the critical temperature, approximately 1,400° Fahrenheit. The firing end of the furnace is now closed by withdrawing the blowpipe from the gas-mixing chamber and a tight-fitting cap lined with fibrous asbestos adjusted to the outer end of gas-mixing chamber and locked. The flue-chamber end is closed by a similar cap by use of the hollow observation steel tube extending back through the outer wall of the lower end of stack. The furnace is now rotated until the charging-door is directly beneath the ore-hopper. The charging-door being opened, a bag or charge of granular carbon, commonly called "coal," is passed in and the door quickly closed. The furnace is now rotated, and an intimate mixture of the metallic oxids and the carbonaceous reduction agent is produced, and the act of immediate reduction occurs, the product being carbon dioxid and metal particles or lumps.

The thermochemistry of the process is as follows: Given metallic oxids or carbonates in the presence of incandescent carbon, excluding oxygen, the mineral molecule will break up with the formation of carbon dioxid and metal. The carbon dioxid still in the presence of incandescent carbon will break up, giving half its oxygen to the incandescent carbon, with the formation of carbon monoxid plus carbon monoxid. With its demand for oxygen still unsatisfied, therefore a vigorous reducing agent, my process is applicable to the mineral-bearing ores whose temperature of decomposition is not above the temperature of decomposition of carbon dioxid and is especially useful for the reduction of the oxids, carbonates, and roasted sulfids of copper, silver, and gold ores of commerce.

I claim as my invention—

1. The herein-described process of immediate reduction of ores of metal which do not form carbids, consisting in subjecting the incandescent ores, at a temperature below the fusion or volatilizing point of the contained metal, to the reducing action of finely-divided carbon, and the nascent carbon monoxid produced at the instant of reduction of the by-product gas, carbon dioxid, in the absence of air and flux.

2. The process of immediate reduction of



ores of metals which do not combine with carbon to form carbids at the temperature of gas-fired furnaces, and the retention of the same in the metallic state, consisting in sub-  
5 jecting directly-heated ores at a temperature below the fusion or volatilizin point of the contained metals, while excluding atmosphere oxygen, to the reducing action of finely-divided incandescent carbon, and the in-

stantly-produced nascent carbon monoxid, in the absence of air and flux.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

OLIVER B. DAWSON.

Witnesses:

STEPHEN J. LINDSLEY,  
W. O. DAWSON.