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APPARATUS FOR RECOVERING SOLVENTS.

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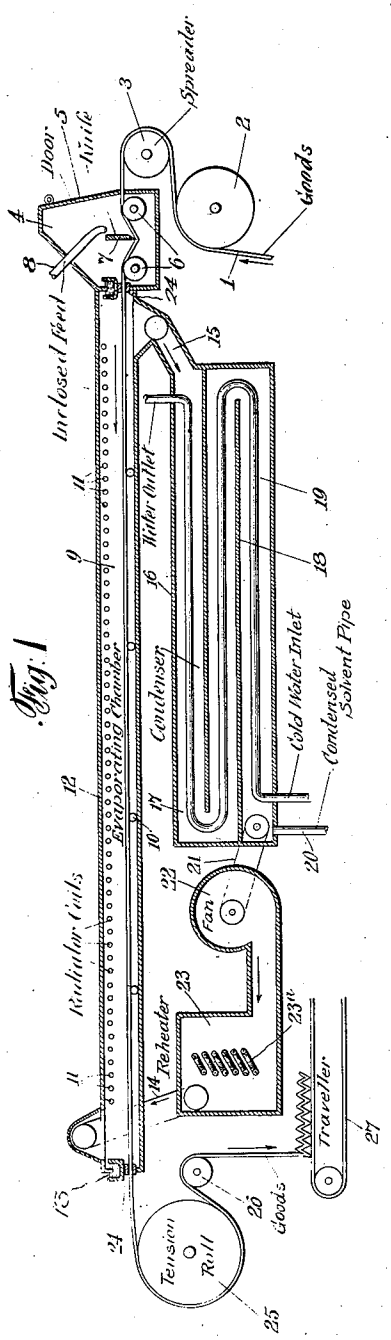


Fig. 1.

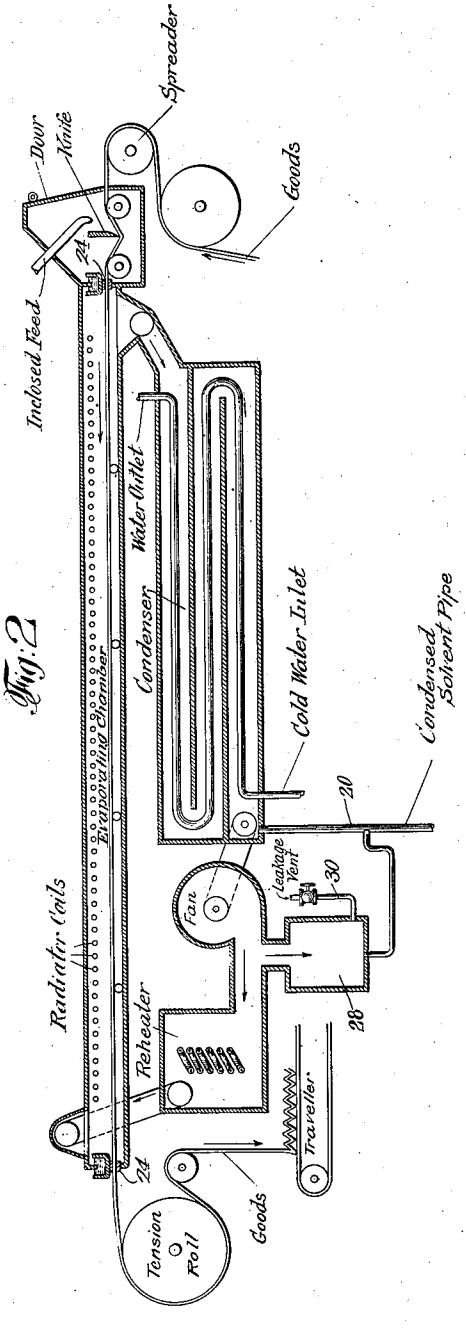


Fig. 2.

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APPARATUS FOR RECOVERING SOLVENTS.

1,228,225. Specification of Letters Patent. Patented May 29, 1917.

Application filed October 16, 1912. Serial No. 726,016.

To all whom it may concern:

Be it known that I, JAMES LYNAH, of Newburgh, in the county of Orange and in the State of New York, have invented a certain new and useful Improvement in Apparatus for Recovering Solvents, and do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates particularly to a method and means for recovering solvents used in coating compositions, although it may be adapted to use in any other connection where it is desired to recover solvents. My invention is particularly applicable to the recovery of solvents from coatings of paper or textile fabrics containing india rubber, pyroxylin, oils, paints or varnishes, and employing volatile solvents such as benzol, alcohol, ether, acetone or turpentine.

The object of my invention is to provide a process and apparatus for carrying out the same, in which a very large percentage of the solvent utilized may be recovered in the drying operation; in which the drying operation is effected with the greatest degree of rapidity; and in which the danger of serious explosions is minimized. A further object of my invention is to enable the coating operations to be carried out with the smallest possible amount of labor and with the greatest degree of uniformity of result. Further objects of my invention are to provide an apparatus of the kind described, which is constructed with a closed chamber in which the coating is applied to the surface operated upon in a closed, vapor-tight chamber; to effectively spread the materials in said chamber; to maintain the surface operated upon taut so as to avoid wrinkles; to prevent the escape of vapors at the point where the flexible material for receiving the coating enters and leaves the apparatus; and to provide a cover which is loosely supported upon the top of the apparatus to avoid damage in case of an explosion.

As illustrative forms of apparatus which may be used for carrying out my process, I have shown two different forms of apparatus in the accompanying drawings, in which—

Figure 1 represents a side elevation of one form of apparatus which may be used for carrying out my process, the apparatus being shown somewhat diagrammatically; and

Fig. 2 is a similar view of another form of apparatus which may be used for the same purpose, this apparatus being also shown somewhat diagrammatically.

In Fig. 1, I show a continuous strip of paper or textile fabric 1 which is conducted over a supporting roller 2, and thence around a spreading roller 3 which may be constructed in any desired manner to move the two free ends of the cloth laterally to remove the wrinkles from the same. From this point the web of material to be coated passes through a slot into a chamber 4 having at its front, immediately above the web 1, a door 5. Within the chamber 4 the web is supported upon a pair of idler rollers 6 and between these rollers a knife 7 is provided for spreading out upon the surface of the goods in a uniform layer a coating of any desired composition containing a volatile solvent, such as pyroxylin dissolved in a mixture of solvents, for example, benzol, alcohol, etc., led into the chamber in front of the knife by means of a feed pipe 8. The chamber 4 is so constructed that all of the joints are as tight as possible to prevent the escape of the vaporized solvent. From the chamber 4 the web, together with the solvent vapors which accumulate in the chamber 4, pass into a long, flat metal-lined evaporating chamber 9, having a plurality of idler rollers 10 to support the traveling web. Immediately above the traveling web there is a series of radiator coils 11 which is adapted to receive a current of hot water or steam at the end farthest removed from the point of entry of the web to be coated and adapted to discharge the same at the other end of the chamber. By this means the coated web will be gradually dried by being subjected to an increased temperature until it leaves the evaporating chamber. A cover 12 is located over the evaporating chamber, said cover being arranged in the form of a bell having its edges supported in a liquid seal 13 filled with castor oil or other liquid, surrounding the top of the evaporating chamber. The presence of a cover of this kind permits the cover to yield upwardly in case of an explosion, and normally prevents the escape of any volatile solvent. In order to

facilitate the drying, a current of air is continuously circulated through the evaporating chamber, the air being led into the same at the end from which the traveling web is discharged, by means of a pipe 14, and being discharged from the same at the other end by means of a pipe 15. The mixed air and evaporated solvent which are conducted from the evaporating chamber through the pipe 15 are led into a condenser 16 formed with a circuitous passageway 17 by the presence of a plurality of oppositely directed baffle plates 18. A cooling coil 19 adapted to be fed with cold water or other cooling agent, is situated in the passageway 17. The solvent which is condensed in the condenser 16 is conducted away through a discharge pipe 20 to any suitable receptacle. From the condenser 16 the air and any residual, uncondensed vapor are led by means of a pipe 21 to a rotary fan 22 which again returns the same to the evaporating chamber through a reheater 23 containing heating coils 23^a, and the pipe 14, which is connected to the reheater. In leaving the evaporating chamber, the coated web is drawn through a pair of felt strips 24 by means of a tension roller 25 over which the web is conducted, and from this point the web passes over an idler roller 26 to the surface of a horizontal belt conveyer 27, where the coating is allowed to harden before the web is finally wound into rolls. The presence of the felt strips 24 effectually prevents any vapors from being dragged out of the evaporating chamber by the traveling web.

In Fig. 2, I have shown a type of apparatus which is constructed exactly the same as that shown in Fig. 1, except that between the fan 22 and the reheater 23, there is located a trap 28 to receive any solvent which is condensed between the fan and the reheater, this trap 8 being connected by a pipe 29 with the discharge pipe 20, and near the bottom of the trap 28 there is located an upwardly directed vent pipe 30 to admit air and allow any accumulated solvent to be discharged from the trap when desired through the branch 29 of the pipe 30.

In carrying out my process, the traveling web of paper or textile fabric is fed into a coating chamber in which it is provided with a uniform coating of the desired composition containing solvent. This chamber is so arranged that the escape of any of the solvent vapors is prevented as far as possible. This is brought about by the fact that the coating composition is led into the chamber by means of a pipe, and the use of the spreader obviates the necessity of frequent access to the chamber to remove wrinkles. The vapors which accumulate in the chamber 4 are ultimately dragged into the evaporating chamber 9 through the traveling web 1, whence they are withdrawn and condensed. As the traveling web passes from this chamber it is received by the evaporating chamber which is arranged with the heating and drying coils above the same to avoid any drippings which might be explosive in nature, from falling upon the coils from the coated web. The heating coils heat the traveling web principally by radiant heat, the heat being applied in this manner directly to the surface to be dried. This chamber is, furthermore, so arranged that the danger of explosion is minimized as the size of the chamber is made as small as possible to reduce the amount of solvent vapor contained therein, and as the cover is made so that it may be readily elevated in case of an explosion to relieve the pressure within the evaporating chamber. The presence of this particular type of cover also enables the heating devices on the interior, which are located above the surface of the coated web to be more readily accessible. The coated web is rapidly dried in the evaporating chamber owing to the fact that the coils 11 radiate directly against the surface to be dried, and do not have to pass through the lower, uncoated side of the web. Furthermore, the rapid circulation of the air through the evaporating chamber enables the evaporation and drying to be effected as rapidly as is consistent with the production of a uniform smooth surface. At the same time, the solvent which is taken up by the circulating current of air is quickly condensed in the condenser 16, and is led away to any convenient condenser where it may be recovered and used again in preparing the coating composition. The air and uncondensed vapors which pass through the condenser are again used by being passed through the reheater and into the evaporating chamber, the loss of any uncondensed solvent vapors being thus entirely obviated. It sometimes happens that a small percentage of the uncondensed vapor becomes condensed and accumulates between the fan and the reheater prior to the reëntry of the current of air into the evaporating chamber, and if desired, the process may be operated with an apparatus such as that shown in Fig. 2 in order to collect the solvent thus condensed between the fan and the reheater, and the solvent condensed in this manner may be conducted to the discharge pipe which leads from the condenser. The apparatus shown in this figure is also arranged so that atmospheric pressure may be admitted between the fan and the reheater in order to permit any accumulated solvent to be discharged.

While I have shown and described above only certain forms of the process and apparatus which may be used for the carrying out of the same, I wish it to be understood

that many changes may be made therein without departing from the fundamental principles thereof.

I claim:

1. In a device of the character described, an evaporating chamber, means for supporting a coated web in the same, a vapor-tight cover loosely supported over the same and an air pipe connected to said cover.

2. In a device of the character described, an evaporating chamber, means for supporting a coated web in the same, and a vapor-tight cover loosely supported over the same in a castor oil seal.

3. In a device of the character described, a feeding chamber for a coating material, an evaporating chamber, means for supporting a coated web in the same, and a vapor-tight cover loosely supported over the feeding and evaporating chambers.

4. In a device of the character described, a feeding chamber for a coating material, an evaporating chamber, means for supporting a coated web in the same, and a vapor-tight cover loosely supported over the feeding and evaporating chambers in a liquid seal.

5. In a device of the character described, a feeding chamber for a coating material, an evaporating chamber, means for supporting a coated web in the same, and a vapor-tight cover loosely supported over the feeding and evaporating chambers located at the outer edge of the cover, and also between the feeding chamber and the evaporating chamber.

In testimony that I claim the foregoing I have hereunto set my hand.

JAMES LYNAH.

Witnesses:
W. R. GALT,
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