UNITED STATES PATENT OFFICE.

WILLIAM W. HARDING, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN RESTORINC AND RECOVERING ALKALINE WASTES.

Specification forming part of Letters Patent No. **191,759**, dated June 12, 1877; application filed October 16, 1876.

To all whom it may concern:

Be it known that I, WILLIAM W. HARDING, of the city of Philadelphia, in the county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in the Process of Recovering and Restoring Alkaline Wastes used in Manufacturing of Paper and Paper-Pulp; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to recover the alkali that has been used in reducing rags, jute, straw, wood, and other paper-stock. This object is important for two reasons, viz: First, a large part of the alkali is recovered, so as to be used again, thus diminishing the expense of preparing pulp for paper; and, second, the running of the waste alkali into the stream is prevented. In large paper-works the amount of alkaline liquor is so great as to create a public nuisance by its discharge into the stream.

Heretofore various plans have been devised for recovering this alkali. These consist essentially in evaporating the waste liquor in pans such as used in producing salt from brines and in evaporating sirups and extracts. When evaporated by these plans the result is a dense, thick mass, composed of the alkali and the vegetable matter removed from the paper stock. To obtain the alkali it is necessary to burn out the vegetable matter. As it is mixed with the alkali in the mass it is very difficult to burn, since the coating of the alkali upon the vegetable matter prevents free access of air, and therefore prevents combustion even when raised to a high temperature. This difficulty is overcome by my invention, which consists in evaporating the waste alkaline liquor spread in a thin film upon a heated metallic surface, and removed by scrapers as fast as it is formed into a paste or solid state, which has to be subsequently burned down to a dry state in a suitable furnace.

The following description will enable others to make and use my invention:

I provide a hollow cylinder or drum, which may be regularly heated on the inside, so as to keep the outer surface at a high temperature. The heating may be conveniently done by suspending a fire-box within the revolving drum, or the flame and heated product of combustion may be made to pass inside of the drum from one end and out the other, as in the well-known revolving furnaces used for heating ores and metals; or even heated air or steam and superheated steam may be employed for the purpose; but I prefer a metallic drum heated by a suspended fire-box or by passing the flame and products of combustion in at one end and out at the other. Apparatus of these kinds being well known and in common use, need not further be described.

The evaporation on the surface of the heated cylinder may be much expedited by passing a current of heated air over and round the exterior of the cylinder. The heated air may be derived from the products of combustion of the fire inside the cylinder or from any other convenient source. The heated air and gases may be directed round the cylinder by a suitable hood or covering, by means of an ordinary chimney-draft; or they may be sucked from the fire and forced round the cylinder, by means of a fan or other similar mechanical device. On the outside of the drum I place a scraper or very stiff brush, so as to rub the surface and remove any adhering matters as the cylinder or drum revolves. Any number of these drums or cylinders may be employed. With such an apparatus, to reduce the alkali to a dry condition, the liquor, as it comes from the digesters or washers, is run in a fine stream or sprayed upon the heated surface revolving, or into a vessel into which the lower part of the cylinder dips during its revolution.

By having the cylinder revolve at the proper speed and at a high temperature, all the water will be driven off in the form of vapor or steam, and a thin paste of alkali mixed with vegetable matter from the pulp will be left adhering to the cylinder. As the cylinder revolves against the scraper or scrapers, this paste will be scraped off. By keeping the cylinder at nearly or quite a red heat the vegetable matter will be partially charred and left in porous condition, so that it will readily burn when placed upon the hearth subjected to the flame of an ordinary reverberatory fur-

nace. After being burned the alkali is extracted by lixiviation, in the ordinary way.

A flat or revolving surface, heated from below, might be used according to the principle of my invention, if the liquor were sprinkled or sprayed upon the surface and then scraped off as fast as dried; but the revolving drum or cylinder with steam or fire-heat inside I regard as the best plan.

I do not claim recovering alkalies from the waste liquor of paper stock by evaporating in pans so as to form a mass and then burning out the vegetable matters.

I do not broadly claim the evaporation of saline liquors by showering or flowing the same upon heated cylinders, pans, or plates; nor do I claim, broadly, the incineration of residuums of evaporated alkaline solutions, so as to remove vegetable matters; but

What I do claim is—

The process herein described for recovering alkali from the waste liquor used in disintegrating paper-stock, in reducing it first to a dry porous or flocculent substance, by exposing the liquid in thin layers to the action of heated cylinders or plates and scraping or brushing and then incinerating the porous mass in the hearth of a reverberating furnace, all substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

WILLIAM W. HARDING.

Witnesses:
JOHN G. FORD,
AUG. B. RITTER.