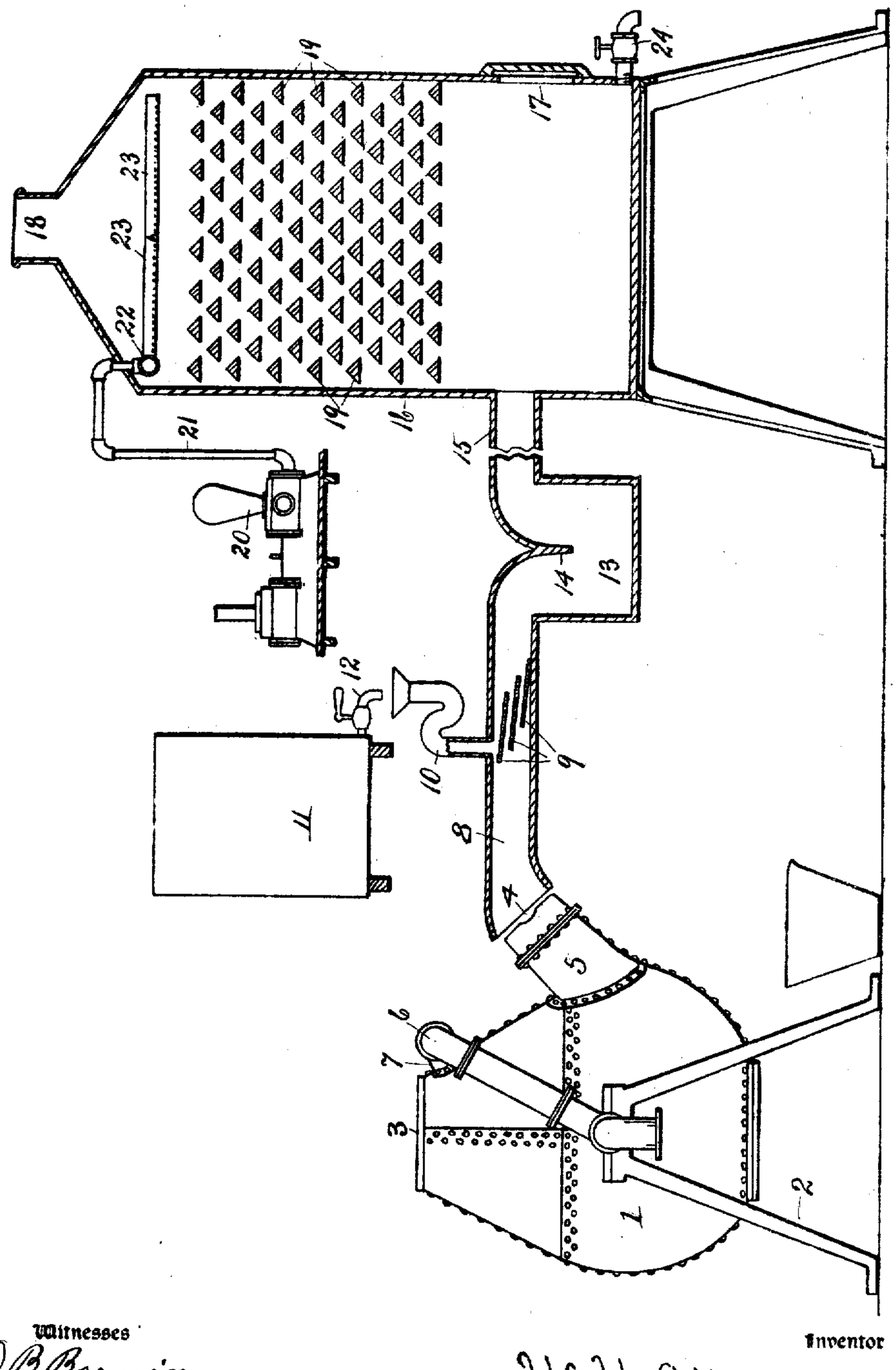
W. H. ALLEN.

PROCESS OF FORMING METAL SALTS.

APPLICATION FILED DEC. 9, 1907.

910,982. **Patented Jan. 26, 1909.**



Witnesses

O. B. Baenziger.

E. M. Brown.

Inventor

W. H. Allen

By Edward N. Pagelsen

Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM H. ALLEN, OF DETROIT, MICHIGAN.

PROCESS OF FORMING METAL SALTS.

No. 910,982. Specification of Letters Patent. Patented Jan. 26, 1909.

Application filed December 9, 1907. Serial No. 405,633.

To all whom it may concern:

Be it known that I, WILLIAM H. ALLEN, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have invented a new and Improved Process for Forming Metal Salts, of which the following is a specification.

My invention relates to the process and to means for recovering metal oxids, sulfates, sulfids and other salts and pure metal in a finely divided or gaseous state such as those which pass off with the gases from melting furnaces, wherein oil or gas is used for melting the metals.

The object of my improvement is to mingle the gases which carry the metal, metal oxids, and metal salts, often in the form of gases, with acid vapors, then reduce the temperature so as to permit the action of the acid upon the oxids, salts and finely divided metals so as to form salts of said metals and finally to separate the salts from the gases.

My invention consists in a process and in an apparatus in which the metal bearing gases mingle with a vapor of acid and become partially saturated with the acid vapors.

It further consists in a process and in means for causing a thorough mixing of the gases and the acid vapors.

It further consists in a process and in means for separating the resulting metal salts from the gases.

In metal melting furnaces of the Schwartz, Rockwell and similar types, the metals to be melted, consisting usually of copper, zinc, tin and lead are placed in the bottom of the furnace and a blast of burning gases is blown onto the surface of the metal. The result of this is that the upper surface of the metal becomes intensely heated, while the force of the blast causes a considerable circulation of the metal as soon as it becomes fluid. It also results in the volatilization and oxidation of a considerable percentage of metal. Where copper, tin, and zinc are melted together to form brass, gun-metal and bronze, under certain conditions this loss through vaporization and oxidation sometimes reaches ten per cent. While these metals escape with the burned gases and other products of combustion partly in the form of metal oxids, a portion escapes in the form of gaseous metal and another small portion may escape in the form of sulfates or sulfids.

The apparatus shown in the drawings is adapted to recover the oxids and the gaseous metal by reducing them to sulfates or chlorids and then separating them from the burned gases in a cooling chamber. At the same time the sulfids and sulfates which escape from the furnaces will also be separated from the burned gases.

In the drawings an oil burning Schwartz furnace is shown consisting of a receiver 1 mounted on frames 2, so it may swing to discharge the melted metal. The furnace is charged through a cover 3 and discharged through an opening 4 in the spout 5. The liquid or gaseous fuel is supplied through the pipe 6 and nozzles 7. The waste gases and other products of combustion escape through the opening 4 and have heretofore been lost. To recover these, the structure shown is eminently adapted. The gases passing from the aperture 4 enter the horizontal passage 8 which has mounted therein the perforated plates 9. Just above these baffle plates a curved pipe 10 connects to this passage, the upper end of which pipe is adapted to receive sulfuric acid or hydrochloric acid from the tank 11, the flow of the acid being regulated by the faucet 12.

As the gases which enter the passage 8 from the furnace 1 are of very high temperature, the baffle plates 9 will become very hot and the acid which falls on them from the pipe 10 will be immediately evaporated and mingle with the gases. To insure thorough mingling of the acid vapor and the gases, a chamber 13 is provided having a division wall 14 which insures an eddy and a thorough mingling. From this chamber the mixed gases and vapors pass through the passage 15 into the cooling chamber. The length of this passage will be determined by the temperature of the gases and also by the metals which are usually melted in the particular furnace. The passage should be so constructed as to permit the gases to cool below the point of dissociation, that is, to the point at which the acid radical will unite with the metal, so that the vapors of the acid will unite with the metal oxids after they have left the form of gases and have become solids in a minutely divided state. The acid vapor will also combine with the metals in the finely divided state after they have returned from the form of gas to that of solid matter.

While the apparatus illustrated is adapted for the recovery of metals from the waste gases from melting furnaces, it is also adapt-

ed, in connection with such furnaces, for the manufacture of sulfates, chlorids or other salts from the metals.

Sulfuric acid being the most satisfactory that can be used in this apparatus no other need be considered, although this invention is not limited to sulfuric acid alone. The vaporous sulfuric acid will unite with the oxids and form sulfates, setting free oxygen which unites with the hydrogen of the acid to form water vapor. These sulfates will be in the form of an impalpable powder and will be carried along with the gases into the chamber 16.

Chamber 16 is of such size that the blast of the burned gases through the passage 15 will create but very little movement therein. The result will be that a larger portion of the metal salts will settle to the bottom, from which they can be removed through the door 17. A large portion of the chamber is filled with parallel tiers of triangular bars as shown in the drawings, which serve to break up the current of gases entering through the passage 15 and escaping through the passage 18. The gases carrying the salts impinge against the lower flat sides of these triangular bars 19 depositing there a portion of the salts which fall down after sufficient quantities have collected. In place of the bars, any other well known filling may be employed.

A pump 20 having a discharge pipe 21 forces a stream of water or of diluted sulfuric acid into the main 22 from which extend the pipes 23, across the upper end of the chamber 16. The liquid escapes through the perforations in the bottom of the pipes 23 and rains down on the cross bars 19, being further broken by these cross bars and intercepting any solid matter carried by the gases entering through the passage 15. Any of the uncombined acid vapors which enter through the passage 15 will also be taken up by this liquid so that practically nothing but useless gases escape through the opening 18. The liquid may be drawn from the bottom of the chamber 16 through the faucet 24 and the metal salts removed through the door 17.

Having now explained my improvements, what I claim as my invention and desire to secure by Letters Patent is:—

1. The process of forming metal salts, which consists in mixing furnace gases carrying metallic fumes with an acid vapor, then reducing the temperature so that the acid vapor and metallic fumes will unite, and finally cooling the gases with a spray of water until the solids are separated from the fixed gases.

2. The process of forming metal sulfates which consists in mixing smelting furnace gases carrying metallic fumes with vaporized sulfuric acid and then reducing the temperature to that at which union of the acid radical and the metallic fumes will take place.

3. The process of forming metal salts consisting in mixing smelting furnace gases carrying metallic fumes with acid vapors at a temperature above that of combination and then reducing the temperature below that of dissociation.

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

WILLIAM H. ALLEN.

Witnesses:
EDWARD N. PAGELSEN,
ELIZABETH M. BROWN.