

COLLODIO-CHLORIDE EMULSION FOR TRANSPARENCIES.

FROM the very earliest days of the colloidio-chloride process it has been the custom to speak of it as an admirable method of making transparencies, and yet how seldom do we see any results produced in this manner. The ordinary print-out emulsion is now referred to, as, if an emulsion for development be required, one of silver bromide is infinitely to be preferred.

The reason why colloidio-chloride transparencies are so seldom met with is, no doubt, to be found in the fact that the emulsion as usually compounded is anything but suited to use on glass or to the formation of a smooth, structureless film when viewed by transmitted light. In the first place, the large amount of crystalline matter it contains is against its drying evenly on the non-absorptive glass surface, or, if it be dried with a semblance of evenness, retaining that evenness for very long, owing to the tendency of the different salts it contains, some to crystallize, some to deliquesce, and all to interfere materially with the smoothness of the film. Add to this that the excess of acid, sometimes unnecessarily large, used for the double purpose of giving vigor to the image and keeping qualities to the emulsion, exercises a specially injurious action on the collodion, rendering it thick and viscid, with a tendency to flow in ridges, and to dry in much the same state in two painfully visible crapy lines.

Another point that may perhaps have some bearing on the matter, though it does not directly affect the quality of result, is the character of the chloride used in making the emulsion. On account of their easy solubility in alcohol, and for other reasons, certain chlorides, such as those of calcium, barium and zinc, are often used, and these, although they may not at once confer any bad qualities on the emulsion, will sooner or later cause it to clot together and lose its fluency and eventually become solid. Unless, therefore, a quantity of emulsion is to be used up at once, the greater part of it becomes useless, which is naturally not a recommendation in favor of the process.

In making an emulsion, therefore, specially for transparency purposes, we should endeavor to steer clear of these difficulties, and, in fact, in every way work in the direction of a preparation that will adapt itself to the exigencies of glass. But perhaps the first point to be considered is the pyroxyline, for without a suitable sample of this all further efforts are without avail. The best sort of colloidio-chloride is a very soluble sample, and such being obtained, the first step should be to ascertain how large a quantity can safely be used without causing a crapy and unsightly film. One great fault is that too small a quantity of cotton is too often used, which, though it gives a smooth and easy-flowing emulsion, and one quite suitable for paper, is too thin both to hold the salts without crystallizing and to give the density necessary in a transparency. Therefore ascertain, first of all, the maximum quantity of cotton the collodion will bear. This should, with a good soluble sample, be not less than nine or ten grains to the ounce.

The following formula is one that has given very good results, both on glass and on paper, flows and dries well, and keeps for some months without becoming thick:

Pyroxyline	100 to 120 grains.
Ether, methylated (0.720)	5 ounces.
Absolute alcohol	5 "
Chloride of sodium	15 grains.
Citric acid	20 "
Nitrate of silver	90 "

Dissolve the cotton in the ether and three ounces of alcohol, reserving two ounces of the latter for the solution of the salts. When the cotton is dissolved, add the citric acid in crystals, or it may be dissolved before making the collodion in the three ounces of alcohol. When dissolved, the silver may be added. This is first dissolved in about forty minims of water by boiling in a test tube, and one ounce of alcohol gradually added, warming it to prevent precipitation of the silver. Pour this a little at a time into the collodion, and shake well after each addition; this will produce a white, milky emulsion, partly from formation of citrate of silver and partly from precipitation of the nitrate in minute crystals. Next dissolve the chloride of sodium in the same quantity of water, carefully washing out the test tube first, and add the remaining ounce of alcohol; pour in in the same manner as the silver, and shake vigorously for two or three minutes, and afterward at intervals. In an hour's time the emulsion may be filtered through a piece of clean calico or linen, and is ready for use, but it will be better in a few hours' time.

Chloride of lithium, in the proportion of ten grains instead of fifteen, may be used instead of the sodium salt, though the latter is to be preferred if absolute alcohol and 0.720 ether can be obtained. If not, the lithium salt, being easily soluble without the aid of water, saves the addition of the second forty minims, and thus improves the flowing qualities of the preparation. If the image prints too red in color, two or three drops of strong ammonia may be added, and thoroughly well shaken.

Colloidio-chloride on glass is very difficult to work without a substratum, owing to its strong tendency to peel off. The substratum may consist of a plain solution of gelatine, three grains to the ounce, poured on to the glass warm, drained and allowed to dry in a place free from dust. In addition to causing the film to adhere firmly during washing, toning, and fixing, the substratum also helps, by absorbing the crystalline matter, to prevent crystallization and unevenness in drying.

Glass plates should, however, never be prepared beforehand, as, owing to the hygroscopic nature of the matter contained in the film, it is impossible to avoid deliquescence and crystallization unless they be hermetically sealed. It is an easy matter, however, to coat the glass at the time of use, and if dried by heat and the negative also warmed, no trouble need be feared from any of the causes of unevenness. The transparencies should be toned and fixed as soon as possible after printing. Any of the usual toning baths will answer, acetate, phosphate, or tungstate giving the best results.—W. B. Bolton in The British Journal of Photography.

THE USE OF GUTTA PERCHA IN THE UNITED STATES.

By JOHN M. ARMSTRONG.

IT is not a pleasant thing to say, perhaps, but the manufacturers of the United States show a dullness and apathy in certain lines that is in marvelous contrast to their progressiveness in others. For example, if one wishes to get articles manufactured of gutta percha, it is next to impossible to get any one to even attempt the work unless it be in staple lines. On the other hand, if anything is to be made of India rubber, no matter how insignificant, there are scores of bidders for the work. India rubber has completely eclipsed gutta percha in America, and it is a pity that it is so, for there are many places in which gutta would fit far better than rubber. The progressive rubber manufacturers to-day are looking for new gums for friction, for packing, for special work, and examine anything new in rubber with the deepest interest. If, however, an importer brings in a ten cent low grade gutta and ask that it be tried, even if he can point out a place where it is needed, and tell how to manipulate it, the manufacturer, nine times out of ten, will refuse to touch it. Not only is this distaste toward experimenting with gutta very general to-day, but it is on the increase, and that, too, in the face of the fact that in Europe the business is growing, and every new grade of the gum finds some good use. For instance, a six cent gutta, an inferior article, of course, was rejected with contempt by the American manufacturer as utterly worthless. An English firm, however, took it up, and made of it a paint for ships' bottoms, to which no barnacle can be tempted to attach itself, and as a result have made a handsome fortune.

Twenty years ago it was not an unusual thing for an order for fifty tons of gutta to be placed by a single firm. To-day such an order would be looked upon as a great curiosity. Nor is this falling off due to the scarcity of the gum. Orders can be filled in spite of the constant talk about the growing scarcity of the article.

Gutta percha in the United States is used chiefly for the insulation of cables, in the making of cements, in pattern work, in linings for soda fountains and acid tanks, in golf balls, and in the manufacture of tissue. In spite of this, more manufactured gutta is imported than is here made. Here gutta percha tissue is costly. In Europe it is so common and so cheap that every tiny bunch of flowers for the buttonhole has the stem wrapped in it to keep them from wilting.

In keeping with the indifference of the rubber manufacturer regarding this wonderful gum is the ignorance of the general public concerning it. The vast majority believe it to be the same as India rubber, while the semi-intelligent few confuse it with vulcanite. For this and other reasons it seems to me that an occasional résumé of the history of gutta percha should be a part of the educational plan of the India Rubber World.

The gutta percha of to-day is produced chiefly from the tree known as the Dichopsis gutta. This tree is of great size, being from four to five feet in diameter and between 100 or more feet in height. It has a clean, straight stem, the flowers are small, white, and divided into six petals and six sepals. The seeds, generally two in each fruit, are early eaten by birds and monkeys. The method of collecting gutta has been many times described and does not vary particularly from year to year, although, through the efforts of the conservators of forests, the trees are now being carefully tapped instead of being felled as heretofore. The gutta as first collected is white, but soon becomes pink and finally brownish red. A fact with regard to crude gutta percha that is not generally understood is that there are many varieties of it. For instance, in the Straits Settlements are to be found six kinds of Dichopsis which produce a marketable article, no two qualities being alike. Further than that, nearly a hundred species of gutta producing trees have been located and described by botanists, most of which are to-day tapped for the gum.

It is of interest, now that we are fairly launched into a consideration of this subject, to go back a few years and learn what the past of the gum has been.

Gutta percha, like many other of the most valuable substances and agents in nature, was discovered by accident. The merit of the discovery is due to Dr. W. Montgomerie, of England. He received, in 1845, the gold medal of the Society of Arts, in London, for his valuable service in introducing it to the British public.

As far back as 1822, when on duty at Singapore as assistant surgeon to the residency, he accidentally heard the name of the substance, and was led to make some inquiries concerning it, but it was not till 1842 that he met with any success. While at Singapore he observed on one occasion, in the hands of a Malayan woodsman, the handle of a parang made of a material quite new to him, and which appeared to be very different from caoutchouc, to which his attention had hitherto been mainly directed. On inquiry he found that it was made of a substance which the natives called gutta percha. Having subjected it to experiment, he speedily discovered many of its valuable properties; and at once concluded that if procurable in large quantities it would become extensively useful, and would in a great degree supplant the use of caoutchouc. The conclusion induced him to forward specimens of the gutta percha to the Asiatic Society of Bengal and to the Society of Arts in London.

When Dr. Montgomerie made his inquiries in 1842, this substance was quite unknown to the people at Malacca and Sumatra. The gutta percha tree grows abundantly in the island of Singapore and in the dense forests at the extremity of the Malayan Peninsula; also in Sarawak, and all over the island of Borneo. The tree is one of the largest found in these forests, and while its wood is seldom used, an oil is procurable from the fruit, which the natives use with their food.

Gutta percha was first introduced into England for purposes of manufacture by Richard Archibald Brooman, of London. To him letters patent were granted for some of its applications in 1844 and 1845. Others were granted as follows: In May 20, 1845, to Christopher Nickles, for its application to bookbinding, etc.; May 29, 1845, to Charles Keene, of London, for its application to boots, shoes, hats and all articles of wearing apparel; September 4, 1846, to a Quaker of Dublin, of the name of Bewley, for its application to the manufacture of flexible syringes, tubes, bottles, hose and articles of a similar description. Three, dated January 12, 1846, May 15, 1846, and February 15, 1847,

were granted to Charles Hancock, of London, for the manufacture of machine bands, cords, etc.

For the first two years (1845 and 1847) after the introduction of gutta percha as an article of commerce and manufacture, it was confined to England. This will occasion no surprise, when we consider the shrewdness, the energy and enterprise with which the article was managed by the English patentees. As soon as it was discovered that gutta percha had any value for manufacturing purposes, the Dublin Quaker and others purchased all the patents in England, formed a gigantic company, enlisting in it many members of the East India Company, and at once commenced the manufacture of gutta percha in all its branches. This company immediately applied for letters patent in France, Germany and the United States. So that scarce had the name of the article reached the public ear before a vast monopoly, with one of the richest banking houses in England at its head, was formed. This rapidity of movement and abundance of capital were necessary to secure the end the company had in view, namely, to monopolize not only the manufacture of gutta percha, but also the raw material. For this purpose they established their agencies at Singapore, and, in connection with the East India Company, planted them along the entire length of the Malayan coast. All this was accomplished ere a word reached this side of the Atlantic. To this statement there is one exception; for as early as May, 1846, William S. Wetmore, Esq., an eminent merchant of the city of New York, received from one of his agents at Singapore a few bundles of whips made by the natives of that country. Always distinguished for sagacity and enterprise in his business movements, this gentleman became at once exceedingly anxious to know more of this substance. Himself a pioneer of the island of Borneo, and well acquainted with the resources of that and the neighboring islands, he immediately ordered his agents to purchase the raw material and ship it to the United States.

In the summer of 1846, Samuel T. Armstrong, of New York City, well known for his numerous and important contributions to the useful arts, received from one of the directors of the East India Company specimens of gutta percha, in its crude and manufactured state, with an invitation to visit London for the purpose of effecting some arrangement with that company, by which that article might be introduced into the United States. Owing to engagements entered into with the American government, Mr. Armstrong could not leave for London till the month of March, 1847. He arrived in England about the first of April, visited all the gutta percha manufactories there and on the Continent, and finally made arrangements for the purchase of the patents granted by, or to be granted by, the United States to Brooman, Hancock, Bewley, Keene and Nickles. He also effected an arrangement with the monopoly in London for a supply of the raw material, knowing that without such an arrangement it would be impossible to undertake the manufacture of gutta percha in this country. Mr. Armstrong returned to the United States in the fall of 1847, and immediately applied himself to the construction of the necessary machinery. This being accomplished, he at once began the manufacture of gutta percha in all its most important branches. The first intimation which reached the public of this was the announcement of the arrival of an invoice of gutta percha from London, consigned to S. T. Armstrong. From these facts it will be seen that Mr. Armstrong was the earliest importer of gutta percha, as an article of commerce and manufacture, into the port of New York, and the first manufacturer of the article in the United States. The first gutta percha belt used in this country on machinery was sold by Mr. Armstrong to Messrs. Corning, Horner & Company to be used on machinery run by them at Sing Sing, N. Y.

A curious fact about the early use of the gum was that by many it was believed to have a far more brilliant future than India rubber.

In the manufacture of vulcanized India rubber at that time under the Goodyear patents, there were those who honestly believed that gutta percha was destined to drive out rubber. It was a matter of belief that from gutta percha could be produced all of the goods that to-day are produced from India rubber. In a pamphlet issued by a gutta percha company in the early fifties, the following comparisons between crude India rubber and crude gutta percha are instituted, and, as they serve to show the radical difference between the two gums, they are worth quoting:

"India rubber is of a soft gummy nature, not very tenacious, astonishingly elastic."

"Gutta percha is fibrous, extremely tenacious, and without elasticity or much flexibility."

"India rubber once reduced to a liquid state by heat appears like tar and is unfit for further use."

"Gutta percha may be melted and cooled any number of times without injury for future manufacture."

"India rubber coming in contact with oily or fatty substances is soon decomposed and ruined."

"Gutta percha is not decomposed by coming in contact with oily or fatty substances."

"India rubber is ruined by coming in contact with sulphuric, muriatic and other acids." [?]

"Gutta percha resists the action of these and nearly all acids."

"India rubber is a conductor of heat, cold and electricity." [Evidently an error.—ED.]

"Gutta percha is a non-conductor of heat, cold and electricity."

"India rubber exposed to the action of boiling water increases in bulk, does not lose its elasticity and cannot be moulded."

"Gutta percha exposed to the action of boiling water contracts, becomes soft like dough, may be moulded into any shape, which will be retained when cool."

"India rubber is not a perfect repellant of water, but is more or less absorbent according to quality."

"Gutta percha has an oily property and is a perfect repellant of liquids."

It is important for the reader to understand that the writer was talking about crude or unvulcanized India rubber and crude gutta percha. The success that the Goodyear patents attained in doing away with almost all of the disabilities of crude India rubber led inventors to attempt to remove the very plain disabilities that gutta percha possessed. Among the first to claim to have succeeded in producing vulcanized gutta percha

was Charles Hancock, of England, while in this country were granted what were known as the Rider and Murphy patents for the vulcanization of gutta percha. The first of those granted in 1852 to William E. Rider described the preparation of the gutta percha for vulcanization as follows: First heat the gum to 285° to 430° F. to expel all volatile gases. Then incorporate a hyposulphite either with or without metallic sulphurets, or with or without whiting or magnesia. Then subject to temperature from 285° to 320° F. The second patent granted to William E. Rider and John Murphy in the year following covered a process for subjecting the gutta percha goods to hydrogen gas to remove the bloom.

There is no doubt but what the goods produced by this firm had many characteristics that we do not expect to find to-day in manufactured gutta percha, and were the gum more abundant and cheaper than India rubber, some such processes would be doubtless used. It is also within the limits of probability that our mackintosh fabrics and many other goods would have gutta percha for water repellant instead of India rubber. It is a matter of record that fabrics were produced that were very similar to vulcanized rubber, would stand a high degree of heat, and that never decomposed nor grew tacky.

While the Americans were claiming to vulcanize gutta by one process, the English were at work on another, for, in 1846, Charles Hancock was granted a patent for combining gutta percha with sulphur or sulphurets and treating it for a long time under a high pressure of steam. He also describes the manufacture of porous gutta percha by mixing it with alum, carbonate

MACHINE FOR DEGREASING LEATHER.

THE use of dyed leather is familiar to every one. It is seen in purses, cigar cases, the linings of hats, in gloves, and in hundreds of other instances. The skins most generally employed for such purposes are sheep skins (skivers and basils), calf, goat, chamois, and white leathers. They are tanned with sumac or with bark, according to their nature, but whatever the agent employed, the natural grease existing in the skin is not wholly removed in the process. The grease resists the introduction of the dye, and not only does it render the skin less capable of absorbing the coloring matter, but owing to its unequal distribution, it causes the dye to act irregularly, producing a mottled effect, which is quite inadmissible in high class goods dyed in light colors. To remove the grease the skins need to be treated with benzine, which, by its well known solvent action, leaves them in a state in which the dye can penetrate them perfectly. It is possible to carry out this degreasing treatment by the crude method of soaking and drying in the open, but the cost of the spirit and the danger of the process have long since caused this plan to be abandoned. The ordinary practice is now to skewer the skins in batches on frames, and hang them in closed vats, where they are subjected to a constant shower of benzine. When the grease is believed to be entirely removed, the benzine is stopped, and hot air forced through the vats to evaporate the spirit still remaining in the skins. This part of the process needs to be conducted with great caution, as a slight excess of temperature has a very detrimental effect on the leather.

ment of gearing (Fig. 2), consisting of chains passing over two chain wheels having a balance weight attached to the end of the chains, actuated by a spur wheel and pinion, upon the axis of which is fixed a hand chain wheel for working the lifting gear intended for raising and lowering the lid. On the underside of each lid are three sets of gratings, each carried by four connecting links, and from these gratings the skins to be treated are suspended by spring clips. Each grating accommodates 12 dozen skins, which are hung vertically face to face, with a space of $\frac{1}{2}$ in. between each pair of adjacent faces. There are three clips to each skin, the center one being fixed and the other two movable, and capable of being instantly adjusted to suit any width of skin. As soon as a skin is put into position, and the clips released, the suspended skin is held stretched between the outer clips, by means of two compressed springs, fixed on the wire, carrying the clips for each skin. The advantage of this means of suspension, as opposed to the older system of skewering, is apparent on account of the more efficient circulation both of air and spirit among the skins, apart from the mechanical damage done to the goods by the method of skewering.

When the lid has been lowered, together with the skins, into the degreasing chamber, the latter is at once made airtight by a special arrangement of fastenings. A reciprocating motion is imparted to the frames, and the skins are thereby kept in constant motion in the solvent, aiding its action, and preventing any chance contact between adjacent skins from shielding them from the action of the fluid. This agitation, combined with a constant and vigorous circulation of compressed

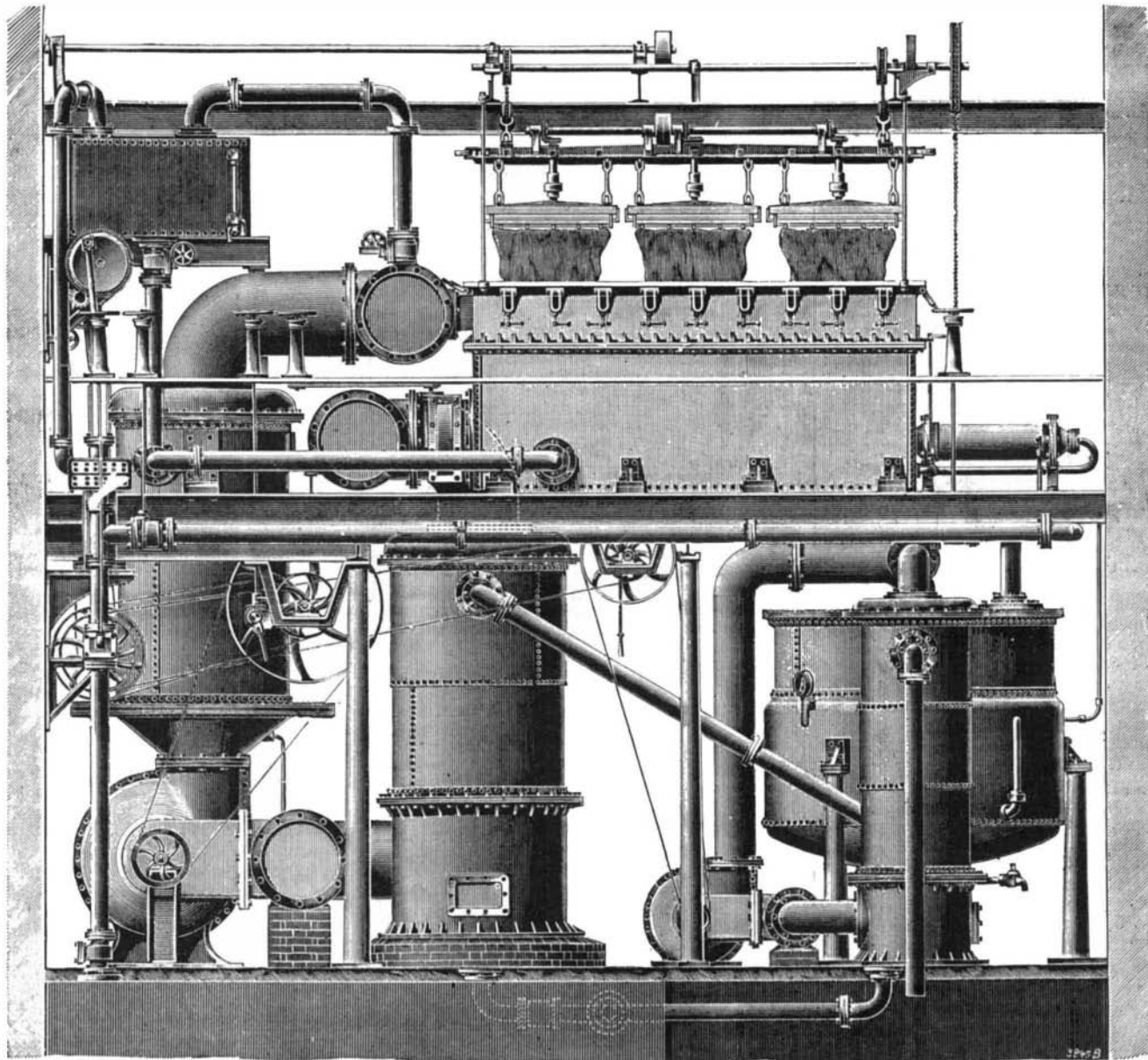


FIG. 1.—MACHINERY FOR DEGREASING LEATHER.

of ammonia, or some such substance that volatilized easily, and subjecting it to heat. In a patent granted to him in May of the same year, he steeps gutta percha in an alkaline solution, thereby diminishing its acidity and removing its smell. In a patent granted in February of the year following, he really claims the vulcanization of gutta percha by a combination of sulphur and sulphurets. The proportions that he advises are 48 parts of gutta percha, 6 parts of sulphuret of antimony or hydrosulphuret of lime or some analogous sulphuret, and one part of sulphur. The compound is boiled under pressure.

All this is of course interesting and shows the experimental work done by the early pioneers in India rubber to develop gutta percha. To-day no one expects this gum to take the place of rubber. As a vulcanized gum it is not a success, but for acid work, for insulation under water, and for a thousand and one special uses it is needed, and every manufacturer of mechanical rubber goods, of druggists' and surgical specialties, or of insulators, should be perfectly familiar with it.—J. M. Armstrong, in India Rubber World.

Italy broke its record of emigration in 1896, the number of persons leaving the country being 306,093, three fifths of the number intending to stay away permanently. Sixty-eight thousand persons came to the United States, 75,024 went to Argentina, the others went chiefly to Uruguay and Brazil. For the first time the number of Italian emigrants exceeds that sent out by any other European country during the year.

Recently a new machine for degreasing leather has been invented by Messrs. Wright & Monk, Parkinson Street, Nottingham. This machine we illustrate on the present and opposite pages in this issue. It has been designed to avoid the defects of the existing process by obtaining a perfect distribution of benzine over every part of each individual skin, and by conducting the drying process at a much lower temperature than heretofore. As will be gathered from the description we give, very great pains have been taken to insure the success of the various operations, and to render the apparatus as nearly as possible automatic, the only manual operations being those connected with fixing the skins in the frames and subsequently removing them.

The apparatus is contained in a building 42 ft. by 34 ft., and 32 ft. high, and provided with a 6 ton traveling crane for erecting the plant and executing repairs. The operation is carried out on the second floor, 19 ft. from the basement, from which the various parts of the machine are manipulated. The upper parts of the machine are carried upon four main girders, running from side to side of the building, and supported also by eight cast iron columns from below. The two tanks in which the skins are degreased are 14 ft. by 7 ft. and 6 ft. 6 in. deep, and are so arranged that while 36 dozen skins are being degreased in one tank, another lot are being dried in the second tank. The tops of the tanks are of cast iron fitted with suitable lids for closing the tanks while the goods are being operated upon. Each lid, together with the iron frames supporting the gratings, is lifted from above by a convenient arrange-

ment of gearing (Fig. 2), consisting of chains passing over two chain wheels having a balance weight attached to the end of the chains, actuated by a spur wheel and pinion, upon the axis of which is fixed a hand chain wheel for working the lifting gear intended for raising and lowering the lid. On the underside of each lid are three sets of gratings, each carried by four connecting links, and from these gratings the skins to be treated are suspended by spring clips. Each grating accommodates 12 dozen skins, which are hung vertically face to face, with a space of $\frac{1}{2}$ in. between each pair of adjacent faces. There are three clips to each skin, the center one being fixed and the other two movable, and capable of being instantly adjusted to suit any width of skin. As soon as a skin is put into position, and the clips released, the suspended skin is held stretched between the outer clips, by means of two compressed springs, fixed on the wire, carrying the clips for each skin. The advantage of this means of suspension, as opposed to the older system of skewering, is apparent on account of the more efficient circulation both of air and spirit among the skins, apart from the mechanical damage done to the goods by the method of skewering.

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air, is a most important feature in obtaining uniform degreasing. The degreasing tanks are connected by suitable pipes and valves to a charging tank, to which solvent is supplied from a store tank in the basement by a double-acting vertical pump having cylinders 8 in. in diameter by 18 in. stroke, and a plunger speed of 70 ft. per minute. When the necessary charge of solvent has been admitted to the degreasing chamber, the oscillation of the frames is started, and also a horizontal air compressor with cylinder 8 in. in diameter by 12 in. stroke. This pump takes air from the upper part of the tank and forces it through an air heater, which raises the air to a suitable temperature. It is then delivered through a series of perforated pipes at the bottom of the tank, thus keeping the solvent at a uniform temperature, and in a constant state of agitation, so that the specific gravity of the liquid is the same in every part of the tank, and the quantity of fat extracted is distributed and diffuses itself throughout the entire volume of the solvent. When the degreasing operation is completed, the movement of the frames and the air compressor is stopped. A suitable time is then allowed for any solid matter, such as sumac, etc., to settle, after which a portion of the solvent is taken back to the charge tank, and the remaining quantity is run into an evaporator 9 ft. in diameter and 8 ft. deep, with 1,500 gallons capacity. This evaporator is steam jacketed and fitted with a steam coil inside, and is also provided with a set of water gages and a special arrangement of thermometers, to ascertain the temperature at any time during