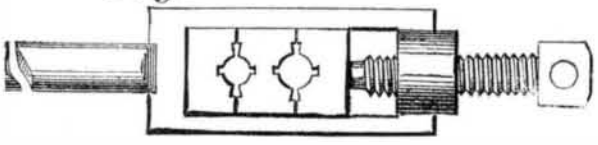
[For the Scientific American.]

A CURIOUS PIECE OF MECHANICAL MANIPULATION.—CUTTING RIGHT OR LEFT HAND THREADS WITH RIGHT HAND DIES.

If there were any one mechanical operation that it would seem the height of absurdity to attempt to accomplish, it would appear to be that of cutting a triple left hand thread with an ordinary pair of right hand dies; but it has been done, and, indeed, is very easy of accomplishment.

A short time since Mr. J. J. Bingley, Master Mechanic of the Hanover Branch Railroad, wrote to me, saying that a workman in Hanover, Pa., had accidentally cut a *treble* left hand thread with a pair of right hand *single thread* dies, and requested a solution of the mystery. Upon request, Mr.

Fig. 1.



Bingley forwarded both the screw and the dies, and the mystery was readily solved, resolving itself into a mechanical operation which may in many cases be turned to excellent account. In Fig. 1 are shown the dies, and in Fig. 2 are a single right hand and a treble left hand thread cut with them. The machinist who cut the first treble left hand thread did so from a combination of manipulative errors, each one of which was necessary to his accidental discovery. First, the dies with which he operated were of a wrong shape, and secondly, the iron upon which he cut the thread was larger in diameter than such a pair of dies should be applied to; thirdly, he wound the dies the wrong way; fourthly, he put a pressure upon them in a direction wrong with relation to the direction in which the dies were wound upon the work.

Fig. 2.

Referring to the first point: Dies for use in hand stocks, that is to say, adjustable dies that are made in two pieces, and are intended to pass more than once along a thread before finishing it, should be, and are almost universally, cut with a hub or master tap larger in diameter than the bolt they are intended to cut threads upon, for the following reasons: In Fig. 3 is shown a pair of dies tapped with a ¾ inch master tap or hub, and in Fig. 4 is shown the same pair of dies, opened out and placed upon a ¾ inch bolt. Dies made in this manner, it will be observed, when opened out to take the first cut upon the bolt, have nothing to steady them, since only the very corners of the teeth contact with the bolt; and the sides of the thread and the length of the teeth of the die have a great deal of clearance upon the bolt, and the consequence is that they operate very unsteadily until the thread is cut to some depth upon the bolt. The edges of the teeth, at A and B, perform all the cutting duty; and as the thread approaches completion upon the bolt, the friction becomes very great unless the dies are given clearance in the thread. It is usual, therefore, to cut such dies with a master tap of larger diameter than that of the bolt upon which the dies are intended to operate. How much the excess of the diameter of master tap should be is a disputed question. In some cases an amount equal to twice the depth of the thread is used, and in others once that depth is preferred. The dies shown in Fig. 5 are twice the depth of the thread larger in diameter than the size of the bolt; and as a result, when placed upon the bolt, the teeth fit closely to it, and therefore operate very

Fig. 3.

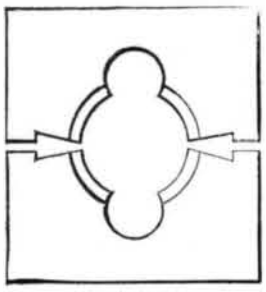


Fig. 4.

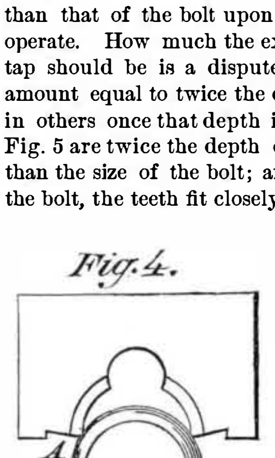
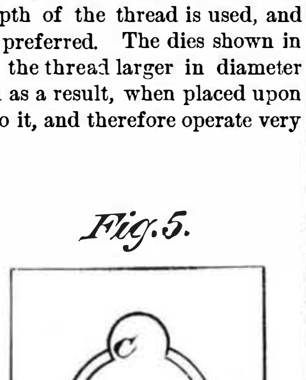


Fig. 5.



steadily, the cutting edges being in this case at C and D. It is obvious that here the dies require to close nearer together than would otherwise be the case; hence a piece of metal equal in thickness to, or rather more than, twice the depth of the thread is placed between the dies while they are being drilled and cut by the master tap. With dies cut in this manner, the sides and length of the teeth fit so closely to the thread, as shown in Fig. 6, as to preclude the possibility of their cutting a thread any different from that of their own teeth, and the cutting edges are well supported by the metal behind them; whereas, in dies cut as shown in Fig. 4, the teeth are very liable to break off, as well as to dull very rapidly. Therefore it is that such dies are wrong in construction. The dies sent to us by Mr. Bingley are of this construction; and it will readily be perceived that, even when applied to bolts of the same diameter as the die itself, the teeth bear upon such fine points, and the back of them is so well clear that, by taking a very fine cut and putting a pressure upon them, they would act as chasers, well canted over; and they would travel in whichever direction the pressure determined. As the die teeth, however, enter the bolt, the sides of the thread would come into play, and would steady and force the dies to cut correct grooves.

These dies are tapped with about ¼ inch taps, and the iron upon which the right and left hand threads are cut is full $\frac{5}{16}$ inch in diameter; and as a consequence, we have the condition of things shown in Fig. 7, in which the very points of the teeth only have contact with the bolt. As a result, the thread may be cut the full depth, without the sides of the thread upon the bolt and those upon the die coming into contact at all. If, then, the dies are placed upon the bolt, and set to take a very light cut, the direction of the up or down pressure placed upon the dies will determine the direction in which the dies will travel and the thread be cut. If the dies are wound from right to left while pressed downwards, the thread cut will be a left hand one, and *vice versa*; and whether the thread so cut will be a single, double, treble, or quadruple one, depends upon the size of the bolt and the amount of the pressure; for though the size of the bolt may afford sufficient clearance to the sides of the die teeth to cut a quadruple thread, yet, if the vertical pressure placed upon the die moves it at the necessary speed, only a double thread will be cut. In other words, the thread cut will be in all cases proportionate to the amount of vertical movement of

Fig. 6.

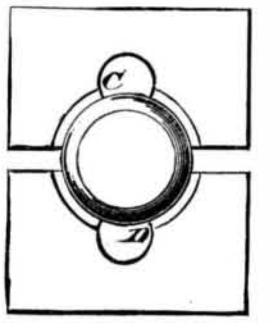
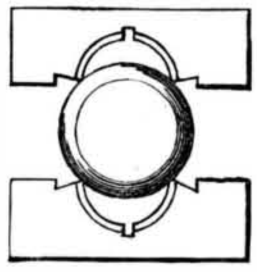


Fig. 7.



the dies. Of five threads cut with the dies shown in Fig. 7, three were treble left hand ones, one was a double left hand, and one a single right hand one. I find as a rule that the thread is apt to be as coarse as the clearance between the threads will permit; and this occurs because of the difficulty of judging the exact amount of vertical pressure necessary to cut any particular pitch. And since the pitch of the thread cut cannot in any event exceed such an amount as will bring the sides of the threads into contact, it becomes easier to cut that extreme pitch than any less one. In cutting the left hand threads, it is necessary to reverse the natural order of things by moving the dies backwards when the pressure is placed forwards, and *vice versa*. By a simple attachment to regulate the vertical motion of the dies when starting, the double or treble threads might be cut with accuracy and certainty. J. R.

On the Use of Tannic Acid for Testing Potable Waters.

The importance of using pure water, in order to prevent disease and death, cannot be too frequently impressed upon the minds of the public. At all seasons, but more especially in the spring and summer months, persons who use well water are in danger of taking into the system the germs of typhoid and other fevers. These dangerous constituents seldom influence or mar the taste of the water, and are not suspected until they have lain one or more victims on a bed of sickness.

In a recent number of the *Journal für Practische Chemie*, Hermann Kämmerer says, in regard to the reagents employed by chemists for testing potable water, that for the most part they merely show the presence in water of organic matter; but some kinds of organic matter may be present in large quantities without causing epidemics or sporadic diseases. Most methods for the chemical analysis of water do not determine the nature of the organic matter which is dissolved in the water, and, at most, a conclusion is drawn as to the presence or absence of nitrogenous organic matter from the odor emitted on charring the residues left by evaporation of the water. This is very uncertain, because the presence of two kinds of compounds frequently frustrates this distinction, or the presence of a large amount of nitrates prevents the production of the characteristic odor by completely oxidizing the compound.

For hygienic purposes, it is very frequently of the greatest importance to know whether water contains putrefactive matter, especially of animal origin, since the present state of Science points to these as the probable bearers or producers of the real causes of disease. Hence the introduction of reagents which shall enable us to detect animal matter with certainty, and also its approximate quantity, is exceedingly desirable when testing water for hygienic purposes. Kämmerer believes that tannin or tannic acid is a very valuable reagent for this purpose. Tannin is really a group reagent for a large number of bodies of animal origin, which readily suffer decomposition or decay, such as albumen, gelatin, etc. These can easily find their way into the water of the soil, rendering it impure, and, according to our present views, must render such water very dangerous.

Tannin has been recommended before this as a test for water, but has as yet attracted but little attention, although Kämmerer proceeds to prove that it is very excellent for this purpose. He thinks it would be very interesting to prove directly whether putrefactive matter be present in well water which is near enough to receive the drainage of graveyards, factories where glue, blood, and similar substances are used, and in many other cases.

Lefort recently directed attention to the probable presence of gelatin or glue in water from churchyards. In an analysis of water taken from a well at a distance of ten rods from the churchyard of St. Didier, made by him in 1873, he obtained a residue, which, when boiled with hydrochloric acid, and on charring, emitted an odor which he thought could only be produced from glue. Lefort does not seem to have sought or obtained any further reaction characteristic of gelatin.

When analyzing three specimens of well water from a churchyard in St. Leonhard, near Nuremberg, Kämmerer observed a similar reaction of the residues of evaporation, and then tested the water directly by means of tannin. For this purpose 18 cubic inches of the water to be tested was placed in a glass cylinder; to each sample was added 0 18 cubic inch of a freshly prepared, cold, saturated solution of tannin, and left standing in vessels closed and airtight. The first sample instantly became cloudy by the separation of a rapidly increasing, curdling precipitate, which, at the end of an hour, formed a thick gelatinous precipitate, and after standing for days did not settle clear and colorless. The sample from the second well acted in a similar manner; at the end of an hour there was a heavy, gelatinous precipitate, which soon took a gray, then light green, and finally dark green color, due to a trace of iron in the water. The third sample retained its clear appearance a longer time, and in the first four hours only a slight turbidity could be observed, yet in 24 hours a thick starchy precipitate had formed. The organic nature of the precipitate was undoubted, but was further proved by charring it, when it gave off, like the residue from evaporation, a strong odor of burned horn, and left behind a very small amount of ash in proportion to its volume. For the purpose of testing for volatile organic acids, sulphuric acid was added to a few quarts of each sample of water, which was then distilled off to one fifth its original volume; a very small quantity of the tannin solution added to the residue caused an immediate coagulation to a stiff jelly also in the residue of the water from the third well, which, when treated directly with tannin, was not entirely precipitated for 24 hours. Since sulphuric acid precipitates tannin from its aqueous solution, and this precipitation looks milky and is difficult to clarify, it was thought possible that the strong reaction in these residues might be referred to the precipitation of the tannin by the sulphuric acid. But this supposition did not agree very well with the volume of the precipitate, which seemed disproportionately larger than the quantity of tannin employed. Comparative experiments were made with tannin precipitated by sulphuric acid, and gelatin precipitated by tannin, and showed that, on heating, the tannin dissolved in the sulphuric acid and water before it reached the boiling temperature, and, on cooling, was precipitated again and soon settled, leaving the liquid clear. The precipitate formed by tannin in a solution of gelatin is not dissolved by dilute sulphuric acid even when boiling, but seems rather to increase. The precipitate formed by tannin in the residues from distillation reacted precisely like the latter; on heating to boiling, they seemed rather to increase than to diminish.

After he had found, by further experiment, that the turbidity produced by tannin solution in the three samples of water were not caused by albumen, but by gelatin, Kämmerer feels that he is justified in drawing the following conclusions:

1. There can no longer be any doubt of the presence of gelatin in well water. In some cases it is found in comparatively large quantities.

2. Tannin is a suitable reagent for detecting this and similar substances, and this test ought never to be omitted in analyses of water for hygienic purposes.

3. The presence of salts and other compounds found in water may retard the precipitation by tannin. To judge of the purity of water from the tannin reaction, it must stand at least 24 hours.

4. Every water that suffers considerable turbidity with tannin must be held to be dangerous for drinking. It seems to make no difference whether the precipitate falls at once or only after some time, as the time depends less on the substance to be precipitated than on the other substances dissolved in the water which retard the precipitation.

Bichromate of Potash an Antiseptic.

M. Langeroy states that one per cent of bichromate of potash in water will prevent putrefaction in animal and vegetable substances immersed therein. Meat, after being kept in the solution for several months, becomes like gutta percha, and the author has struck medals from pieces of it. It is no longer eatable, however, and it is even said that dogs refuse to touch it.

Curiosities of the Railway Ticket Manufacture.

Chambers' Journal gives the following interesting account of how railway tickets are made at a celebrated factory in London, that of Waterlow & Sons:

Like many other great establishments, Messrs. Waterlows' has grown from a small affair to gigantic proportions. Beginning with law stationery, then advancing to account book manufacture, then to various kinds of commercial printing, it has gone on, step by step, until at present it gives employment to between three and four thousand persons.

One of the factories, consisting of a lofty building surrounding an open quadrangle, is devoted to ticket making and printing, chiefly railway tickets; and to the process as carried on there, we will now direct our readers' attention.

The paper for tickets is made of a slightly spongy texture, well fitted to take paste. It is known technically as middles, and is the foundation for two external surfaces of paper, white or colored as the case may be. The primitive paste-brush has long been discarded. A cleverly constructed machine pours out a stream of paste on two rollers, under or over which pass two sheets of paper, each of which becomes thoroughly pasted on one side. These are then quickly applied to the surfaces of the middle. The paste caldrons, in a compartment by themselves, have a vigorous appetite for flour, alum, and water, and pour forth volumes of steam. To show what "a bit of paste" may become when multiplied by millions, it will suffice to say that thirteen sacks of flour per week are used in this one factory! After the pasting, each sheet of cardboard, large enough for one hundred and twenty-five railway tickets, is, with others of the same kind, subjected to flat pressure, rolling pressure, and heat, until the surface papers are firmly and smoothly attached to the middle; exposure to a high temperature in heated chambers thoroughly dries them. Cutting machines sever the sheets into single tickets, the well known railway ticket size, all precisely alike in dimensions.

Next comes the printing. Messrs. Waterlow adopt four different commercial systems in the supply of these tickets. In the first system they manufacture the tickets throughout for the railway companies, who issue them ready for use to the booking clerks at the several stations. In the second, they partially print the tickets, leaving the companies to finish them according to the varying exigencies of the traffic. In the third, they sell the blank tickets, properly prepared and cut, to the companies; the printing in this case being wholly carried on by the companies. And in the fourth, they sell the machines to the companies, with a license to use them.

A pile of about five hundred blank tickets is placed in an upright tube or hopper, with just room to sink down readily. The bottom of the tube is open, allowing the lowermost blank to rest upon a flat metal plate. A slider, with a rapid reciprocating horizontal motion, strikes the lowermost blank dexterously aside to a spot where it can be printed on the back with those cautions, instructions, and references to by-laws which most companies deem proper to communicate to the public. Another sharp stroke drives the blank farther on, where the printing and numbering of the front or principal surface are effected. When the blank is printed on both surfaces, it is struck onward again, and comes underneath an exit or delivery tube, just the same height and dimensions as the hopper or feeding tube. Up this it is driven by a series of jerks, until a pile of (say) five hundred is finished. In traveling horizontally from tube to tube, and vertically up the delivery tube, each ticket acts as a kind of cardboard policeman, saying to its predecessor: "Move on, if you please." And they do move on, all undergoing some process or other at each stage of the movement. As the pile in one tube lessens, so does that in the other increase in height, like the two columns of liquid in a syphon. The whole pile can be removed from the delivery tube at once by a dexterous hand; but woe betide the luckless wight who "makes pie" (as the printers call the dropping and disordering of types in composing or distributing); for if a single ticket be disarranged, extra trouble is given in the after checking and correction.

As to the various colors displayed on railway tickets, some depend on the use of colored sheets of paper in the first instance; some on the production of stripes of color in a way bearing a resemblance to the making of colored stripes on earthenware or stoneware in the pottery districts; and some by a process more nearly resembling ordinary printing. One of the companies adopts a particular diagonal red line on all tickets, distinguishing them from other tickets which have to pass through the railway clearing house.

The automatic action of the machine or machines is very beautiful. For numbering each ticket, a peculiarly constructed wheel is used, which changes its particular digit every time a new blank is presented to it; and thus the consecutive numbers are produced on a series of tickets with unerring accuracy. A tell-tale index and a tell-tale bell, both automatically worked, give information as to the number of tickets printed, and the readiness of the machine to take in more food; but it is a matter of practical detail whether and when these tell-tales shall be deemed necessary. To give the reader an idea of how nicely this mechanism is adjusted, it refuses to work unless all the tickets are exactly of equal size, nicely squared, and in perfect order. It strikes one as being almost like a thing of life to see the machine detect a ticket from which a piece has purposely been torn off one end; its language is virtually: "Thus far shalt thou go, and no farther," for its prints as far as the defective ticket, and there stops.

As neither human fingers nor automatic machines are absolutely infallible, errors in numbering may occur in spite of all precautions. These are detected in a singular way. All the tickets in one series are made to pass through a machine with a velocity which the eye can scarcely follow. When stopped, the numbers are tested by two little index plates or wheels; if the same number is denoted on both indexes, all is well; but if any error has crept in, the index notifications differ, and afford means for determining at what part of the series the mishap has occurred.

A sheet of cardboard is certainly not a ponderous substance; but it is surprising how weighty the packages become when large quantities have to be dealt with. The tickets are tied up into small compact rows (string and tying being peculiar), and then packed into cubical masses in tin-lined boxes or cases—so firmly and closely pressed as to be as dense as a mass of wood. About fifty thousand tickets weigh one and a quarter hundredweight. The factory turns out two and a half millions of printed tickets (railway, steamboat, refreshment, etc.) per week, and ten millions of smoothly prepared but unprinted tickets; these numbers multiplied by the fifty-two weeks in a year, give a total annual production of something like six hundred and fifty millions, weighing upwards of sixteen thousand hundredweight! If these tickets be taken at two inches in length, and if they were laid flat, end to end, they would reach—— But we leave our junior readers to exercise their arithmetical skill in solving this problem: merely hinting that it would require many voyages from England to America, and back again, to cover a distance equal to the length of this cardboard ribbon. From such small beginnings do great results ensue.

The Niagara Railway Suspension Bridge.

It is said that a curious spectacle is daily presented at the Railway Suspension Bridge, near Niagara Falls, N. Y. Whenever a passenger train arrives, weighing in all, say 150 tons, the passengers are ordered out of the cars and requested to walk over the bridge, on the pretence of better safety; but at the same moment, and while the passengers are on the bridge, the heaviest freight trains and locomotives, weighing 230 tons or more, are passing over the upper floor of the same bridge, directly above the heads of the passengers.

It appears that the Great Western Railway Company is the lessee of the bridge, for which, by agreement, they pay fifty-five thousand dollars a year rental to the Bridge Company. Owing to the fall in the price of materials, the Great Western might now build a new bridge, of their own, at a cost the interest whereof would be considerably less than the present rental. But the only way to escape this rent is to break the lease: which might be done if the bridge should be decided by the referees to be unsafe, not otherwise. The Bridge Company lately caused a most careful examination of the bridge to be made by several of the ablest engineers, whose report, recently published by us, showed that the structure was in splendid condition as to strength and safety. But the Great Western Company still aim to get a decision of the referees, one of whom they have appointed, one has been selected by the Bridge Company, while the third remains to be chosen by the other two. They have not yet been able to agree upon the third referee. In the meantime, it is supposed that the object of the Great Western Company in compelling the unfortunate passengers to bundle out and walk the bridge at every trip is to create a public opinion, in advance, against the safety of the bridge, in the hope of thus influencing in their favor the decision of the third referee, whoever he may be.

Transmitting Photographs by Telegraph.

A French *savant* has proposed some method by which a photograph may be transmitted from one place to another by the agency of the telegraphic wire; but we have not yet been able to learn anything of the means proposed to be adopted for securing so desirable an end.

We are, however, says the *British Journal of Photography*, in a position to give details of a method by which a photograph may be transmitted with the "speed of thought" to any part of the world with which the sender is placed in electrical communication. But this transmission is subject to compliance with certain modifications by which the original character of the picture, as a photograph, must be slightly altered, although this alteration is not necessarily any greater than that to which it has to be subjected before it meets the eye of the public as an engraving in any of our illustrated periodicals.

Rather more than twenty years since, Mr. F. C. Bakewell, the author of a well known treatise on "Electric Science" and other philosophical works, invented what he termed "the copying telegraph." By means of this system the very handwriting of the person who wrote a message could be transmitted in *facsimile* to his correspondent, all errors in transmission being avoided owing to the fact of the message being traced by mechanical agency from the original document. To render clear our description of a method by which a photograph can be telegraphed, it is necessary that we should give a brief account of Mr. Bakewell's clever invention.

Premising that paper can be prepared with certain chemicals (such as a solution of prussiate of potash and hydrochloric acid) which are decomposed by the passage of an electric current, the decomposition resulting in a visible mark at any or every place where a sharp point in the electric circuit is allowed to touch the paper, it will be readily comprehended that to bring such a sharp point in communication with the paper so prepared is a feat that can very easily be accomplished at a point distant thousands of miles. Mr. Bakewell's invention consisted in causing the communication to be written on tinfoil with an ink which was a non-conductor of electricity. The letters thus written formed on the surface of the metal a number of non-conducting marks. If, now, this sheet of tinfoil, previously trimmed to a definite size, be wrapped round a cylinder which will just suffice to permit of its going once round: if, further, this roller, placed in the electric circuit, be made to rotate at a definite rate of rapidity, and with a spiral or progressive motion from one end to the other in relation to a fixed point: it will be obvious that if this latter point be a needle mounted with sufficient elasticity to rise and fall as it passes over the heights and hollows of the letters which rotate underneath its point (which must be blunted so as not to scratch), a current of electricity will be transmitted to a distance which will be continuous only in the ratio of the immunity enjoyed by the ground, or tinfoil, from the breakages caused by the constant interruption of the non-conducting ink with which the message is written.

The drum or cylinder containing the communication being rotated, spirally, at one end of the telegraph wire, it now remains to be shown how the message is received at the other end. A cylinder, of precisely similar dimensions to that round which the communication is to be sent, must be ready at the receiving end of the wire, and round this must be wrapped a sheet of paper prepared in the way we have indicated. It, too, like the former cylinder, must be pressed upon with a needle-point tracer, and, like the original, it must also be made to rotate at a certain velocity previously determined upon, and, finally, it, too, must be made to move slowly from end to end, so that the point shall pass over it in a continuous line or spiral. It only now remains that, all things being ready, the clockwork be started, when the former roller will rotate under a point which is transmitting electricity subject to the interruptions caused by the letters of the message. As the paper on the receiving roller is traveling both in a circular and lateral direction at the same rate, it is evident that every touch of the tracer on the original communication will be rendered visible on the blank paper at the other end of the wire, the only difference being that, whereas the original communication is dark on a white ground, the message is received in light letters on a dark ground.

To transmit a photograph in accordance with the principle here laid down, it is first of all necessary that it be converted into lines. With our present knowledge of electrical communication, we must not expect the electric current to discriminate between thick and thin non-conductors; and until this has been achieved, if it ever will be, graduated tints must remain in abeyance. To convert a photograph—a portrait, for example—into lines, a print should be made on silver paper in the usual way, and this must be traced over with black ink, using a fine pen. When the tints have in this manner been translated into lines, the photograph is immersed in a diluted solution of bichloride of mercury in hydrochloric acid, by which the photographic image will disappear, leaving the pen-and-ink drawing only visible. If from this a negative be taken and a print in carbon be made upon a sheet of tinfoil, all the electrical conditions requisite for effecting the transmission of this drawing to any distance will have been complied with. The gelatin which forms the blacks, or lines, of the carbon print is a non-conductor; the base, on tinfoil, upon which the print has been developed, or to which it is permanently attached, is a conductor, and nothing else is required in order to effect the transmission of the picture in the manner we have described.

The accuracy of any likeness thus transmitted will depend upon two things: First, the fidelity with which the artist who is employed to make the pen-and-ink tracing effects his work; and, secondly, the adoption of such means as will insure both cylinders (the transmitting and receiving cylinders) rotating with a similar degree of speed—a matter involving no difficulty whatever.

DECISIONS OF THE COURTS.

United States Circuit Court—District of Connecticut.

FIRE ARMS PATENT.—THE UNITED STATES RIFLE AND CARTRIDGE COMPANY AND E. REMINGTON & SONS *vs.* THE WHITNEY ARMS COMPANY *et al.*

[In equity.—Before Shipman, J.]

This was a bill in equity to restrain the defendants from an alleged infringement of letters patent granted to John W. Cochran on May 7, 1872, for improvements in breech loading guns. The plaintiffs are the owners of the patent, and E. Remington & Sons, for whose benefit the suit is brought, are the exclusive licensees thereunder. The answer of the defendants denies infringement upon their part, and also denies novelty of invention upon the part of the patentee, and alleges that the application of the said Cochran for a patent was filed on May 6, 1868, and that for more than two years prior to said date the invention had been in public use and sale with the consent and allowance of said Cochran, and that prior to the said date the invention had been abandoned to the public.

Held by the Court:

The provisions of section 35 of the act of 1870, that upon the hearing of the renewed applications therein referred to, abandonment should be considered as a question of fact, does not render delay of itself conclusive evidence of abandonment, but makes the decision of such cases depend upon the peculiar circumstances as a question of fact and not of law.

The decision of the Commissioner in regard to the questions which have been committed to his exclusive jurisdiction is final—such as the sufficiency and competency of the formal acts and proofs which the statute provides shall be a prerequisite to the issuing of a patent; the existence of those facts upon which a reissue is to be granted or an extension made; and the sufficiency of the reasons for delay exceeding two years in prosecuting an application made since the act of 1870.

The granting of a patent is *prima facie* but not conclusive evidence that the right to the invention has not been surrendered to the public, and the same is true in regard to abandonment upon renewed applications which were made under the 35th section of the act of 1870.

All the defenses which the statute authorizes may be made as well in respect to patents granted upon applications renewed under the 35th section of the act of 1870, as in respect to those issued upon original applications. Lapse of time, *per se* does not constitute abandonment.

The filing of an application is conclusive evidence that at its date the inventor did not intend to give his invention to the public, but it is not conclusive evidence that he did not subsequently do so.

Cochran's application was filed January 11, 1859, withdrawn February 20, 1860, and not renewed until after a period of eight years had elapsed. He, in the meantime, made numerous other inventions of a kindred nature, and obtained twenty-two patents thereon, constantly engaged in their development, and though poor, not thereby deterred from prosecuting his other inventions, and could have obtained a patent on this or at least kept the application alive had he so desired. Meanwhile the invention was