Concrete vs. Brick Floors.

The designer of a certain warehouse in Germany, unable to find definite data of the resistance of such floors, resolved to make trials for his own information, and incidentally for that of his professional brethren. The warehouse was of immense size, covering nearly an acre of ground, and was intended for the storage, among other things, of heavy pieces of metal, the handling of which often involved considerable shocks to the floors. The whole building was fireproof, part of the flooring being of brick arches in cement, between iron beams, and part of concrete slabs supported in the same way. Five trial floor arches were built, each 44 inches in span, of which the first consisted of concrete, made with one part Portland cement to five parts of gravel, while the second was of hard bricks in Portland cement mixed with three parts of sand, and was covered with a coat of asphalt three-quarters of an inch thick; the third was of softer brick, in mortar containing one-half as much lime as cement, and four parts sand; the fourth was of the same brick, in equal parts of lime and cement, and five parts sand; and the fifth was of the same brick, in cement alone, mixed with four parts sand. These last floors were finished with a coat of cement, three-quarters of an inch thick or more.

Fifty-four days after their completion, each floor was loaded with pig iron to the amount of 200 pounds to the square foot. This weight had no effect, and two days later the concrete arch was tested by letting fall upon it an iron ball of 60 pounds weight. This, dropped from a height of five feet, did no harm, and another ball, of 135 pounds weight, was let fall from the same height. The first blow produced no effect, but by dropping the ball repeatedly on the same spot a crack was started at the fourth blow, and the eighth broke a hole entirely through the floor, the opening being 4 inches in diameter at the top and 24 inches at the under side.

Thirty days later the same test was applied to another part of the floor, and a hole of the same size and shape was broken through at the ninth blow of the ball. The thickness of the concrete in the middle of the span was 4 inches. Trials were made of the brick floors in the same way. The first, of hard brick in strong cement mortar, stood forty-eight blows of the heavy ball before it was pierced; the second, of softer brick, with lime added to the mortar, gave way at the tenth blow; the third, at the seventh blow; and the last, of soft brick in sandy cement mortar, without lime, at the tenth. In all these cases the hole broken through was much larger at the intrados than at the extrados. A new floor was then built of soft brick, in mortar made with two parts lime to three of cement and ten of sand, and covered with a layer of concrete, of equal parts of cement and sand, 2 inches thick. After this had set, the floor required seventy-one blows of the 135 pound weight to break it through. This protective effect of the thick layer of concrete over bricks is very curious, but aside from this, the result of the tests was decidedly in favor of the brick arching.—*American Architect.*

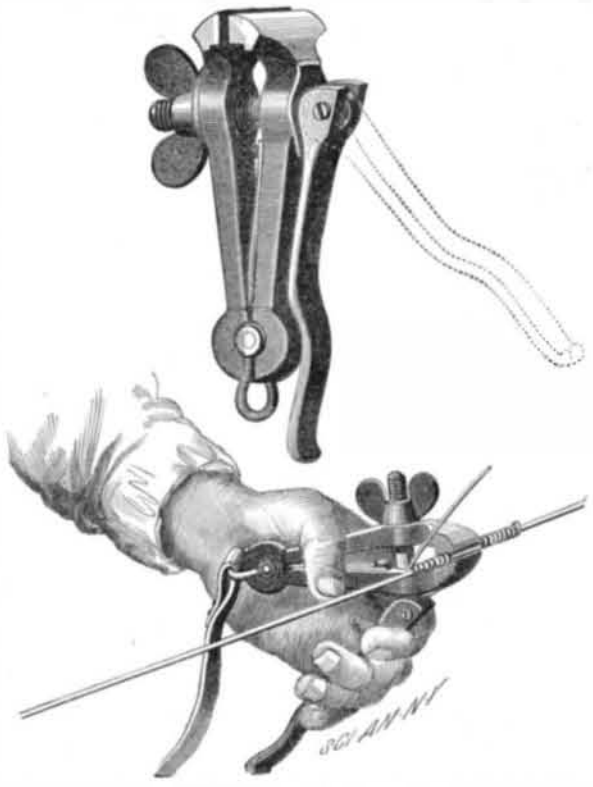
Exemption of a Physician's Property from Debt.

A New Hampshire physician was unfortunate enough to fall into debt and have judgments entered against him. The creditors naturally tried to obtain payment by issuing execution, and among the articles levied on by the sheriff were the physician's wagon and harness. The New Hampshire law says that such articles as are "tools of a person's occupation" cannot be seized and sold under an execution. The physician maintained that his wagon and harness came under this designation, and tried to recover them from the sheriff. The court, in deciding the question, which is an important one, does not settle the particular case, but refers it to a jury. The legal principles involved are of interest, and we quote from the decision as follows:

"The court cannot say, as a matter of law, that a wagon or a harness is a tool of a physician's calling, and so exempt to all physicians; nor can they say that it is not such a tool. The most that can be said, as a matter of law, is that it may be a tool of his profession if, in the particular case, it is reasonably necessary for him to use it as a tool. If it should appear that his practice was confined to his office, or that he was a physician or surgeon in a hospital, attending to no cases outside of the institution, or that he was a surgeon on shipboard, or that he went on foot or horseback, or on the cars, to visit his patients, a wagon and harness would not be exempt under our statute, because they would be of no use to him as tools in his practice. They might be of use to him in other respects, as in going to church, or in carrying his children to school, or in visiting friends, or as a means of recreation and pleasure; but these uses are manifestly not within the legitimate scope of the technical duty of a physician. Not coming within the strict definition of the term tools, and not being reasonably necessary as tools for him in his practice of his profession, they would not be tools within the meaning of the statute, and so would not be exempt as such. But if it should be found that the physician claiming the exemption could not practice his profession with reasonable success without a team with which to visit his patients; that he was located in a country town, for example, where it was necessary for him to ride a large part of the time in order to accomplish anything professionally, a wagon and harness might properly be found to be reasonably necessary for him as tools of his occupation. But the finding would be one of fact, so far as the reasonableness of the use is concerned; and it could not be said that these articles are exempt to every physician, or to physicians generally, but only to the debtor in the particular case. If there is any doubt whether an article claimed to be exempt from attachment is a tool under the statute, the question should be submitted to the jury whether its use as a tool by the debtor in his business is reasonably necessary. If it is, it is exempt; otherwise, it is not exempt."

IMPROVED VISE.

The object of an invention recently patented by Mr. William M. Whiting, of Elizabeth, N. J., is to construct a vise for grasping and securely holding articles of various sizes in such a manner that the pressure exerted by the pivoted jaws may be increased at will by a device acting independently of the screw and nut usually employed for forcing them together. The jaws of the vise are of the usual form. A screw threaded bolt extends through holes in the jaws, and at one end is pivoted to a cam lever, which also serves as a head for the bolt and prevents it from passing through the hole. A nut turns upon the thread of the bolt projecting



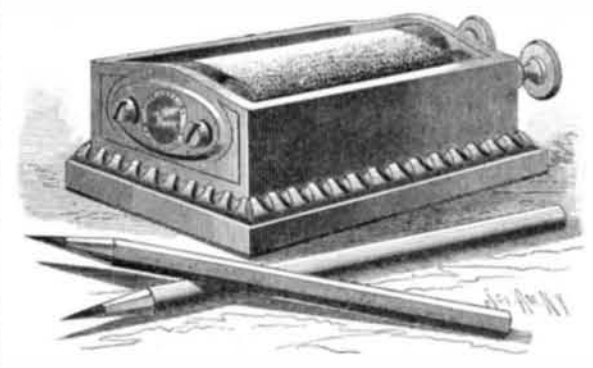
WHITING'S IMPROVED VISE.

from the opposite side of the vise. By means of this nut the jaws may be forced together, but where a greater pressure is desired than can be obtained in this way, the cam lever is raised so that the narrowest portion of its eccentric is interposed between the jaw and pivot of the lever.

After the jaws have been brought sufficiently together by the nut, the final pressure for grasping the object is obtained by forcing the lever downward, when it may be conveniently held by grasping it in the hand, together with the lower portion of the vise. This vise is designed with especial reference to the requirements of telegraph line men, and is of great value in working upon several articles of the same size, for in such case it can be set, by means of the screw, so as to allow the object to be readily placed between the jaws, after which the grasping pressure may be instantly secured by a single movement of the cam lever.

COMBINED PAPER WEIGHT AND PENCIL SHARPENER.

A small article which artists and draughtsmen will find particularly useful has been recently brought out by Messrs. Keuffel & Esser, of 127 Fulton Street, New York city. In a cast metal coverless box are journaled, longitudinally, two rollers, the axles of which are extended through the case at one end and provided with buttons by means of which they may be turned. Each roller is formed with a longitudinal slot just wide enough to admit the edge of a piece of fine sand or emery paper, which is of such a length



COMBINED PAPER WEIGHT AND PENCIL SHARPENER.

as to admit of its being wound several times around the rollers. The paper passes over a bar placed across the top of the box parallel to and between the rollers, and thus presents a wide surface upon which the pencil may be conveniently sharpened. When the exposed part of the paper becomes worn, a clean portion may be brought up by simply turning one of the rollers. All the dirt is collected at the bottom of the box. The device also forms a very handy paper weight.

DECISIONS RELATING TO PATENTS.

United States Circuit Court.—Northern District of Illinois.

THE BROWN MANUFACTURING COMPANY *vs.* DEERE & CO.

Blodgett, J.:

The first claim of letters patent No. 190,816, granted to William P. Brown, May 15, 1877, for an improvement in couplings for cultivators, examined, sustained, and the defendant held to infringe.

The phrase in the claim "against or with the weight of the rear cultivators or plows" should not be read, as defendant contends, "against and with the weight," etc. There is no uncertainty or ambiguity in this claim. The claim is comprehensive enough to cover both the arm, M (by which a spring power is applied), and the arm, M′ (by which the draught power can be applied), for the purposes to which the inventor proposed to apply them.

The objection that the specification describes and the claim covers a useless form or construction, as well as a useful one, is of no avail where the infringer uses the latter. The well known maxim applies, "*Utile per inutile non vitiatur*"—that which is serviceable is not to be rendered invalid by that which is useless.

Transferring the point of applying the lifting force of a spring from a point behind the forward end of the beam to an arm on the coupling, to which the beam is pivoted, *held* to involve patentable invention.

The fact that not only the defendants in this case, but other large manufacturers of cultivators, have at once adopted substantially the same auxiliary lifting devices shown in complainant's patent is evidence of the popular acceptance of this as a practical solution of many of the difficulties which had been encountered in the attempt to use the older devices, and is such a change and improvement as required more than mere mechanical skill, and brings this device fairly within the domain of the patent laws.

The fact that these older devices—Stover of 1870 and Brown of 1872—which it is now claimed were susceptible of being modified by mere mechanical skill into a machine in its operation and effect like that shown by the complainant's patent, rested without any such modification until the present patent was promulgated, held to be quite conclusive proof that it required something more than mechanical skill to produce what is shown in this patent.

United States Circuit Court.—Southern District of New York.

HOLMES ELECTRIC PROTECTIVE COMPANY *vs.* METROPOLITAN BURGLAR ALARM COMPANY.

Wheeler, J.:

Patent No. 120,874, granted to Edwin Holmes and Henry C. Roome, November 14, 1871, construed to be for an electrical covering fitting the outside of safes, as distinguished from an electrical protection applied to houses and other buildings and to rooms. The patent sustained, and a preliminary injunction granted.

The provision of the statutes that a United States patent for an invention previously patented abroad shall be so limited as to expire at the same time with the foreign patent seems to mean that the term of the patent here shall be as long as the remainder of the term for which the patent was granted there, without reference to incidents occurring after the grant. It refers to fixing the term, not to keeping the foreign patent in force.

Rifle Caliber Machine Guns.

Lieut. Sleeman, in an article in the *N. A. Review* for October upon the development of machine guns, says:

The use of rifle caliber machine guns offers to a general the simplest and most effective means whereby to intensify rifle fire at any point of his position, without causing the offensive or defensive power of any other part to be weakened for this purpose.

Rapid firing single barreled shell guns possess some exceedingly important features for the military service, whether used in the field, as mountain guns, or for the armament of fortifications and earthworks. The properties that most strongly recommend these guns for service in the field are rapid fire, little or no recoil of gun carriage, mobility, simplicity of mechanism and manipulation, and, lastly, the use of made-up or self-contained cartridges. It is difficult to conceive of more suitable guns for light horse artillery. Take, for instance, a battery of six rapid firing three-pounder shell guns, each capable of discharging eight projectiles in half a minute, with deliberate aim between each shot. A battery of this nature could in this short period of time deliver forty-eight projectiles, equivalent to 144 pounds of metal, and if common shells were used, with 1,440 splinters, or for shrapnel shells, with 2,016 lead bullets. Such a rain of bursting shells would create terrible confusion, and have a most demoralizing and destructive effect, if thrown among a body of troops, while if directed against earthworks or houses, the continuous fire of shell after shell would soon produce considerable damage. The comparative lightness of these weapons would permit of their being provided with an effective shield protection without reducing to any serious extent their property of mobility; besides, the additional weight of this shield would permit of a larger powder charge being used, with a corresponding increase in initial velocity, accuracy, and power. Three-pounder guns have been referred to, but six-pounders are also adapted for field service, by allowing them to recoil and automatically return to their original positions without causing their carriages to run back.

Vermilion.—Its Manufacture in China.

The Chinaman has no knowledge whatever of chemistry, and of the principles of natural philosophy and statics generally his notions are of the most rudimentary and primitive description. How then, in the face of these obvious disadvantages, have the Chinese contrived to place themselves in the front rank among nations in the matter of certain chemical manufactures, one of the most important of which is the subject of this article—vermilion? In our last article we have seen with what ingenuity and pertinacity in carrying out his ends the Chinaman has succeeded in making perhaps the most delicate and perfect iron castings in the world.

He has succeeded in that instance not by any deep researches into the hidden mysteries of nature, by no process of thought involving an inquiry into the "reason why;" to this the Chinaman is averse, the whole tendency of his education, such as it is, tends to made him satisfied with observing effects; it is sufficient to him to know that things are so, without going into troublesome or elaborate investigations into those changeless laws of nature into which his philosophy teaches him that, as he cannot alter or control research, is fruitless; but that he has in his own small, ingenious, patient way observed effects to very good purpose the unrivaled excellence of some of his manufactures testifies. We will now enter a vermilion manufactory, and watch the process from the first stage of mixing its two ingredients—mercury and sulphur—to the final process of weigbing and packing this costly and beautiful pigment for the market.

The first objects to attract the visitor's attention on entering the yard attached to the works will probably be large piles or stacks of charcoal, crates or baskets of broken crockery ware, and numerous rusty old iron pans of somewhat similar shape to the rice pans previously described, but considerably thicker and heavier. There will also probably be a few broken and disused cast iron mortars. All these articles are the cast off or worn out implements of the manufacture, and will be described in their proper order. On entering the factory proper, scores of little stone mills, each being turned by one man, and other long rows of workmen weighing out and wrapping up the vermilion, will be seen.

The furnaces are then arrived at; these may be a score or more in number and may be ten or twelve in each furnace room, five or six on each side. After passing these the stores of quicksilver, sulphur, alum, glue, new spare iron pans, serviceable crockery ware, and sieves, and other utensils used in the factory are arrived at, and this completes the view of the works. The iron pans in which the vermilion is sublimed are those referred to above; they are circular and semi-spherical in shape; all are of the same size and weight; they are cast upside down, and in the casting, a runner or lump of iron, two and three-eighths inch in diameter by from six-eighths to one inch in depth, is purposely left on every pan, in order to enable the workman the more readily to handle the pan when stirring up its contents. The size of the pans proved by actual measurement to be twenty-nine and a quarter inches in diameter, by eight and seven-eighths inches deep, and the weight forty catties, or say about fifty-three pounds. These pans are set in rows of five or six on each side of a small rectangular room, in size some twelve feet by fifteen feet; the door of this room is of wood, and contains an aperture a few inches square in order to enable the workman to watch the progress of his operation, from time to time, without the necessity of lowering the temperature of the apartment by opening the door. The pans are set in brickwork, each pan having beneath it a grate to hold the charcoal used as fuel. There is no communication between the grates or furnaces under each pan, and no chimney, the flames and products of combustion finding exit from the front of the grate, which is left wholly open at all stages of the operation.

The process of manufacture is as follows: Taking an iron pan, which is of four inches smaller diameter than those described, and also in all other respects proportionately less, except the runner, which is the same size, a skilled workman proceeds to weigh out seventeen and one-third pounds of sulphur. This he places in the pan, and adds about half the contents of a bottle of quicksilver. The pan with its contents is then put upon a small earthen brazier or portable furnace, the fuel used in which is charcoal. When the sulphur is sufficiently melted, the workman, taking an iron spatula or stirrer, rapidly stirs up the quicksilver with the sulphur, and gradually adds the remaining contents of the bottle of quicksilver, stirring the two ingredients together meanwhile until the mercury has wholly disappeared, or "been killed," as the Chinese put it. When this takes place the pan is removed from the fire, a small quantity of water is added, and rapidly stirred up with the contents of the pan, which have now assumed a dark blood-red appearance and semi-crystalline structure.

This mass is then turned out of the pan into an iron mortar, and then broken up into a coarse powder. This forms a charge for one of the large pans previously described, and when sufficient material has been prepared to charge all the pans in one furnace chamber the sublimation is proceeded with as follows: All the pans having received their quantum of crude vermilion, this is covered with a number of crockery or porcelain ware plates of tough, strong manufacture, each about eight inches in diameter; some of these plates, however, are broken up, and are in a more or less fragmentary condition. When these plates have been piled up into a dome-shaped heap of the same shape as the bottom of the upper pan, to which they should extend, the whole is covered with one of the smaller pans previously described. Now, it will be remembered than the smaller pan was of four inches less diameter than the larger one; there will consequently be a circular space of two inches all round between the circumference of each pan.

Consequently the rim of the upper or covering pan will be about two inches lower than the rim of the lower pan; there will also be some four inches space horizontally between the rim of the larger lower pan and that portion of the smaller pan which is at the same height as the rim of the larger one. This space is carefully filled with a clay luting into which some holes, generally about four in number, are pierced, extending down to the rim of the smaller pan or cover; this is done in order to allow the heated air and other matters to escape. All the pans in one furnace chamber being thus charged and covered, the fires are lighted. The flames from the charcoal should occasionally play several feet above the mouths of the furnaces. The door of the chamber is kept closed, except when it is opened for a moment in order to enable the workman to replenish the fires, which must be kept up at a fierce heat for eighteen hours. During the process a blue lambent flame is seen to play above each of the four holes which are pierced through the clay luting of the pans, so it is evident that a considerable quantity of either one or probably both the ingredients is wasted.

After eighteen hours the fires are allowed to go out, and the contents of the pan cool down. When this is accomplished, the greater portion of the vermilion will be found adhering to the lower surface of the broken up porcelain plates with which the crude product is covered. The vermilion is then carefully removed from the porcelain by means of chisels, and is now ready for the elutriating mills. Another portion of vermilion of not so good quality is found adhering to the upper iron pan and that obtained by washing the clay luting in a cradle, as diggers wash dirt for gold. This together with the wipings and scrapings generally is mixed up with alum and glue water into cakes, and, after drying on a brick surface heated beneath by means of wood or charcoal, is powdered up on a mortar, and resublimed when a sufficient quantity has accumulated.

The vermilion which was removed from the porcelain plates is of a blood red color and crystalline structure. This is then powdered up in a mortar and removed to the levigating mills; these are the ordinary little horizontal stone mills used by Chinese and other natives of the East to grind rice and other grain into flour or pulp, as the case may be. Each stone is about two and a half feet in diameter; the lower stone is stationary, the upper is turned by a direct-acting piece of wood having a hole in it, which works a wooden peg affixed to the upper stone, which is made to revolve by a backward and forward movement of the piece of wood, or handle, some three or feet long, previously mentioned. One man turns each mill. The upper stone has a small hole in it near its center, down which the workman from time to time pours a little spoonful of the powdered vermilion, which he washes down into the mill with water; as he turns the mill the workman keeps continually ladling little spoonfuls of water down the aperture or hole in the upper stone; the ground and thus elutriated vermilion, as it escapes from between the stones, is washed down by the water into a vessel placed beneath to receive it.

When work is suspended for the evening, the ground vermilion is carefully stirred up with a solution of glue and alum in water, in the proportion of about an ounce of each to the gallon. The glue has been made to mix with the water by previously heating it with a small quantity of water; the earthen pots in which this process is effected each hold about six gallons. The mixture is then left to settle. In the following morning the mixture of glue and alum is poured off the vermilion, and the upper portion of the cake of vermilion at the bottom of the vessel—that is, the portion which remained longest suspended in the liquid—will be found to be in a much finer state of subdivision than the lower portion, which requires to be again elutriated as on the previous day; this separation of the more finely divided vermilion from that which was coarser by suspension in a dense medium, is a really most ingenious process, for which we should give the Chinamen every credit.

The process of grinding, elutriation, and separation of the coarsely ground from the fine vermilion sometimes requires to be several times repeated, in order to fully bring out the color. As a final process the damp cake of finely ground vermilion is stirred up with clean water, and allowed to settle down until the next morning, when the water is carefully poured off into large wooden vats to still further deposit a small quantity of vermilion still remaining in suspension, and the vermilion dried in the open air on the roof of the premises. When quite dried the cakes of now full colored pigment are carefully powdered and sifted by means of square muslin bottomed sieves, contained in a covered box some two feet high by two and a half wide, in which the sieves, which slide on a framework inside the box, are jerked backward and forward by means of a handle on the outside of the box or case containing them.

The now fully prepared vermilion is removed to the packing house, where may be seen rows of workmen, men and boys, seated before a series of tables. Between every two workmen is a third, with a small pair of scales, which he holds in his left hand; and as the workmen on either side place before him the little pieces of paper in which the vermilion is to be wrapped up, he weighs into each paper one tael (about an ounce and a third avoirdupois) weight of vermilion; the papers are two in number, the inner a black or prepared paper and the outer a piece of ordinary white paper. After being wrapped up the packets are placed in rows before another workman, who stamps them with a seal containing in Chinese characters the name and address of the manufactory in which the article has been made, and the quantity and quality of vermilion contained in the packet.

The rapidity and deftness of the Chinese workmen at this employment is really surprising; the stamping, for instance, is effected at the average rate of sixty impressions per minute, and the wrapping up is carried on with proportionate rapidity. The mixture of alum, which is the ordinary aluminum potassium sulphate, with the vermilion, in one of its stages of manufacture as described above, is not added, as at first sight we thought it might be, merely to assist in clarifying or purifying the water by causing it to deposit its sediment, but seems to have some peculiar effect upon the color. Although what may be the *rationale* of the process, or how it acts, we cannot quite clearly see; the glue is added as described above merely to favor separation of the finely elutriated vermilion by holding it longer in suspension than the coarser particles, which sink first, and may therefore be separated in their order of stratification.

The actual composition of vermilion is one hundred parts of mercury to sixteen of sulphur, when both these ingredients are in a perfectly pure state; the excess of five and one-third pounds of sulphur added by the Chinese is probably volatilized and lost in the process of sublimation, or as the sulphur used is generally not quite pure, a part may go for foreign matter contained in the sulphur; the balance being probably the *raison d'etre* of the blue lambent flame seen playing over the apertures in the luting during the sublimation process. For a people, having like the Chinese no acquaintance with even the first rudiments of chemistry, the proportion of ingredients taken—fifty-six and one-quarter catties to 13 catties, or say 75 pounds to 17 and one-third pounds—shows wonderfully accurate powers of observation and a knowledge of combining proportions only to be gained by much experience and a long extended series of careful observations highly creditable to the manufacturers. The entire process is one of the most ingenious and interesting to be seen in any part of the world.

Hong Kong, March 29, 1884.

—*T. I. B., Chem. News.*

Mounting Prints on Muslin.

At a recent meeting of the Rochester Photographic Society, Mr. J. M. Fox gave the following account of his method of mounting prints on cloth. He said:

"After trying many experiments in double mounting on muslin I have adopted the following method: I prepare several yards of cloth at a time by sizing with starch, and always keep a roll of it on hand ready for use. While damp the cloth is stretched not too tightly on a frame, and sized plentifully with warm starch paste made rather thin, and spread on evenly. Where large quantities of muslin are used, perhaps tenter bars might be employed to advantage for stretching. When dry cloth is cut to the size required before mounting, allowance being made for the expansion of the prints, if the starch for mounting be used while warm (which I think is preferable), it should be as stiff as can be conveniently spread on the print, for the reason that it will expand the cloth less and dry quicker. From the moment the first print touches the cloth dispatch is important; therefore both prints are first pasted, one being laid aside ready to be picked up quickly. The first print is rubbed down with a hand roller, which can be done more expeditiously than with the hands. When the second print is properly laid on the side there is less occasion for haste, and rubbing down by hand is preferable; because, although the roller does the work perfectly on the first print mounted, it is liable to leave air bubbles in rolling down the second one. To avoid bubbles in the hand rubbing, the strokes should be toward the middle of the print, and not in every direction from the center. When the mounting is completed, the prints are placed between papers and covered immediately with several folds of cloth of sufficient weight to keep them in place. To facilitate drying they may be aired after an hour or two and placed between dry papers and again covered with the cloth."

A Mischievous Toy.

On each side of 108th St., between Third and Lexington Avenues, this city, is a row of new flats. The row on the south side is almost completed, but a very large number of the whole glass windows have been shattered. The hole in the glass is generally small and round, with fractures extending in all directions.

"The boys do it with what is just now the most popular toy Harlem ever saw," said a policeman in Lexington Avenue. "The toy is made like the stock of a gun. A short, hollow, wooden cylinder fits into the channel of the gun stock and is secured near the muzzle of the stock by a stout rubber cord. When this cylinder is pulled back to the position a gun lock would occupy, it is caught on a trigger. The boys put a lead bullet into the little cylinder, aim at a window a square away, and pull the trigger. A jingle follows every time. Sparrows and cats even have been killed by the bullets. It has been impossible so far to catch the boys in the mischief, because there is nothing to tell where the shot comes from. Unless we are lucky enough to see some of them in the act, we will probably not be able to stop the destruction."