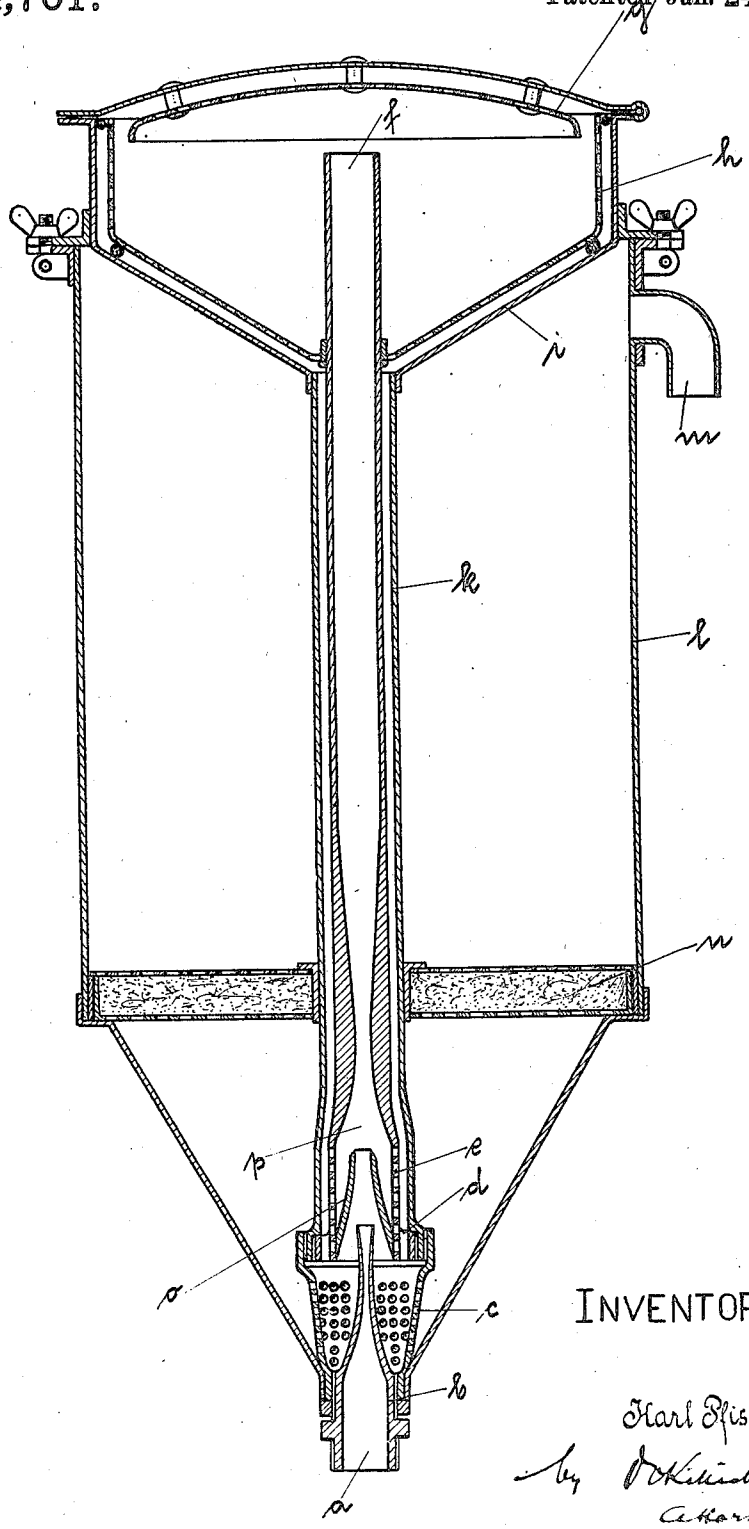
K. PFISTERER.

MIXING APPARATUS.

APPLICATION FILED OCT. 29, 1920.

1,404,701. Patented Jan. 24, 1922.



INVENTOR:

Karl Pfisterer.

by O. Kirchhain

Attorney

UNITED STATES PATENT OFFICE.

KARL PFISTERER, OF ZUFFENHAUSEN, GERMANY.

MIXING APPARATUS.

1,404,701. Specification of Letters Patent. Patented Jan. 24, 1922.

Application filed October 29, 1920. Serial No. 420,547.

To all whom it may concern:

Be it known that I, KARL PFISTERER, a citizen of the German Republic, residing at Zuffenhausen, Germany, have invented certain new and useful Improvements in Mixing Apparatus, for which I have filed application in Germany, Oct. 18, 1919, of which the following is a specification.

The apparatus which are used at present for intimate mixing and for the production of uniform saturated clear solutions of pulverized, coarse, or finely grained chemicals in liquids, as for example for the production of saturated clear lime water for the purification of feed water for boilers, require very large receptacles if a uniform action shall be obtained.

My invention relates to a mixing and saturating apparatus which, in consequence of its novel construction and of its novel way of working, requires much less space, e. g., only one-sixth of the space required hitherto for an apparatus of the same efficiency and which further possesses the advantage that the solid substances are dissolved or suspended as completely as possible in the liquid.

This I obtain essentially through the novel application of a jet pump with a mixing nozzle which, being supplied with the mixing or dissolving liquid, feeds this liquid to the sieve box which contains the substances to be dissolved or to be suspended, the particles descending in the mixing space being continuously driven up again until they are distributed in the liquid so finely that the dissolved particles are no longer influenced by the action of the jet pump and flow out through lateral outlets of the jet pump or of the mixing space into a clearing vessel which is constructed so that those particles which settle in the same are once more subjected to the action of the jet pump.

In the accompanying drawing a device embodying my invention is shown by way of example, the apparatus being represented in a vertical axial section.

The jet of liquid which is under a pressure slightly above atmospheric, enters at *a* into a jet nozzle *b* whose suction space is surrounded by a perforated wall *c*. A jet *o* is placed above the nozzle *b*; it terminates in the mixing nozzle *p* which is mounted coaxially in a vertical circulating tube *k* and extends with its upper end *f* into the proximity of a distribution sieve.

The part of the nozzle *p* which surrounds the jet pump *o* has perforations *e*. Borings *d* serve for establishing a communication between the tube *k* and the space between the nozzle *b* and sleeve *c*.

A sieve box *h*, designed to serve as a receptacle for the substances to be dissolved, is arranged around the upper end of the mixing nozzle and located in a vessel *i* mounted on the upper end of the circulating tube *k*.

All the parts described are mounted coaxially in a clearing vessel *l* whose bottom is conical and narrower towards the perforated sleeve *c* which it surrounds. The outflow *m* of the clearing vessel is arranged as close to the upper end as possible.

The operation of this apparatus is as follows:—

The jet of liquid entering at *a* passing through the pump *o* and nozzle *p*, at a pressure slightly above atmospheric, strikes against the distributing sieve *g* when coming out of the orifice *f* of the mixing nozzle so that it loses its velocity and its direction of movement almost instantaneously. The liquid is thus distributed over the sieve and divided into drops which trickle uniformly over the entire cross section of the sieve box *h*. In consequence of the breaking up of the liquid into small drops which filter through the substances enclosed in the sieve box *h* a very rapid dissolution or intimate mixing is obtained. The solution flows between the wall of the sieve box *h* and the funnel *i* through the tube *k* to the lower part of the jet pump. Owing to the enlargement of the tube *k* at its lower end the solution is conducted over the outer wall of the nozzle which has perforations *e* so that it enters into the suction space of the nozzle *o* where the suspended coarse particles are almost completely separated from the liquid and returned to the liquid jet. The remainder of the solution flows through the borings *d* into the suction space of the nozzle *b* in which the remaining suspended particles are separated from the solution. The particles which have been sucked off by the nozzle *b* are brought back to the sieve box *h* by means of the jet of liquid.

The solution diffuses through the perforated wall slowly from the lowest suction space and rises in the outer vessel *i* passing through a filter *n* which is arranged so that it can be easily exchanged, and flows off through the outflow pipe *m* as an abso-

lutely clear, saturated solution or as a most intimate mixture.

A special remarkable feature of the improved apparatus is the absolute separation of the intense movement in the spaces which serve for mixing and distributing from the clearing or settling space in which the effect of the jet apparatus makes itself felt only in a favorable manner, that is to say in assisting the settling, a further remarkable feature being that accumulation of mud in the clearing vessel is absolutely avoided.

As shown in the drawing the distributing sieve *g* is preferably fixed to the lid of the apparatus, and the sieve box *h* is arranged so that it can be easily removed.

I claim:—

1. In a device of the kind described in combination, a central jet pump and mixing nozzle, a circulating tube surrounding said nozzle with a clearance, a vessel surrounding said circulating tube and communication between said jet pump and the lower end of said circulating tube and between said tube and said vessel.

2. In a device of the kind described in combination, two superposed vessels, a circulating tube connecting an opening in the bottom of the lower vessel with an opening in the bottom of the upper vessel, a jet nozzle in the bottom end of said circulating tube, a jet pump and tubular mixing nozzle above said jet nozzle, said mixing nozzle extending through and beyond said circulating tube into the said upper vessel and communication between said jet pump and said lower vessel.

3. In a device of the kind described in combination, two superposed vessels, a circulating tube connecting an opening in the bottom of the lower vessel with an opening in the bottom of the upper vessel, a jet nozzle in the bottom end of said circulating tube, a jet pump and tubular mixing nozzle above said jet nozzle, said mixing nozzle extending through and beyond said circulating tube into the said upper vessel, communication between said jet pump and said lower vessel and a filter partition within said lower vessel above said communication.

4. In a device of the kind described in combination, two superposed vessels, a circulating tube connecting an opening in the bottom of the lower vessel with an opening in the bottom of the upper vessel, a jet nozzle in the bottom end of said circulating tube, a jet pump and tubular mixing nozzle above said jet nozzle, said mixing nozzle extending through and beyond said circulating tube into the said upper vessel, communication between said jet pump and said lower vessel and a distributing disc above the upper end of said circulating tube.

In testimony whereof I affix my signature in presence of two witnesses.

KARL PFISTERER.

Witnesses:
WILHELM WINTER,
EMILIE DEYLE.