an adequate solution of the problem of how to cheaply and quickly remove snow from the streets. The mere cost of coal for melting would probably not prove an insuperable obstacle, but the freezing of water resulting from the operation would be a greater evil than that sought to be remedied. The writer believed that melting the snow would be more economical than carting it away; but in order to do this, the snow must be swept from the street ways, either to the traveling machine or to fixed pipes, previous to melting; and the water must be conducted direct to the sewers to prevent the formation of ice in the streets. He knew of no means by which this could be accomplished, but expressed the opinion that improvements yet to be made will, in the future, make snow melting the most satisfactory method of cleaning city streets in winter.

Combustion.

At a recent meeting of the Edinburgh and Leith Engineers' Society, a paper on "Combustion" was read by Mr. Wm. Allan Carter, C. E. He remarked that an ordinary sample of anthracite coal is found to contain the following constituents in something like the following proportions:—Carbon, 86·32 per cent; oxygen, 7·21 per cent; hydrogen, 3·75 per cent; nitrogen, 0·41 per cent.; ash, 2·21 per cent; sulphur, 0·10 per cent. But in ordinary bituminous coal, such as from Edinburgh, Glasgow, Newcastle, Lancashire, or Durham, we find the carbon ranging from 74 to 88 per cent, and the hydrogen from 5 to 6 per cent; and in bituminous coal, the amount of hydrogen is an important feature, as it is from this gas that flame is produced during combustion.

We will suppose some time has elapsed since fresh fuel has been thrown on the fire, and we find that the fuel on the bars presents to our view a glowing, incandescent mass, with no appearance of smoke and no flame, and we will suppose that the only access for the air necessary for supporting combustion is through the fire bars from the ashpit, through the incandescent fuel and finally away to the chimney; and it need scarcely be said that the supposed case is one of very common occurrence.

The moment the air comes in contact with the incandescent fuel it is resolved into its constituents, nitrogen and oxygen, the nitrogen passes on to the chimney with no further change than increase of volume from increase of temperature; the oxygen, however, is arrested, and each atom of carbon seizes two atoms of it, and one atom or equivalent of carbonic acid is formed. If this carbonic acid got away to the chimney, nothing further could be desired, and complete combustion of the coke would be effected. But it is not destined to escape in this manner, for before the atom of carbonic acid has struggled through the mass of fuel and got free from it, it has taken up another atom of carbon, and now, instead of being carbonic acid, CO_2, it has been converted into C_2O_2, or two equivalents of carbonic oxide, and it is this gas which escapes to the chimney. Experiment has proved that carbonic acid is not combustible, but that carbonic oxide is, and it stands to reason, if anything of a combustible nature is escaping from the chimney, we cannot be having complete combustion in the furnace; but there are very few practical men who have any idea whatever as to the magnitude of the loss of heat when carbonic oxide is the result of combustion instead of carbonic acid; for we find from calorimetrical experiments that, in the former case, we only get three tenths of the evaporative power produced in the latter. Now in order to burn this carbonic oxide, we must supply each atom of carbon in it with another atom of oxygen while the carbon is at a sufficiently high temperature; if the combination is effected, then our carbonic oxide is reconverted into carbonic acid, and has given out during its reconversion the seven tenths of heat which we noted were deficient in the formation of the oxide.

The next point considered was the gaseous portion of the coal, and it was pointed out how fuel might be lost, either by the gas escaping wholly or by being only partially burned, the latter alternative causing the formation of smoke and soot. Mr. Carter showed how this latter alternative was generally attributable to the want of a proper supply of air admitted above the fire, or to the flame being brought into contact with the metal plates of the boiler, and so cooled down below the temperature necessary for ignition of the gas, and mentioned the following instance:

"Last winter I had a little stove in one of the rooms of my house; it is one of those commonly known as a gill stove; the whole of the air supporting the fire had to pass from beneath through the bars, and consequently through incandescent fuel, before reaching the flue. I was greatly disappointed with the performance of this little stove, as far as its heating power was concerned; eventually I took off the door and drilled a number of small holes in it so as to admit jets of air above the fire; the fire inside has been as bright and as lively again since this surgical operation, and the quantity of soot collecting in the flue, which before proved a constant nuisance, is now almost reduced to *nil*. This is an instance of how easily a remedy may sometimes be applied."

After going through various calculations to show the quantity of air required above and below the fire for certain quantities of coal, and how smoke and soot were formed, Mr. Carter concluded in the following terms:

"So long as popular errors prevail amongst that class of men who have the direct control of furnaces of all descriptions—I allude to the practical managers or foremen in manufacturing works—little will be done to prevent waste of fuel; and as a rule, when you begin to speak to them about carbonic acid and carbonic oxide, they look at you with an incredulous smile, you at once lose caste with them and fall from the high position of a practical man to the pitiable *status* of a mere theorist. But I maintain that this is not simply a matter of theory, but that the principles involved are of an eminently practical nature, and if applied in practice may be turned to good account. We must impress on the practical man that air is required in certain quantities and delivered in certain methods; we must combat the idea that gas is smoke, or that gas and smoke are synonymous terms. We must point out that volumes of black smoke do not constitute the only indication of waste of fuel, for, as I have shown, the waste may be enormous although no vestige of smoke is to be seen. We must challenge the idea that a furnace can consume its own smoke, that is simply impossible; we can construct a furnace to prevent the formation of smoke, but let smoke once be formed, and it cannot be consumed in the same furnace, its presence indicating that the furnace is wanting in those conditions essential for the completion of combustion."

OCEAN TELEGRAPHY.—THE FOREIGN CONNECTIONS OF NEW YORK CITY AND THE EXISTING RATES OF CHARGES.

Telegraphic communication between the United States and the West Indies is maintained over the following routes: From Punta Rassa, Florida, *via* Key West to Havana by cables, thence by land lines to Batabano; thence by cable to Santiago de Cuba; thence by cable to Kingston, Jamaica. From Kingston a series of cables extend to Demarara, South America, touching at Porto Rico, St. Thomas, St. Kitt's, Antigua, Guadaloupe, Dominica, Martinique, St. Lucia, St. Vincent, Barbadoes, Grenada, and Trinidad. A cable also extends from Jamaica to Aspinwall on the Isthmus of Panama.

A cable steamer is now on her way to Trinidad to lay a cable from Port of Spain, Trinidad, to Ponce, Porto Rico, touching at St. Croix, after which she will proceed to lay a cable between Cienfuegos, Cuba, to Jamaica. When these are completed, the United States and West Indies will be substantially united by a double series of cables, so that, in case of failure of any one of them, communication will not be interrupted. The shore ends of a cable to extend from Demarara, South America, to Cayenne, South America, were laid last month, and the cable steamer Hooper is now on her way to Cayenne, to lay the deep sea cable to Demarara. When this link is laid, there will be a complete line of telegraphic communication between the United States and Rio Janeiro, South America; and when another link is laid between Rio Grande do Sul and Maldonado, Uruguay, the United States will be in telegraphic communication with all of South America, bordering on the Atlantic ocean, north of Buenos Ayres, and with Chili on the Pacific. A singular fatality has thus far attended the laying of the cable between Rio Grande do Sul and Moldonado. The telegraph steamer Gamas was first wrecked in attempting to lay it, and more recently the La Plata was chartered to pursue the work and was wrecked in the Bay of Biscay, the cable and all persons on board being lost.

Until the cable is laid down between Cayenne and Demerara, communication between the United States and other parts of South America must be forwarded *via* Europe, the cable between Lisbon, Portugal, and Pernambuco, Brazil, furnishing the only means of telegraphic intercourse.

Communication between the United States and England is maintained by land lines to Sydney, Cape Breton, thence by cables, to Placenta, Newfoundland, thence by land lines to Hearts Content, Newfoundland, thence by three cables to Valentia, Ireland, thence by land lines to Wexford, Ireland, thence by cable to Haverfordwest, England, thence by land lines to London.

Communication between the United States and France is maintained by cable from Duxbury, Mass., to St. Pierre, and thence by cable to Brest, France. Communication between Great Britain and the various continental states is transmitted over two cables to Denmark; two to Germany; two to Holland; two to Belgium; one to Norway; one to Portugal; two to Spain; and six to France.

There is one cable between France and Denmark; one between France and Spain; two between France and Algeria; two between Portugal and Gibraltar; one between Gibraltar and Malta; one between Algeria and Malta; two between Sicily and Gibraltar; one between Malta and Alexandria; one between Italy and Alexandria, touching at Corfu, Zante, and Candia; one cable between Russia and Turkey, through the Black Sea; one between Norway and Denmark; one between Denmark and Sweden; one between Sweden and Russia; one between Denmark and Russia; one between Sweden and Germany; one between Egypt and India, through the Red Sea and Indian Ocean, touching at Aden; one between Persia and India, through the Persian Gulf, touching at Gwadar in Beloochistan; one from Madras, India, to Penang in the Strait of Malacca; one from Penang to Singapore; one from Singapore to Saigon, Cochin China; one from Saigon to Hong Kong and Shanghai, China; one from Shanghai to Nagasaki, Japan; one from Nagasaki to Hiogo and Yokohama, Japan; one from Nagasaki to Wladivastok, Asiatic Russia; one from Singapore to Batavia, Java; one from Java to Australia; one from Australia to Tasmania or Van Diemen's Land. The following cables are projected: From Australia to New Zealand; Ceylon to Australia; Singapore to Borneo; Borneo to Luzon; Luzon to Hong Kong; Yokahama to Hokodadi; Siberia, mouth of the Amoor, to Kamtchatka; Calcutta to Penang; Hong Kong, China, to San Francisco, touching at the Sandwich Islands; Havana to Vera Cruz; Aspinwall, Isthmus of Panama, to Carthagena, South America; Panama to Buenaventura, New Grenada; Buenaventura to Callao, Lima; Callao to Valparaiso, Chili; England to Virginia, touching at the Azores and Bermudas; Portugal to New York, touching at the Azores; Scotland to Labrador, touching at the Faroe Islands, Iceland, and Greenland.

Communication between England and India is mainly confined to the following routes: First, from Penzance on the southeastern coast of England to Lisbon, Portugal; thence to Gibraltar; thence to Malta; thence to Alexandria, Egypt; thence by land line to Suez, and thence by cable to Aden and Bombay. Second, by cable from Lowestoft, England, to Emden, Germany, thence by land line, *via* Berlin, Germany, Warsaw, Jitomer, Odessa, Kertsch and Tiflis, Russia; Teheran, Bushire, Henjaum, and Jask, Persia; Gwadar, Beloochistan, and Kurrachee, India. This is known as the special Indo-European line, and is worked in one circuit from London to Teheran, a distance of six thousand miles. From Kurrachee and Bombay, land lines extend to Calcutta, Madras, and Paumben. From Paumben a cable extends to the Island of Ceylon. From Madras a cable extends to Penang and Singapore. From Singapore cables extend to Saigon, Cochin China, and thence to Hong Kong and Shanghai in China and Nagasaki, Hiogo, and Yokohama, in Japan. From Nagasaki a cable extends to Wladivostok, the terminus of the Russian land lines in Siberia. From Singapore a cable extends to Batavia in the Dutch island of Java; from Java a cable extends to Port Darwin, Australia, and there connects with a land line extending to Victoria, Australia; from Victoria a cable connects with Tasmania or Van Diemens Land. Telegraphic communication exists between Victoria, British Columbia, and Hobart Town, Tasmania, embracing 273 degrees of longitude, and thus lacking but 87 degrees of encircling the globe; and when the projected cable from San Francisco to China is laid, the circle will be completed. When this latter enterprise is carried out, the telegraphic correspondence between North and South America and the West of Europe, with China, Japan, and Australia, will take this route, as it will be the shortest, cheapest, and most expeditious.

The telegraphs of the world, aerial and submarine, embrace 385,872 miles of line, 871,417 miles of wire, and 30,150 stations. The annual traffic amounts to about 80,000,000 messages.

The tariff upon telegraphic despatches from New York to other countries is as follows: Great Britain and Ireland $1 per word, France $10 for 10 words or less, Cuba $5.40 for 10 words or less, Jamaica $7.75, Porto Rico $11.50, St. Thomas $11.88, St. Kitt's $12.75, Antigua $13.00, Guadaloupe $13.38, Dominica $13.75, Martinique $14, St. Lucia $14.25, St. Vincent $14.50, Grenada $15.00, Barbadoes $15.13, Trinidad $15.50, Demarara $17.50, Berbice $17.50, Aspinwall $12.75, Panama $13.75, Aden, Arabia, $20.00, Port Darwin, Australia, $56.62, New South Wales $57.88, South Australia $56.62, Victoria, Australia, $57.12, Tasmania and Queensland $59.12.

Austria and Hungary $11.50, Baden $11.50, Belgium $10.84, Channel Islands $11.66, Denmark $11.40, Germany $11.10, Holland $11, Norway $11.80, Portugal $12, Roumania $11.88, Russia in Europe $12.50, Servia $11.88, Spain $12, Sweden $11.75, Switzerland $11.75, Turkey in Europe $12.25, Wurtemberg $11.50.

Beloochistan $18, Bushire, Persia, $16.12, Ceylon $20.50, Hong Kong, Amoy, and Shanghai, China, $40, Saigon, Cochin China, $38.50, Corfu $12.50, Egypt $15.30, Gibraltar $12.75, Greece $12.75, India $20, Japan $50.38 to Nagasaki and $52.62 to Hiogo, Osaka, Simonosaki, Yeddo, or Yokohama.

Java $40.62 Madeira Islands $15.38, Malta $12.50, Penang $33.50, Persia $16.12, Russia in Asia from $13.12 to $19.16, Cape de Verde Islands $24.38, Singapore $37.50, South America: Buenos Ayres $68.75, Chili $68.75, Montevideo $68.75, Pernambuco $40.50, Bahia and Para $51.50, Rio de Janeiro $56.50, Santos $62.25, Rio Grande do Sul $63.25.

Machine Belts.

In a recent paper read by John W. Sutton, M. E., before the New York Society of Practical Engineers, the author made the following observations:

Although the use of belts for the transmission of power is not, strictly speaking, an American invention, the great improvements made in this country have caused it to be known in Europe as the American system. In Europe the greater part of the power is transmitted by cog wheels, but in this country 99 per cent is transmitted by belting. The latter is used everywhere, from the sewing machine to the 500 horse power engine of the largest factory. Belts can be run in any way, at any angle, of any length, and at any speed, and can be put up by any one of ordinary skill. They can be made of any flexible material—leather, rubber, gutta percha, cloth, paper, raw hide, cord, or wire—and they may be either round or flat; and the last novelty is a sheet iron belt, and it is said to work well. Every one uses them. While so handy and so popular, they have one fault. They are not positive. If you start from the motor with a certain number of revolutions, you lose a portion of them with every belt used. This is the only fault of the system. It is noiseless, yielding, and regular. but, unlike cog wheels, it is not positive. The number of revolutions that are lost may, and do, vary continually by changes of the load or of the atmosphere. It is upon these peculiar changes of our favorite system that I propose to speak to night. Belts derive their power to transmit motion from the friction between the surface of the belt and the pulley, and from nothing else, and are governed by the same laws as friction between flat surfaces. The friction increases regularly with the pressure.

The lecturer then gave the results of some experiments with belts and pulleys to prove this. He found that there was a great difference in the friction of belts, and it was due to their elasticity of surface, that is, the more elastic the surface, the greater the friction. He made experiments with a pulley and belt, moved by a lever and spring balance, to show the difference in the actual friction between the grain and flesh sides of a leather belt in contact with a

smooth cast iron pulley. He said that the old rule, "that the number of inches in contact, multiplied by one half the velocity of the belt in feet per minute, and divided by 33,000, would give the horse power," might give it once in a hundred times, but not oftener. The rule is that a belt holds upon a pulley as the tension (pressure) and as the square of the degrees of wrap. A belt wrapped one quarter around a pulley has only one fourth the power of a belt wrapped one half around the same pulley with the same tension.

A line around a post will give a good illustration of this. One half a turn, and a man's weight is doubled: while a full turn, and his weight is nearly enough to stop a heavy boat, and two turns and his weight will stop the boat, or the line will part.

Belts always run to the high part of a pulley when the shafts are parallel; but when they are not, the belt will always run toward the ends of the shafts that are nearest together, and this tendency is much stronger than to run to the highest part of the pulley. If you have a belt that gives trouble in this way, you can see if it is the fault of your shafting by drawing a line across the edges of the two pulleys. Sometimes the bearings may be in line; but the tension of your belt is so great as to spring the shaft, so as to throw the pulleys out of line. A stiffer shaft or another bearing is the remedy. Leather and rubber belts each have their advocates, and each party say theirs is very much better; but each kind is better in its place. Where the belt is clear, a rubber belt will transmit 20 per cent more power with the same tension, and will last as long and run perfectly straight. It can be made of any length or width, of exactly the same thickness in every part, perfectly smooth on its surface; and when in use, every part will come in contact with the face of the pulley. The greater tractile power of a rubber belt is due to its surface elasticity.

Leather belts have to be made from pieces, and, as the leather is not perfectly flat, a perfectly flat belt cannot be made from it. If a belt is cut from the back of a hide, the edges are not so firm as the center, and upon a crowned pulley they will not hug as well as if they were of the same firmness as the center. If the belt is cut from one side of the back, then one edge will be less firm than the other, and the belt will be crooked, and one side will have more tension than the other. Leather belts are usually riveted at the joints. Now, if a rivet head touches the pulley, the friction is less than if the leather touched. If the head is above the surface of the belt, then a portion of the belt is not in contact with the pulley; and if the head is below the surface of the pulley; then of course there is no contact. Now every rivet in a belt is in one or the other of those positions, and leather belts would be improved by using something else in their place. Double leather belts are used more than single ones; but it is clearly a mistake, as a single leather one will transmit more of the power than a double one. If you look at the face of a leather belt, you will see when it has been used for a time, the face has a mottled appearance, light and dark, showing how much of the surface of the belt has been in contact with the pulley. If an average of one inch of width has not touched, then you have paid for one inch of belt that is of no use, but is really a detriment. Double leather belts run straighter than single ones, as the flank side of one part can be put against the back of the others. A double belt will stand a greater tension than a single one, but a single one will stand all that should be put upon any belt.

The cost of belting is increasing every year, and it is well to look out for the belt of the future. My impression is that it will be made of low steel of great tensile strength, and will run upon pulleys, with an elastic surface to give greater friction. The instance I mentioned, of a sheet iron belt running upon cast iron pulleys, is, I believe, in Pittsburgh. But we have a hundred instances of the steel belt upon an elastic surface pulley in this city, in the band saw, and one of a large sawmill sawing logs with a band saw about three inches wide. Now a band saw is a belt, and the power to do work is all derived from the friction between the band saw and the lower pulley. In the case of the sawmill spoken of, it amounts to from 10 to 15 horse power, and this is all transmitted by the saw itself. It may be said that we cannot get belts of steel wide enough to take the place of our large belts. Whenever such belts are wanted, they will be made of any width and length asked for.

Belts of the present make are run with a strain of one fifth their strength; and as the strength of low steels is over 100,000 pounds to the square inch, a belt one foot wide and one eighth of an inch thick would have a strength of 150,000 pounds or more. One fifth of that would give us 30,000 pounds; this strain, upon an elastic surface pulley of, say, 16 feet, running at a speed of 2,000 feet per minute, would give us a belt with the power to transmit over 1,800 horse power. If the belt were one sixteenth of an inch thick, it would be able to transmit 900 horse power. We have no belts now capable of anything like this. How will this belt be joined? When the band saw first came out, that was looked upon as the stumbling block in its way, but to-day they are joined without a thought, and in about the same time that it would take to join a belt of leather. The steel belt would be joined in the same way. Whether this steel belt is the belt of the future or not, there will be wanted a better and cheaper one than we now have, and it is to the practical engineers that we are to look for it.

Encke's Comet.

The return of Encke's comet to our heavens has been for some time expected, but its immense distance (182,000,000 miles) rendered all search with ordinary instruments useless. The large equatorial at the Naval Observatory, Washington, D. C., was recently put into service, and the comet was seen through this superb instrument by Professor Holden and Paymaster Tuttle of the U. S. N. Its distance rendered the use of the micrometer impossible, and it will scarcely be observable under ordinary conditions for several weeks.

It is known to our readers that the equatorial telescope above mentioned is one of the finest in the world. It is Alvan Clark's masterpiece, and has an objective 26 inches in diameter. Its power is now demonstrated in a remarkable manner

THE POST OFFICE A CARRIER OF MERCHANDISE.

Since the adoption of postal cards for cheap communication by mail, there has been no modification of our postal laws which so greatly accommodates the public as the one permitting the sending through the mails of nearly all classes of merchandise, in packages not exceeding four pounds in weight, at the low price of one cent for every two ounces. The following are some of the articles officially named as belonging to the class of merchandise that can be mailed at this low rate:

We copy from the *Post Office Guide*, which gives this provision of the law:

Rates of postage on third class matter: Mailable matter of the third class embraces all pamphlets, occasional publications, transient newspapers, magazines, handbills, posters, unsealed circulars, prospectuses, books, book manuscript, proof sheets, corrected proof sheets, maps, prints, engravings, blanks, flexible patterns, articles of merchandise, sample cards, phonographic paper, letter envelopes, postal envelopes and wrappers, cards, plain and ornamental paper, photographic representations of different types, seeds, cuttings, bulbs, roots, scions, and all other articles not above the weight prescribed by law, which are not, from their form or nature, liable to destroy, deface, or otherwise injure the contents of the mail bag or the person of any one engaged in the postal service.

All packages of matter of the third class must be wrapped or enveloped, with open sides or ends, so that their contents may be readily and thoroughly examined by postmasters without destroying the wrappers; but seeds and other articles liable, from their form or nature, to loss or damage unless specially protected, may be inclosed in unsealed bags or boxes which can readily be opened for examination of the contents and reclosed; or closed bags, made of material sufficiently transparent to show the contents clearly, without opening, may be used for such matter.

No writing will be permitted on articles of this class, or their wrappers or envelopes, except the address of destination. Any other writing in or upon any package or article of this class will subject it to letter rates of postage.

Matter of the third class inclosed in sealed envelopes notched at the ends or side, or with the corners cut off, cannot be mailed except at letter postage rates.

The foliowing, and some other articles unnecessary to specify, are unmailable: Packages containing liquids, poisons, glass, explosive chemicals, live animals, sharp pointed instruments, sugar, flour, or any other matter liable to deface or destroy the contents of the mail, or injure the person of any one connected with the service.

Persons living at a distance can send small models much cheaper by mail than by any other means; and if properly packed, they usually arrive at their destination in good condition. We receive a number of models from various parts of the country by every mail; and the only trouble we have with packages so sent arises from the sender not following the official rule, which requires that the package shall not be sealed, and shall not contain any writing; and that the full postage on the package shall be prepaid. When the sender does not observe these requirements, we are obliged to pay full letter postage, which makes the cost by mail greater than by express.

By observing the law's requirement, inventors can avail themselves of the mail, for transmitting their models from distant places to this office, to great advantage. But one thing which we would forcibly impress upon our clients is that, by the same mail in which they forward the model, they should *announce the sending* in a separate letter, giving description of the invention, time of sending model, name of post office and State, and full name of inventor. Observing these rules will save us much trouble, and insure a prompt answer to the sender.

Spiritualism to be Medically Considered.

Dr. G. M. Beard lately read before the Medical Society of the County of New York an extensive paper on "The Relation of the Medical Profession to Popular Delusions, Spiritualism, Mind-Reading, Clairvoyance and Animal Magnetism." He reviewed the many delusions which have appeared in this country on this subject. He looked upon them as a species of epidemics which from time to time immemorial have periodically made their appearance.

A committee of five, consisting of the following gentlemen, Dr. J. C. Peters, Dr. Fordyce Barker, Dr. Ellsworth Eliot, Dr. Austin Flint, and Dr. A. B. Crosby, was appointed to consider, and report on, the following questions:

1. Is the state or condition of mind known generally as the mesmeric state a reality or a deception?

2. If it is a real physiological state, what are the conditions necessary to its production, and what the phenomena attending it?

3. Is it a state to which one mind can subject another, or does it depend on some conditions voluntarily submitted to by the individual?

4. Is it possible, while in this so-called mesmeric trance, or at any other time, or in any other condition known to man in his mundane experience, for one person to divine what is passing in the mind of another, except through the medium of signs?

5. Is there any such faculty known to our race as perceiving, by some mysterious second sight, what is transpiring in places far beyond the reach of ordinary human vision, or what is written on a paper when an opaque object lies between it and the person attempting to read?

6. Is there any evidence that the well known law of gravitation is ever overcome by a force hitherto unrecognized by scientists?

The members of the committee are all of them eminent physicians in this city, and will doubtless be glad to receive statements of evidence and experience from all who can supply such information.

IN no case in general practice should the pressure, on even the slowest moving journals, be allowed to exceed 1,000 pounds per square inch of longitudinal section with steel journals, or about 600 on iron, in well-worn boxes.

APPLES should be stored in cellars where there is a thorough circulation of air.

DECISIONS OF THE PATENT OFFICE.

NEW PATENT RULE CONCERNING REJECTED CASES.

In the matter of the application of George L. Rouse and M. W. Stoddard for a patent for an alleged "Improvement in Wheels," filed May 18, 1874. On appeal from the Examiner-in-Chief:

Two claims are left in the application which the examiner rejects for want of novelty, citing as references the patents of P. Murphy, August 12, 1873, and the application of Charles Spofford filed August 3, 1874, and rejected the 8th day of the same month. The Examiners-in-Chief have affirmed the decision of the Examiners below, on the ground that the patent of Murphy is a good and sufficient answer to the claims of applicants. They have not discussed the pertinency of the rejected application of Spofford, as a reference.

After a careful examination, I have come to the conclusion that the Murphy patent is not a sufficient answer to the claims of Rouse and Stoddard, which are limited to the special construction shown and described by them. It is admitted, however, that the construction of wheel hubs shown and described in the application of Spofford is almost identically the same as that of applicants. More than two years having elapsed since the final rejection of Spofford's claim, his application is regarded as abandoned under the 32d section of the patent act.

It is insisted on the part of the applicants that, in view of recent decisions of the courts, a rejected and abandoned application does not constitute a bar to the grant of the patent sought by them. It becomes necessary, therefore, to examine this question and determine the practice of the Office in view of the decisions referred to.

Within a few years, several decisions have been rendered in the United States Circuit Courts, in which the effect on patents of prior rejected applications has been discussed; but the question did not receive the attention of the Supreme Court, until the case of Brown *vs.* Guild came up on appeal during the October term of 1873. One of the defenses set up against the Brown patent was an old application filed by Remy and Kelley in June, 1850, which was rejected and withdrawn the August following. The evidence showed that only one machine was ever made by them, and this merely for experiment, in the year 1849. In discussing the effect of this application on the validity of Brown's patent, the court uses the following language:

"The experiment made in 1849, when Remy worked it by hand, was a mere experiment which was never repeated. It may have presented one or two ideas in advance of other machines, but it can hardly be said to anticipate the machine which we have described as Brown's. Were it not for the application for a patent, it would justly be regarded as an abandoned experiment, incapable of being set up against any other claim. Can the fact that such an application was made and afterward voluntarily withdrawn, and never renewed make any difference? We think not. Had a patent been actually granted to Remy and Kelly it would have been different. The case would then have come directly within the seventh section of the act of 1836, which makes a "patent," or a "description in a printed publication" of the invention claimed, a bar to further patent therefor. But a mere application for a patent is not mentioned as such a bar. It can only have a bearing on the question of prior invention or discovery. If upon the whole of the evidence it appears that the alleged prior invention or discovery was only an experiment, and was never perfected or brought into actual use, but was abandoned and never revived by the alleged inventor, the mere fact of having unsuccessfully applied for a patent therefor cannot take the case out of the category of unsuccessful experiments." Brown *vs.* Guild, *6 Off. Gaz.*, 322.

There can be no mistake as to the meaning of this language; the doctrine is distinctly announced that a mere application is not a legal bar to the grant of a patent to a subsequent applicant. This decision must be heeded by the Commissioner of Patents, and govern him in regulating the practice of the Office. I have had frequent occasion to state my views on the necessity of harmony between the practice of the Patent Office and rulings of the courts. There can be no question about the propriety of this course. The Commissioner ought not either to issue patents which the courts will declare invalid, nor to refuse the grant on grounds which have already been considered judicially and declared insufficient. But it will be noticed that the Supreme Court does not entirely ignore abandoned applications, for it is stated that they have a bearing on the "question of prior invention or discovery," and the effect of the application is made to depend on the question of actual use of the invention described therein.

It has been urged in argument that, if no objection appears to the grant sought by Rouse and Stoddard except the abandoned application of Spofford, the Commissioner should issue the patent and allow the question of public use to be determined hereafter in the courts. The suggestion must have its origin in a misconception of the duty of the Commissioner of Patents. The law makes him something more than a mere ministerial officer, whose function is to issue letters patent simply for the asking. The Commissioner is made the guardian not only of the rights of inventors, but also of the interests of the public. It is just as solemnly his duty to refuse to issue a patent which clearly ought not to be granted, as to grant the issue when the applicant shows an unimpeached right to the invention.

In this case, if without further inquiry the Commissioner should issue a patent to Rouse and Stoddard, and it should afterwards appear that the invention of Spofford was put into public use, it would be invalid, as I understand the decision which has been quoted.

It is his duty, therefore, to inform himself on this question, if possible, and the application of Spofford indicates the direction in which inquiry may be made. The only question in my mind is how to prosecute the investigation. The law restricts interferences to unexpired patents and pending applications.

An interference, therefore, cannot be declared with an abandoned application. I have no doubt whatever, however, that the Commissioner of Patents has ample authority to institute an *ex parte* inquiry at any time, for the purpose of determining whether or not a statutory bar exists to the grant of a patent for which application is pending. This is necessary to enable him to comply with the statute. Unsatisfactory as *ex parte* evidence may be, it appears to be the only source of information open to the Commissioner in cases like the present, without further legislation; and I do not believe that in a single instant a patent should issue for an invention shown in a prior abandoned application without an attempt, at least, to settle the question of public use.

The decisions of the Examiners in Chief, affirming the Examiner on reference to the patent of Murphy, is reversed. The application of Rouse and Stoddard is remanded to the Examiner, who is instructed to forthwith dispatch letters of inquiry to the applicant Spofford, and to his attorney of record, for the purpose of ascertaining whether the invention of the former has been brought into actual use. At the same time, they will be informed that an application is now pending for the same invention, and that the inquiry is made for the purpose of determining the right of subsequent applicants to a patent therefor. Information furnished by them should be in the form of affidavits, clearly and fully setting forth the facts in the case. Counter affidavits will also be received from applicants if they so desire. The issue of a patent will be determined by the information thus received.

Until otherwise ordered, this will be the rule and practice in the Patent Office in like cases. J. M. THACHER, Commissioner of Patents.

Jan. 28, 1875.

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