Date.	From	Length in miles.
	Porto Rico to St. Thomas	110
	Santiago, Cuba, to Jamaica	140
	Port Patrick, Scotland, to Donaghadee, Ireland	25
	Anjer, Java, to Telok Betong, Sumatra	75
	Banjoewangie, Java, to Port Darwin, Australia	1,082
	St. Thomas to St. Kitts	133
	St. Kitts to Antigua	90
1871.	Javea to Iviza, Balearic Islands	53
	Majorca to Minorca	35
	Villa Real to Gibraltar	155
	Marseilles, France, to Algiers, Africa	447
	Singapore to Saigon, Cochin China	620
	Key West to Punta Rassa	120
	Saigon to Hong Kong	975
	Hong Kong to Shanghai	1,100
	Shanghai, China, to Nagasaki, Japan, thence to Wladiwostock, Siberia	1,200
	Rhodes to Marmarice	22
	Latakia to Cyprus	86
	Samos to Scala Nuova	11
	Mytelene to Alvali	13
	Khania to Retimo	32
	Rhetimo to Candia	41
	Candia to Rhodes	201
	Chios to Chesmeh	6
	Zante to Corfu	150
	Zante to Cephalonia	18
	Lowestoft, England, to Greitseil, Germany	223
	Antigua to Demarara, connecting the West India Windward Islands	1,028
	Porto Rico to Jamaica	582
1872.	Lizard, England, to Bilbao, Spain	460
	British Columbia to Vancouver Island	18
1873.	Falmouth England, to Lisbon, Portugal	1,150
	Caithness to Orkney	8
	Valencia to Newfoundland	1,900
	Key West to Havana	150
	Placentia, Newfoundland, to Sydney, Cape Breton	300
	Heligoland to Cuxhaven, Germany	40
	England to Denmark	450
	France to Denmark	550
	Denmark to Sweden	10
	Pernambuco, Brazil, to Para, Brazil	1,382
	Alexandria, Egypt, to Candia or Crete	390
	Candia to Zante	240
	Zante to Otrunto, Italy	190
	Alexandria, Egypt, to Brindisi, Italy	930
1874.	Lisbon, Portugal, to Madeira, Madeira Islands	633
	Madeira to St. Vincent, Cape de Verde Islands	1,360
	St. Vincent to Pernambuco, Brazil	1,953
	Jamaica to Colon, South America	600
	Pernambuco, Brazil, to Bahia, Brazil	450
	Bahia, Brazil, to Rio Janeiro	1,240
	Italy to Sicily	7
	Jamaica to Porto Rico	582
	Rio Janeiro to Rio Grande do Sul	840
	Rye Beach, U. S., to Tarr Bay, Nova Scotia	550
	Barcelona, Spain, to Marseilles, France	200
	Shetland to Orkney	60
	Valencia to Newfoundland	1,900

The following is a list of the principal submarine telegraph companies, with the amount of their capital:

Anglo-American Telegraph Company: Ireland to Newfoundland; Newfoundland to Cape Breton; Brest to St. Pierre; St. Pierre to Duxbury, U. S. (five cables)—$35,000,000.

Brazilian Submarine Telegraph Company: Portugal to Brazil—$6,500,000.

Cuba Submarine Telegraph Company: Santiago to Havana—$800,000.

Direct Spanish Submarine Telegraph Company: England to Bilbao, Spain—$650,000.

Direct United States Submarine Telegraph Company: Ireland to Nova Scotia; Nova Scotia to the United States—$6,500,000.

Eastern Submarine Telegraph Company: England to Bombay *via* Mediterranean and Red Sea—$15,000,000.

Eastern Extension, Australian and China Submarine Telegraph Company: Madras to China and Japan; Java to Australia—$8,315,500.

Great Northern of Copenhagen Telegraph Company: England to Denmark, Norway, Sweden, and Russia—$2,000,000.

Great Northern China and Japan Extension: Siberia to Hong Kong and Japan—$3,000,000.

International Ocean Telegraph Company: Florida to Havana—$1,500,000.

Mediterranean Extension Telegraph Company: Sicily to Malta and Corfu—$760,000.

Montevidean and Brazilian Telegraph Company: Montevideo to Brazilian Frontier—$675,000.

Platino-Brazilian Telegraph Company Rio Janeiro to Uruguay—$2,000,000.

Submarine Telegraph Company: England to France, to Belgium, and to Holland—$2,093,200.

Western and Brazilian Telegraph Company: Coast of Brazil—$6,750,000.

West India and Panama Telegraph Company: Cuba to West India Islands and South America—$9,500,000.

Sanitary Sense.

Dr. W. W. Hall, in his *Journal of Health*, says a great many truthful things in his peculiar way. These are, and certainly should be, extensively read; for they include so much excellent advice that their influence can be for nothing else but good. The last number of the *Journal* is before us now, opened with the intention of clipping an article here and there; but after reading it all through, we really cannot decide that any one subject is better treated than the rest. Consequently, we have culled a few ideas which strike us as especially good and interesting, and these we give below:

Dyspepsia—says the opening paragraph of a short sermon on that wretched malady—means a difficulty in preparing the food eaten so that the nutriment can be extracted from it to supply the wants of the system. Eating too fast and too much are prolific causes; the first because the food, being swallowed in too large pieces, begins to ferment before it can digest, and the second because the stomach cannot cope with the quantity forced upon it. A limited supply of gastric juice is another cause, and this implies bad blood. Out of door life, moderate exercise until hungry, and simple food are the best remedies.

Bitters, the names of the multitudinous varieties of which disfigure the fences and scenery of the country, come in for severe handling, on account of their alcoholic composition. A list of thirty-four of these mixtures is given, including all we ever heard of and a great many which we did not know existed; and in every instance they are shown to contain alcohol. In brief, while persons are using bitters as a medicine, they are often drinking, three times a day, a more concentrated form of alcohol than is found in the purest whiskies and brandies. It should be set down as a settled rule that bitters in any form is alcohol in disguise.

Localities of life should be high. Elevated stations are generally exempt from the ravages of consumptive disease. The air is lighter and contains less oxygen; but as the lungs live on oxygen, as it is the oxygen which they bring in contact with the blood at every breath, it is that which purifies and gives it its life-giving power. If each breath of air does not give a sufficient amount of oxygen, instinct prompts a fuller breath; this distends the lungs more fully, and thus develops and strengthens them. A statement is given of the elevation of several American cities: New Orleans is relatively given as 10, New York and Philadelphia 35, Boston 40, Chicago 585, Nebraska City 1,000, and Winona, Miss., 1,500.

Many a family mansion, says the editor, speaking of healthy houses, has been built with the accumulations of the savings of half a lifetime to make the graves of half the household in a few months, from neglect of the precautions for thorough drainage and a proper water supply for drinking and cooking. Never select a house over a filling; prefer sandy soil or the top of a hill.

In Munich, the bodies of the dead are kept for forty-eight hours before burial, and the fingers are connected with a wire so that, in case the person should revive, his least movement will ring a bell and so give warning. This is not applied to babies; but it is suggested that, if the plan be adopted here, the wire should be attached to the child's toes, as all babies begin to kick as soon as awake.

With reference to winter garments, sufficient clothing, it is said, should be worn to keep off a feeling of chilliness when about usual avocations. Less than that subjects one to an attack of dangerous pneumonia at any day or hour. More than that oppresses. Steadily aim, by all possible ways and means, to keep off a feeling of chilliness, which always indicates that a cold has been taken.

Instinct teaches that less exertive power is required to keep moving than, after coming to a standstill, to set the body in motion again. The frequent stoppages of stages and street cars kill off the horses. Instinct also teaches the requisite expenditure of strength according to the circumstances of the season. No one walks as fast in summer as in winter. We get up in the morning with a certain amount of strength, and much may be gained by economizing during the day.

Spectacles become necessary when you first notice yourself going to the window instinctively for a better light, or when your eye gets tired by looking at any small thing near at hand, or a dimness or watering is manifested, so as to cause indistinctness. First purchase No. 20; and as you observe the symptoms above named, get No. 18, and so on. The glasses should be near enough to the eye almost to touch the lashes; they should be washed every morning in cold water and carried in a pocket by themselves. Brazilian pebble makes the best lenses. Avoid reading before sunrise and after sunset. Read as little as possible before breakfast, or by artificial light; do not sew on dark material at night, and use no other eyewash than pure, tepid, soft water. Babies' eyes are often injured by allowing the glaring sunlight to fall upon them.

Exercise is worth more than all the medicines in maintaining health. If it rains, take an umbrella and let it rain on; if it is cold, walk or work faster; if it is windy, turn around and go the other way; if it rains, hails, snows, and blows, all at once, so that you have to stay indoors, then live on bread and water that day, not an atom else, and you will need no exercise to work it up.

It should always be borne in mind that a large share of our little aches and pains would pass off about as soon by letting them alone as by doing or taking something; and the more we "take," the greater is the necessity for "taking."

The best way to enjoy things is to use them, and thus get the worth of our money out of them. There is no sense in gorgeous parlors kept in darkness.

Sometimes the reading of a single sentiment in a newspaper makes an impression on the mind which tinges the whole subsequent life for good.

The Musconetcong Tunnel.

The tunnel through Musconetcong Monntain, New Jersey, for the line of the Easton and Perth Amboy railroad, was opened on the 16th of December. The work was begun on April 10, 1872, from which date to August of the same year labor was devoted to making an open cut on the west side of the mountain. Tunneling was then started at both ends through formations of limestone and syenitic gneiss. Considerable trouble was experienced during the progress of the boring by irruptions of water from a subterranean lake. The tunnel is almost exactly one mile in length.

ERRATUM.—In our article on the hydrocarbons produced on iron and steel, published in our last week's issue, it is stated that the least volatile portions of the bromated product were "set aside to be treated with an alcoholic solution," "of potassa" should be added to complete the sense.

[For the Scientific American.]

THE ARITHMETICAL OPERATIONS OF MULTIPLICATION AND DIVISION.

We think that most of our readers will agree with the assertion that there is less probability of mistakes, on the part of the ordinary calculator, in making additions and subtractions of numbers than in multiplying and dividing. The reason is that the latter operations are more complex, requiring the use of all the fundamental rules of arithmetic. There is a simple artifice, employed by many in multiplying and dividing, which reduces these operations to cases requiring the application of the rules of division and subtraction only. The method referred to is tolerably well known, but not as generally as it should be; and we think that there are many of our readers who will be interested in receiving an explanation. The method finds its principal application in cases where different numbers are to be multiplied or divided by the same number, as, for instance, in the preparation of tables. We can best illustrate it by giving an example.

According to our observation, a question frequently arising with those who are engaged in mechanical pursuits is the determination of the circumference of a circle when the diameter is known. It is not always convenient or practicable to consult a book in which the properties of circles are given, but one can nearly always carry a few cards upon which useful numbers are written. Let us suppose that one of these cards contains the following:

CIRCUMFERENCE OF CIRCLE.

Diameter.	Multiplied by	Diameter.	Multiplied by
1 =	3·1416	6 =	18·8496
2 =	6·2832	7 =	21·9912
3 =	9·4248	8 =	25·1328
4 =	12·5664	9 =	28·2744
5 =	15·7080		

and that the circumference of a circle whose diameter is 130·0402 feet is required. Below is the solution:

```
   3·1416
 130·0402
 ---------
    62832
  1256640
  9424800
    31416
 ---------
 408·53429232
```

It will be observed that the multiplier is placed beneath the multiplicand, as in the ordinary method; but that instead of actually performing the operation of multiplying the multiplicand by each term of the multiplier, the several products are taken at once from the card and placed in their proper positions, so that we have only to add them to get the whole product. It will be advisable, in following this plan, to use small cards, with only one set of numbers on one side of each, to avoid confusion; and in preparing a card for a given number, it is well to form the several multiples by adding the number first to itself and then to each successive sum, repeating this operation nine times, so as to check the accuracy of the work. Below is given an illustration:

Areas of circles.	Square of diameter multiplied by
	0·7854 = 1
add 0·7854	1·5708 = 2
" "	2·3562 = 3
" "	3·1416 = 4
"	3·9270 = 5
" "	4·7124 = 6
" "	5·4978 = 7
" "	6·2832 = 8
" "	7·0686 = 9
" "	7·8540 = 10

It is evident, from simple inspection, that the last quantity is ten times the first, and this affords a strong presumption that the intermediate calculations are also correctly made.

An example is appended, showing the application of this method to division:

REDUCTION OF CUBIC INCHES TO CUBIC FEET.

Cubic in.	Divided by	Cubic in.	Divided by
1 =	1,728	6 =	10,368
2 =	3,456	7 =	12,096
3 =	5,184	8 =	13,824
4 =	6,912	9 =	15,552
5 =	8,640		

Question: How many cubic feet are there in 901,314,564·268 cubic inches?

```
1,728 ) 901,314,564·268 ( 521,594·076+
        8640
        ----
        3731
        3456
        ----
        2754
        1728
        ----
        10265
        8640
        ----
        16256
        15552
        -----
        7044
        6912
        ----
        13226
        12096
        -----
        11308
        10968
        -----
        940
```

A simple inspection of the card shows the successive figures of the dividend, and gives the products of the divisor by these figures, so that the operation is reduced to a series

of subtractions. It takes very little practice to render any one expert in this method, which combines the advantages of quickness and accuracy. By preparing cards from time to time, as occasion requires, one will find that he has, ere long, a pretty good stock of numbers, which, if carefully indexed, will prove very serviceable. The values of a few useful factors are appended:

Reduction of pounds to kilogrammes: Pounds × 0·454.

Reduction of kilogrammes to pounds: Kilogrammes × 2·205.

Reduction of inches to meters: Inches × 0·0254.

Reduction of meters to inches: Meters × 39·37.

Reduction of square feet to square meters: Square feet × 0·0929.

Reduction of square meters to square feet: Square meters × 10·76.

Reduction of cubic feet to cubic meters: Cubic feet × 0·028.

Reduction of cubic meters to cubic feet: Cubic meters × 35·32.

Reduction of U. S. gallons to cubic feet: U. S. gallons × 0·134.

Reduction of cubic feet to U. S. gallons: Cubic feet × 7·48.

Reduction of imperial gallons to cubic feet: Imperial gallons × 0·1604.

Reduction of cubic feet to imperial gallons: Cubic feet × 6·25.

Reduction of U. S. gallons to imperial gallons: U. S. gallons × 0·834.

Reduction of imperial gallons to U. S. gallons: Imperial gallons × 1·2.

ABOUT two thirds of the New State Capitol at Albany, N. Y., is now completed. The building thus far has cost $5,000,000, and it is estimated that about $7,000,000 more will be required to finish it entirely. If the State Legislature appropriate funds promptly, there is a prospect of the roof being in place by May, 1876.

Recent American and Foreign Patents.

Improved Safety Lock for Elevators.

Henry Carlile, Steubenville, Ohio.—This invention consists in providing an elevator with a pair of clamping jaws, which are actuated by the weight of the cage to seize the guides and arrest the downward movement of the carriage whenever the lift rope slacks or breaks. By the novel means employed in effecting this purpose, all chance of accident is removed, while the carriage may be held automatically at different elevations and stories. It seems admirably calculated for use in eounection with the elevators employed by hotels, warehouses, and stores.

Improved Feed Water Heater and Filter.

George F. Jasper, Freeburgh, Ill.—The supply pipe passes downward through and beneath the filtering material, and the water discharged therefrom passes upward through the said material, and flows over into a scries of sediment troughs or pans, and thence into the heating tank proper, from which it is conveyed to the boiler. The arrangement of the filter below the tank increases the surface available for application of heat in the furnace, when desired or necessary, as well as gives easy access to it for removal of the sediment when the furnace is fired up.

Improved Seed Planter.

Jacob R. Sample, Liberty, Miss.—This invention relates to the simultaneous distribution of comminuted manures and cotton or other seed, and consists in a peculiar shapo of the opening and covering plows, together with the standards hy which they are attached to the frame. This insures great uniformity and accuracy in the application both of seed and manure to the soil.

Improved Rotary Harrow and Roller.

Louis Belly, St. Anne, Ill.—This is an improvement in cultivating machines wherein rotary harrows are employed. The novel feature consists in an arrangement of parts whereby the harrows are supported entirely by the rollers and front wheels of the frame, and the revolution of the harrows arrested when raised from the ground.

Improved Stereoscope.

Absalom H. McClintock and Henry J. W. Barker, Fort Scott, Kan.—This is an improved stereoscopic apparatus designed especially for use in object teaching in classes, so constructed that a copy of the picture may be before each pupil. All the pictures may thus be exhibited, replaced by others, and moved to bring them into focus at the same time and by the same operation. Several pairs of lenses are arranged in a box, and the pictures are raised and held before the former by suitable devices. The supporting frame moves transversely to bring each picture into focus.

Improved Bale Tie.

Sewall J. Leach, Tuscaloosa, Ala.—A plate with a right-angled flange at each end is attached to one end of the hoop, and is a little narrower than the breadth of the latter. The flange is notched transeversely on the inner faces to lock the free end of the hoop, which is correspondingly notched on its edges to fit the notches of the flanges. The latter are inclined in the direction to cause the hoop to draw to the bottom of the space between the flanges, and thus insure the holding of it so as not to work loose. There is also a loop on one end of the tie for the free end of the hoop to pass through, to be kept in position at the time of fastening until secured by the notches.

Locomotive Attachment for Towing Canal Boats.

Charles Howard, New York city.—The driving wheels of the locomotive are constructed with a V-shaped groove in the periphery, so as to bring the bearing diagonally on the sides of rails without touching the tops. This adds to the traction in proportion to the angle or sharpness of the groove. The towing bars are applied on the bottom of the frame, are pivoted equidistant from the wheels near the center of the frame, and are of curved shape, extending beyond the wheels. They are bent at their ends into upward and slightly forward turned hooks, and swing toward the canal, allowing thereby a free adjustment to the different positions of the towing line. Suitable guide pieces applied to the bottom of the frame control the swing of the tow bars, and a spring forces the latter sideways, when there is no strain on them, preventing the obstruction of the track by the slackened tow line.

Improved Corn Coverer and Cultivator.

James Copeland, Bloomingdale, Ohio.—The vertical arm of a standard is slotted to receive a wheel that supports the forward part of the machine when adjusted as a coverer or double shovel plow. When the machine is to be used as a cultivator, the standard may be removed and replaced by a similar standard, the lowerarm of which is without a slot, is curved slightly forward, and has a hole formed through it to receive a bolt for holding a cultivator plow.

Improvement in Manufacturing Shoes.

Charles F. Hill, Baltimore, Md.—This invention consists in a shoe in which an insole, receiving the lasting nails, is covered by another insole, and the whole united by a line of stitching passing through the outer sole, upper, and the two soles.

Improved Office Door Plate.

Thomas S. Kennard, Exeter, N. H.—This invention consists in the application of time-indicating wheels and an inscribed slide to a slotted recessed plate, in such a manner that, when said slide is in a certain position, the device will indicate that the occupant of the office is out, and also the time of his return: and when in another position, that he is in, the name of the day of the week being indicated and the wheels locked in position in each case.

Improved Hydraulic Safety Valve.

John F. Taylor, Charleston, S. C.—This invention relates to certain improvements in hydraulic safety valves, whereby the valve is weighted with great convenience and facility by the fluid employed. It consists in a valve chamber provided with openings in its seat connecting with the escape pipe, in combination with a valve having different areas of pressure upon its opposite sides, the chambers upon the opposite sides of the valve being connected by a channel through the valve, so that the unit of pressure upon the valve is the difference between the opposite areas of pressure.

Improved Combined Hoe and Chopper.

Charles H. Gaylord, Osceola, Ark.—This invention consists in a tool by which the workman may cut up the soil on each side of a row of plants as he passes along, and then, giving it a half revolution, cut the weeds or surplus plants in the front and rear; the first operation being effected by a chop toward himself, while the second is produced by a chop from himself. The construction of the tool is such that the two effects are secured without changing the position of the workman, consequently with much less labor and fatigue, as well as with a great saving of time.

Improved Extension Table Slide.

James Plenkharp, Columbus, Ohio.—The grooved slides are connected by castings of angular form, with a dovetailed base. The lower half of each casting is provided with a projection or shoulder at its angle, the same being notched to receive a fastening screw or nail. Thus the castings are secured to the slides without being weakened and hence rendered liable to break at their angle, under the strain put upon them by the weight or pressure supported by the table top.

Improved Car Coupling.

Henry C. Chapman, Port Jervis, N.Y.—The outer end of the coupling link is raised or lowered by a looped rod, in which the link rests, and by which the said link may be elevated or depressed to suit the various hights of drawheads on different cars. By having a recess made in the face of the drawhead, into which the looped rod which supports the link may recede when the cars bump together, the said rod is prevented from being injured in the collision. The loop rod is suspended from a U crank of a long rod which extends across the end of the car, and which is readily turned from the side of the latter.

Improved Clamping Attachment for Tinners' Machines.

William H. Burnett, Stanfordville, N. Y.—A standard is cast with a ribbed socket-shaped top part and clamp screw for supporting firmly the operating machine parts, and with an enlarged base. For the purpose of dispensing with the permanent attachment of the standards, and for making them detachable, a strong clamping device, with circular top part fitting closely around the base of the standard, is applied by a clamping screw. The standard may be secured to any part of the bench, and also turned readily into any direction over and beyond the latter.

Improved Blind Bridle.

Francis Schwalm, Clarksville, Cal.—This invention consists in forming the cheek pieces of the bridle so that they operate as cranks on the blinds, which blinds are attached to their upper ends. By means of this improvement, the blinds may, at the will of the driver, be drawn tightly over, and so as to close the horse's eye, and held in that position until the danger is passed.

Improved Exhaust Regulator.

Charles C. Gregory, Fredericton, Can.—As the steam enters a receiver it forces up a spring piston. It then expands until the pressure is equal to that at the nozzle, when the spring will begin to react on the steam, and, while steam remains in the receiver to be forced out, will maintain a continuous uniform blast at the nozzle. A valve in the nozzle is provided for opening and closing it, to regulate the escape by opening the passage wider when the greatest pressure exists in the receiver, and closing it when the pressure decreases. This valve is operated by the piston. In case the steam should, at any time, enter the receiver in excess of the means of escape by this apparatus, the excess will be automatically allowed to escape through a pipe by the opening of a valve lifted by the piston, when the last arrives at a certain predetermined hight.

Improved Gas Beater and Condenser.

Sylvanus Warren, New York city.—This is an improved apparatus, to be placed between the exhauster and the purifier of a gas-making mechanism, for beating or scrubbing the gas, and condensing from it the tar and ammonia. By suitable construction, while the gas is passing through the central compartment of a drum, cold, tepid, or warm water or air may be forced through the end compartments and small connecting pipes, to regulate the temperature of the gas as it passes to the purifier.

Improved Shingle Bolting Machine.

William A. Fletcher, Beaumont, Texas.—The pivoted rest for the bolt is provided with two clamps, operated by a single shaft, having right and left screw threads. Said clamps are worked by a single crank for opening and closing them.

Improved Steak Tenderer.

Daniel J. Shults, Mount Union, Pa.—This is a device by which steaks may be easily and rapidly made tender. It consists of two toothed plates, which are hinged at one end, to be adjustable to greater or less thickness of steak, and closed by means of a lever with sectional pinion pivoted to the inner plate, and gearing with a toothed stationary arm of the lower plate. Both plates are carried toward each other by swinging the lever to the front, and act with considerable power on the steak placed between them.

Improved Target and Toy Pistol.

Warren Lyon, Mamaroneck, N. Y.—The first invention is a toy, for use with pea shooters and the like, for the amusement of children. It consists of two or more self-adjusting targets of equal weight, arranged on the ends of radial arms of equal length secured to a rotary shaft. The target is self-righting, and may include several grotesque figures. The same inventor has also devised a toy pistol which may be used in connection with the toy target just described. A piston is arranged in the barrel, and its rod connected at the rear end with a lever. The rod has a coiled spring on it to throw the piston forward. The lever is arranged in a vertical slot in the breech, above which it projects. The lower end has a notch below the pivot, in which a spring catch drops to hold the piston spring, and to be used for tripping it by the trigger. A stop is combined with the spring catch and trigger, to prevent damage to the catch by pulling the trigger too hard.

Improved Grain Separator.

John Gordon, St. Catherine's, Can.—The novel feature in this invention is a hinged valve which may be arranged to connect at will the carrier board leading to the discharge with the carrier board leading to the suction channel. This is useful in case the separation of the wheat into lighter and heavier grades is not desired.

Improved Pump.

J. C. Chambers and S. Chambers, Dallas, Texas.—This invention consists in combining, with three bottom-valved cylinders, three valved connecting pipes, and a single discharge pipe, three differential pistons, of which one is always forcing water into the discharge pipe. This produces a continuous and uniform flow of water, and not only greatly lessens the time usually required, but also very considerably diminishes the labor.

Improved Sack Scale.

Pascal P. Parker, Parkersburgh, Iowa, assignor to himself and Milton I. Powers, same place.—To the inner edge of the seale pan are attached two standards, to which is secured an oval band having an inwardly projecting flange formed upon its lower edge, and which is provided with an open spring ring for supporting a bag, and holding the mouth open while being filled.

Improved Land Roller.

Benjamin S. Healy, Cohocton, N. Y.—The new feature in this invention is an arrangement of the double tree and draft bars whereby the draft will always be applied to the front part of the frame in whatever position the tongue may assume.

DECISIONS OF THE COURTS.

United States Circuit Court.—District of Massachusetts.

PAPER BOX PATENT.—UNION PAPER BAG MACHINE COMPANY *vs.* LUTHER CRANE *et al.*

[Before Clifford and Lowell, J. J.—May Term, A.D. 1874—to wit: October 6, 1874.]

Lowell, J.:

The bill is brought under section 58 of the consolidated Patent Act of 1870, 16 Stat., 207, alleging that the plaintiffs own a patent granted to them December 24, 1872, as assignees of Lorenzo D. Benner, for an improvement in paper bags, of which said Benner was the original and first inventor; that the defendants hold a patent dated February 20, 1872, for an improvement alleged to have been invented by Luther C. Crowell; that the patents interfere, and the plaintiffs pray that the patent of the defendants may be declared void.

The answer denies that Benner was the original and first inventor of the improvement patented to the plaintiffs; insists that Crowell was the inventor of that held by the defendants; does not explicitly confess or deny the interference between the two, and concludes with a prayer that the plaintiffs patent may be adjudged void.

It appears to us, on a comparison of the specifications, that they describe and claim the same invention, and the evidence proves that the plaintiffs intended that their patent should cover the same ground as the defendants. The Patent Office decided in favor of the plaintiffs, after an interference had been regularly declared with Crowell's patent, which had already issued: upon the hearing, Crowell produced no evidence excepting his own statement, and Benner examined several witnesses, and both parties were heard in argument.

Two points of law are taken by the plaintiffs: First, that the decision of the Patent Office is final between these parties; second, that the defendants are estopped by the statement made by their assignor Crowell to the Patent Office respecting the date of his invention to introduce evidence in this cause carrying his invention back to an earlier time than that which he specified in that statement.

1. The decision of the Patent Office is never final upon the question of the novelty or priority of an invention. The rule may have been adopted at first from a consideration of the *ex-parte* character of the proceedings at Washington, but it has never been confined, as is now maintained by the plaintiffs, to cases in which no contest was had; and it is obvious that it cannot be so limited, because, if one party to an interference is concluded as against the other party, the result may be that the patent is valid as against him, which is void against all the rest of the world. If, for instance, Crowell's invention was, in fact, earlier than that patented to the plaintiffs, the latter patent is conceded to be void as against every one who had no hearing before the Patent Office, while the defendants' patent would be void as against the plaintiffs, and all persons claiming under them; so that the only person who could not practice the invention would be he who had made it, and his assignees.

The statute is not ambiguous. It gives a court of equity power to decide between interfering patents without any exception or limitation. This is substantially a re-enactment of section 16 of the act of 1836, under which Mr. Justice Nelson is said to have decided the very point. Atkinson *vs.* Boardman: Laws's Dig., title, Construction of Statutes 18. See, also, section 50 of the act of 1870.

By the act of 1 93, interfering applications were to be passed upon by three arbitrators, and upon this act Mr. Justice Story said:

"The award or decision of the arbitrators would have been final between the parties only so far as respected the granting of the patent.

The sole object of such an award is to ascertain who is *prima facie* entitled to the patent. But, when once obtained, it is liable to be repealed or destroyed by precisely the same process as if it was issued without opposition. Stearns *vs.* Barrett, 1 Mason, 173, 4.

Upon reasoning and authority, then, the new patent granted after a hearing merely makes out a *prima facie* case for the plaintiffs, shifting the presumption that would otherwise exist from the earlier date of the defendants' deed.

2. There is no ground for holding the statement of Crowell an estoppel. It was not made to the plaintiffs, nor intended to influence their action, and the evidence is clear that they did not act upon it.

We have examined, with great care, the evidence concerning priority of invention, and are of opinion that Crowell was the true and first inventor. He neglected his case before the Patent Office, and the examiners were led to believe that he might have obtained hints or suggestions from the drawings of Benner for a patent that was issued to him a short time before that of Crowell. It is true, those drawings were left with Mr. Coffin, one of the persons interested in Crowell's invention, and in the shop where Crowell was at work on his machines; but the evidence in this case does not prove that any use was made of them, but tends to prove the contrary. But a wholly decisive consideration, as to which the course of proceedings before the Patent Office led the examiners into error, is that those drawings do not contain the invention, and, if they had been seen and studied by Crowell, would be no answer to his claim of priority. This is now admitted by the plaintiffs, and was well known to them while the interference was going on, as appears by a letter from their counsel to the president of the company, which they have printed on page 41 of the record. As their argument before the Patent Office is not given, we do not know whether the admission was made at that time; but the fact that the decision was very largely influenced by this mistake is shown by the record, and must detract much from the weight of the adjudication.

Upon the principal point of fact we are well satisfied, not only that Crowell's invention was actually made by him, but that it was completed in 1867. The plaintiffs, not denying that Crowell made the invention, insist that he was not the first inventor, and have introduced evidence which they rely upon to prove that Benner made it in 1868, and that Crowell was not earlier than 1871. The defendants, on the other hand, insist that they have thrown doubt upon the claim of Benner to have made the invention at all, though he may have approached it. As we are satisfied that Crowell really made the invention before Benner or any of his witnesses say that Benner made it, we have not examined the question whether Benner ever made it at all.

Decree for defendants.

United States Circuit Court.—District of New Jersey.

FLUTING MACHINE PATENT.—SUSAN R. KNOX *et al. vs.* ARTHUR H. LOWEBEE *et al.*

[In equity.]

Nixon, J.:

The bill filed in this case charges the defendants with infringing four different patents belonging to the complainants—to wit:

1. Patent issued to Susan R. Knox and W. D. Corrister, April 3, 1866, and reissued to Susan R. Knox, assignee, April 1, 1870, No. 3,681.

2. Patent issued to Susan R. Knox, November 20, 1866, and reissued to her April 26, 1870, No. 3,938.

3. Patent issued to Samuel G. Cabell, July 17, 1866, and reissued to Flora B. Cabell, assignee, March 1, 1870, No. 3,856.

4. Patent issued to Flora B. Cabell, assignee, November 10, 1868, No. 83,924, and reissued to Flora B. Cabell and Susan R. Knox, assignees, November 28, 1871, No. 4,653.

The defendants, in their answer, deny the validity of these patents on various grounds. They allege that the complainants were not the original and first inventors of the said inventions or of any material or essential parts thereof: that there was a prior knowledge, use, and public sale, in many parts of the United States, of machines embodying all the principles and combinations claimed as new by the complainants; that the invention had been mentioned and described in certain printed publications; that there had been an abandonment by the inventor to the public; and that there had been no infringement by the defendants of the rights and privileges alleged in the bill to be secured to the complainants by their several letters patent.

Held by the Court:

A patentee held to have made his invention when he had a machine embodying it completed and in operation and actual use, though the use was private.

Delay in filing an application is no ground for charging the inventor with abandonment if he was residing in the insurrectionary States during the war.

Making the lower roll in a fluting machine adjustable is an infringement of a patent for making the upper roll adjustable by similar means and for the same purposes.

Making the roll adjustable by means of a rack and pinion instead of a screw is also an infringement.

Decree for the complainants against the defendants for the infringement of the first and third claims of the reissued patent No. 3,856, and of the first and second claims of the reissue No. 4,653; but without costs.

[*J. J. Coombs* and *F. W. Leonard*, for complainants.
N. Perry, Jr., for defendants.]