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K. GOLDSCHMIDT & J. WEBER.

METHOD OF DETINNING.

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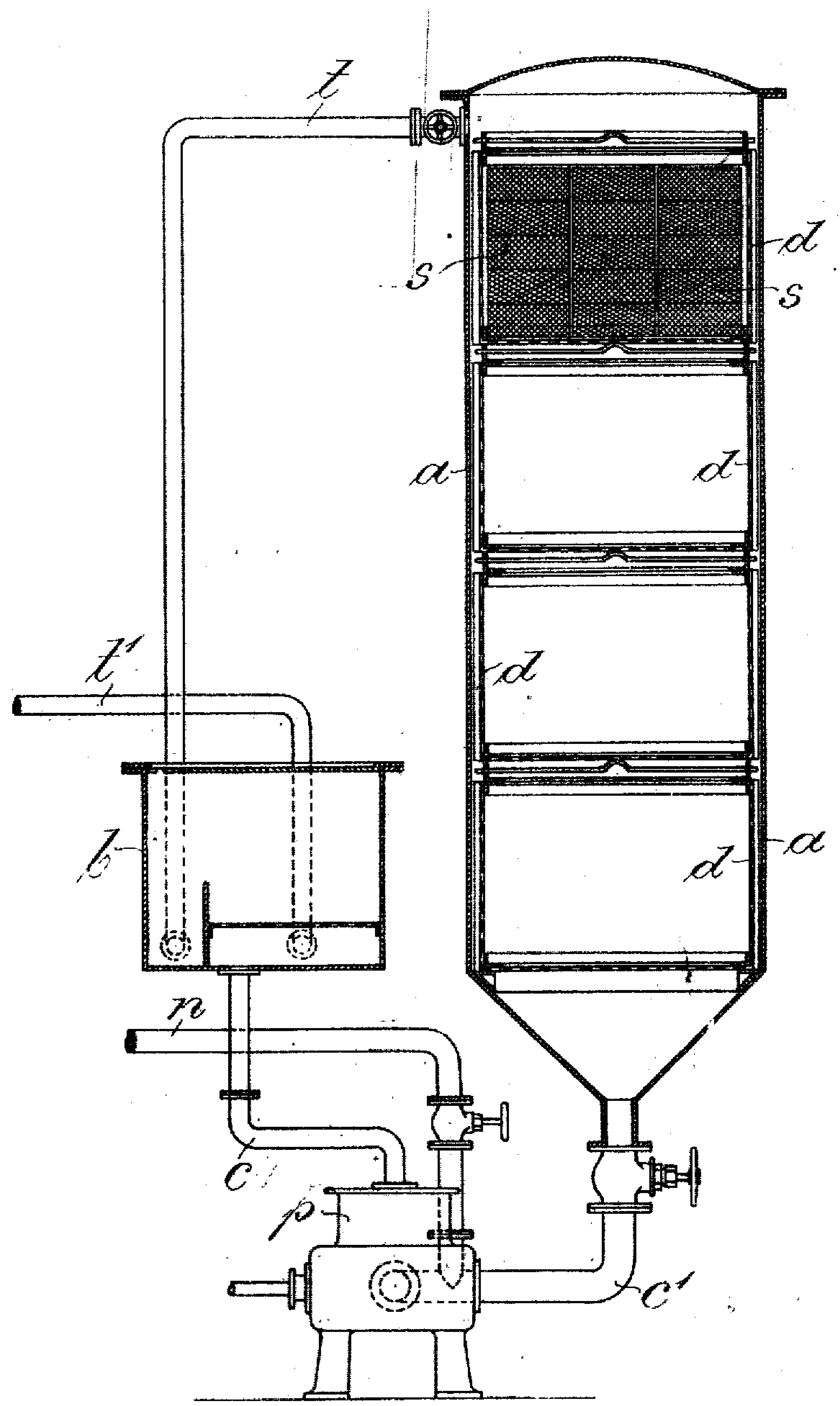

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UNITED STATES PATENT OFFICE.

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METHOD OF DETINNING.

No. 822,115. Specification of Letters Patent. Patented May 29, 1906.

Application filed June 29, 1905. Serial No. 267,680.

To all whom it may concern:

Be it known that we, KARL GOLDSCHMIDT and JOSEF WEBER, both subjects of the King of Prussia, German Emperor, and residents of Essen-on-the-Ruhr, in the Province of the Rhine, German Empire, have jointly invented certain new and useful Improvements in the Method of Detinning, of which the following is an exact specification.

Our invention consists in subjecting the tin scraps in a compressed state to the action of chlorin in combination with an anhydrous fluid in which the chlorin gas may be in a dissolved state. By the term "inert anhydrous fluid" in the description and the following claims we mean an anhydrous fluid which does not attack the scrap or chlorin or the products thereof during the process of detinning. Tetrachlorid of tin may be used as such an anhydrous fluid; but it is possible to employ another anhydrous fluid in which the chlorin gas is finely distributed.

A chief point of our invention is to submit the tin scraps in a firmly-compressed state to the action of the mixture of an anhydrous fluid containing or having dissolved chlorin gas. Now by experiments it has been found out that the reaction of the chlorin takes place even in the narrowest and firmly-closed spaces between the compressed tin scraps, so that even on those surfaces of the tin scraps a sufficient action and detinning can take place.

It is of importance to avoid in the process high temperatures in the mass of the tin scraps and to use the tin scraps in a well-dried state. By this process we get the iron waste perfectly detinned and with a fine smooth gray surface.

The apparatus used in this process is illustrated in the accompanying drawing in a vertical cross-section.

The receptacle for the compressed tin scraps is marked *a* and is of course made of a material which is not affected by chlorin gas or anhydrous chlorid of tin. Preferably an iron vessel is used. The tin scraps are mechanically compressed, so that they form bundles *s*, and the receptacle *a* is filled with these compressed bundles *s* of tin scraps. The bundles are compressed, preferably, in such a size that they can afterward be directly used in steel works. These bundles may conveniently be, for instance, forty centimeters to sixty centimeters in width and length and eight to fourteen centimeters in height, so that they have a weight from about fifty to sixty kilograms. In order to facilitate the filling of the vessel the packets are brought in baskets *d*, and these baskets filled with the bundles of compressed tin scraps are then introduced into the vessel.

After the apparatus *a* has been filled with the bundles of tin scraps an anhydrous fluid—for example, fluid chlorid of tin—is brought into the apparatus. Then chlorin gas is admitted to the fluid chlorid of tin and is dissolved in it. As soon as the dissolved chlorin gas comes in contact with the surfaces of the tin scraps fluid chlorid of tin is formed, and new chlorin gas must be admitted to the receptacle, which is first dissolved in the chlorid of tin and then is brought in reaction with the tin scrap. After the detinning has been finished the chlorid of tin is drawn out of the receptacle, and the detinned scraps may be washed after the last particles of chlorid of tin and of chlorin gas have been removed out of the receptacle.

In the practice the process goes on as follows: At first we fill the receptacle with compressed and well-dried bundles of tin scraps, and then we introduce from above into the receptacle a certain quantity of fluid chlorid of tin through the pipe *t*, in which chlorin gas is dissolved. The chlorin gas enters the receptacle *b* through the pipe *t'*, and the chlorid of tin comes into the receptacle *b* through the pipes *n* and *c*. The fluid chlorid of tin comes in contact with the surfaces of the tin scraps, and the chlorin dissolved in the fluid chlorid of tin acts upon the tin of the tin scraps and chlorid of tin is formed. The fluid chlorid of tin flows down, and new fluid chlorid of tin, in which chlorin gas is dissolved, is led from above into the receptacle. The fluid chlorid of tin is gathered at the bottom of the receptacle and is lifted by a pump *p* through the tubes *c* and *c'* into the receptacle *b*, into which by the tube *t'* chlorin gas is led, so that chlorin is dissolved in the fluid chlorid of tin. This fluid chlorid of tin, in which chlorin gas is dissolved, is brought anew through the tube *t* from above into the receptacle *a*, and the reaction of the chlorin begins anew. The process may be altered in that manner that at first the receptacle *a* is perfectly filled with fluid chlorid of tin or that at first a certain quantity of chlorin gas is admitted into the receptacle; but the chief point is always to use during the process the reaction of an anhydrous fluid in combination with chlorin on the compressed bundles of the tin scraps alone or in combination with chlorin gas.

Another point in this process is of importance—that is, to alter the pressure in the closed vessel during the process. By altering the pressure it is possible to secure a complete and quick reaction even between the most closely-packed surfaces of the tin scraps, and it is of advantage to guide the process in such manner that the pressure in the vessel is so augmented that at the end of the operation the overpressure is, for instance, one atmosphere above the ordinary pressure.

If in the beginning of the process the reacting agents come in close contact with the surfaces of the bundles of the tin scraps, the reacting agent when passing over the firmly-compressed bundles will naturally be eagerly taken up by the tin on account of its great affinity for the chlorin; but as soon as the chief action of the chlorin has taken place at the easily-accessible parts of the tin scraps the reaction will slow down, so the parts of the tin scraps which are firmly compressed and whose surfaces are in closest contact with one another might easily remain unaffected; but by altering the pressure or by increasing the same the reacting agent is driven into the narrowest channels or interstices of the tin scraps, so that the whole surfaces are detinned.

It is easily to be seen that the altering or increasing of the pressure in the vessel is of great importance for finishing the detinning process completely and in a short time. Instead of increasing the pressure in the vessel it is possible to diminish the same and then to increase it again.

It is important to avoid a great increase of temperature during the process. For this purpose the anhydrous fluid is of value, for it may be the bearer of a small quantity of reacting agents, and the produced heat is transferred and distributed over the whole fluid.

It is of great importance to use the tin scraps in a strongly-compressed state, which can, of course, be effected by a pressing operation or by blows. Then it is possible to pack the tin scraps in strong bundles of fifty to sixty kilograms, for instance, into baskets or crates, so that the vessel in which the process is carried out contains several tons of tin scraps. Thereby the cost of labor, which is an essential factor in all such processes, is greatly reduced.

The stronger the tin scraps have been compressed the stronger must be the change in pressure, because only under this varied pressure the reacting medium will easily enter the narrowest interstices or channels and change the tin quickly and completely into tetrachlorid of tin. As already said, the pressure may be decreased or increased in the process; but always a varying of the pressure must take place.

By the term "inert gas" used in the description and in the following claims we mean a gas which does not attack the scrap or chlorin or the products thereof during the process of detinning.

Having thus fully described the nature of our invention, what we desire to secure by Letters Patent of the United States is—

1. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel, with an inert anhydrous fluid, in combination with an inert gas and with chlorin gas.

2. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid containing chlorin, in combination with an inert gas.

3. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved in combination with an inert gas.

4. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved and with chlorin gas, in combination with an inert gas.

5. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid and with chlorin gas and altering the pressure in the vessel during the detinning.

6. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid containing chlorin and altering the pressure in the vessel during the detinning.

7. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved and altering the pressure in the vessel during the detinning.

8. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved and with chlorin gas and altering the pressure in the vessel during the detinning.

9. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert

anhydrous fluid and with chlorin gas and increasing the pressure in the vessel during the detinning.

10. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid containing chlorin and increasing the pressure in the vessel during the detinning.

11. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved and increasing the pressure in the vessel during the detinning.

12. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved and with chlorin gas and increasing the pressure in the vessel during the detinning.

13. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid and with chlorin gas, increasing the pressure in the vessel during the process and then diminishing the same.

14. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid containing chlorin, increasing the pressure in the vessel during the process and then diminishing the same.

15. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid, in which chlorin gas is dissolved, increasing the pressure in the vessel during the process and then diminishing the same.

16. Process of detinning, which consists in compressing loose tin-scrap, and treating said compressed scrap in a vessel with an inert anhydrous fluid in which chlorin gas is dissolved and with chlorin gas, increasing the pressure in the vessel during the process and then diminishing the same.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

KARL GOLDSCHMIDT.
JOSEF WEBER.

Witnesses:
WILLIAM ESSENWEIN,
H. SCHUCHARDT.