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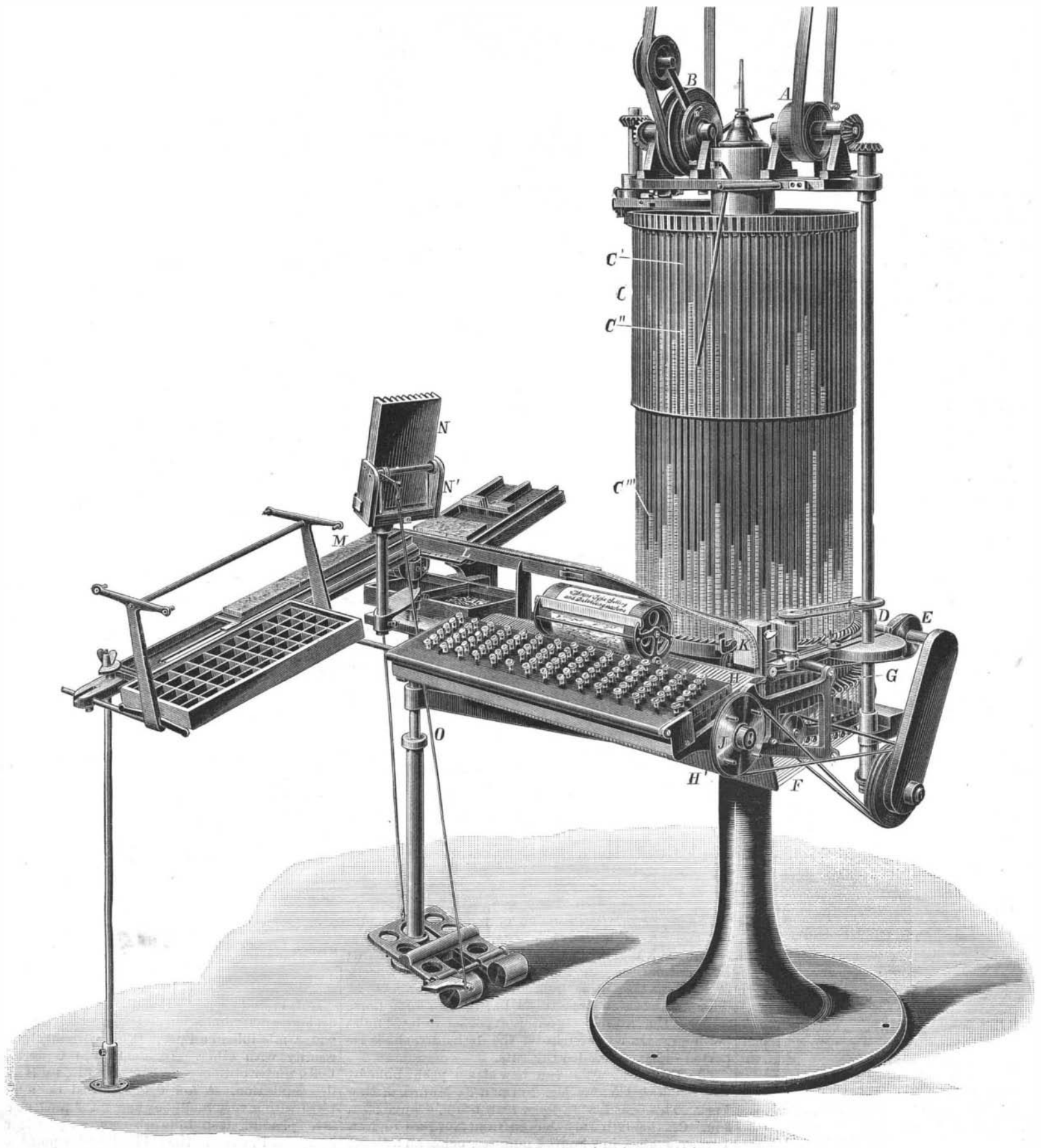
IMPROVED TYPE COMPOSING AND DISTRIBUTING MACHINE.

A great deal of ingenuity has been exercised upon the perfecting of labor-saving machinery for the composing rooms of printing offices, and quite a large number of devices for setting up and distributing type mechanically are now actually in use. Whether the ordinary conditions of the printing trade are such as to render a general use of this machinery impracticable, or whether a conservative adherence to time-honored customs is antagonistic to revolutions such as would ensue upon the adoption of wholly efficient composing and distributing machinery, need hardly be discussed. It is certain that in this country at least, while such machinery does find favor in quite a number of offices, their use does not extend widely. Of course they are necessarily costly and complicated, and assuming everything to be satisfactory, they must be kept in constant use to effect any marked economy, or rather perhaps to avoid a loss.

One of the most interesting objects at the American Exhibition, now open in London, is a machine of this kind. We illustrate it below by a general view, and by some diagrams which will serve to show the general mode of working.

As will be seen on reference to the general view, the two principal features of the Thorne type setting and distributing machine are a keyboard and two vertical cylinders, C and C^{III}, having the same axis, the upper cylinder resting on the lower one. Both cylinders are cut with a number of vertical grooves, C^{I} C^{II}, of such a form as to receive the type, which is to be first distributed and then reset. In the machine shown at the exhibition there are 90 of these vertical grooves in each of the cylinders, sufficient to contain enough characters and kinds of characters as are wanted for ordinary purposes, but of course machines are made with a greater number of these grooves. The keyboard carries a number of keys corresponding to that of the grooves, and when the machine is in operation, whatever key is depressed, the letter corresponding to it is thrown from its proper groove in the cylinder, C^{III}, upon a circular and revolving table, D, which has the same axis as the cylinder, but is of larger diameter. Of course quite a number of types may thus be ejected from the gooves in each revolution of the disk, D, and all are brought round in their proper order to a point of delivery, where they are taken up by a traveling metallic band, K, and fed continuously in front of the keyboard to a galley, M. Here any justifying that is necessary is done by a second operator, who stands opposite the small case, N, containing spaces, quads., etc., any desired one of which can be thrown forward by an

(*Continued on page* 52.)



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(*Continued from first page.*)

ingenious treadle arrangement, N and O. Proof corrections are, of course, done in the ordinary way. The lever connections between the keyboard and the stops, which eject the various types from their respective slots, are indicated by F, J, G, H, and H¹. They are necessarily complicated, but, according to the manufacturer, are not liable to get out of order. Their mode of working will be presently explained. In the general view, A B show the mechanism for causing the distributing cylinder to revolve. As in many other machines of this class, the control of the types is effected by forming on the side of each character recesses something like the wards of a key, the arrangement, of course, being different for each different character. Besides this, some very thin types, such as *l* and *i*, are formed with a nick at the bottom. The grooves on the cylinders are provided with projections corresponding to those on the types, so that no type will fall into any groove other than that it is intended for. This arrangement applies only to the cylinder, C‴, which does not revolve. The grooves in the distributing cylinder, C, are large enough to receive all the types indifferently that are fed into them.

The work of distribution is effected as follows: A suitable attachment to the side of the cylinder, C, enables the operator to place the galley containing the type to be distributed in contact with the cylinder, and by a very simple device line after line of type is fed into the cylinder until, if desired, every groove is nearly filled. Weights are then introduced into the grooves above the type to keep the latter steady, and the upper cylinder is caused to revolve upon the lower one with which it is in contact. As the columns of mixed type pass over the heads of the shaped grooves of the lower cylinder, letter by letter falls into its proper groove as soon as the nicks in the type find their corresponding wards. In this way, and at a speed depending on the rate at which the cylinder, C, is driven, the types are all distributed ready for the work of the compositor.

The details on this page, while not representing exactly the arrangement of the mechanism of the Thorne machine shown at the American Exhibition, will give a clear idea of the principles upon which its action depends.

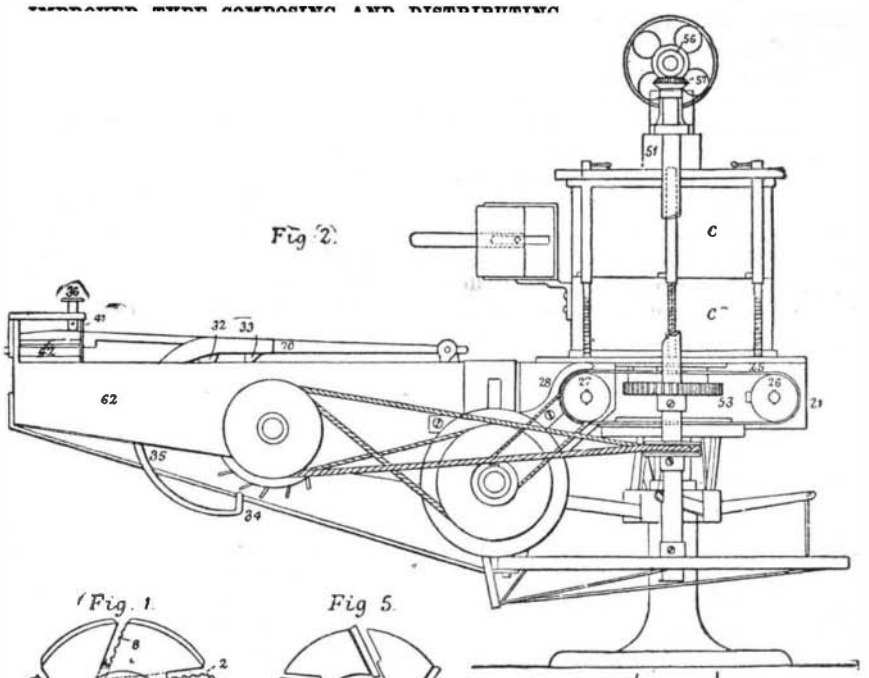
Fig. 1 is a diagram plan of the stationary type case, showing a sufficient number of grooves to illustrate the principle. These grooves or channels, 2, are so formed in the type case as to be open at their upper ends, and they are closed at their bottom ends by means of the base, 20, Fig. 3, which forms a rest for the type lying in the channels. These channels are all furnished on one side with one or more wards, 8, which are variously arranged so as to correspond with nicks made in the types as already said.

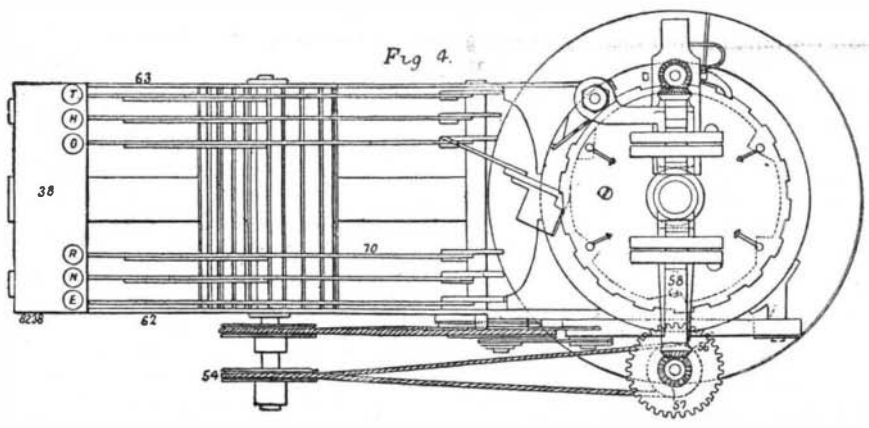
The type conveying mechanism consists of a type carrying table, 30, the surface of which lies in the same horizontal plane as that occupied by the bottoms of the type channels formed by the base, 20. It is mounted so as to revolve with the center of the type case for its center of movement, and thus is adapted to receive type from the channels, 2, upon its surface and carry the same around with it in its circular path of travel.

A circular vertical guard, 21, forms the outward limit to which the types may be projected. This guard is attached to the base, 20, so as to project above the face of the table, 30, to a height at least equal to the thickness of the largest type used in the machine, and this vertical guard is supplemented by a horizontal guard, 22, which projects inwardly and nearly covers the type race that is formed by the type case, the table, and the vertical guard.

The lower end of the type case is furnished with guards covering the space between the type channels that prevent type in process of composition from becoming jammed between the guard, 21, and the type case, as will be explained further on.

The type case, C, and the mechanism and devices sustained by it are supported by a central shaft, 31, mounted in a stand, 61, and by the framework that carries the keys and the side plates, 62, 63.





The means for revolving the type carrying table, 30, is a vertical shaft, 51, at one side of the machine, which carries a spur wheel, 53, that engages the toothed perimeter of the table, 30. This shaft is driven by means of bevel gears, 56, 57, from a cross shaft, 58, mounted above the machine, and supplied with driving and loose pulleys.

The type ejecting mechanism is constructed as follows: Each type channel of the type case, C, is provided with a type ejector, 6, each of such ejectors consisting of a flat plate of metal of a width adapted to that of the type channels, and of a thickness less than that of the type it is to operate upon. The faces of these ejectors are beveled and are carried at the ends of bell crank levers, 67, that are pivoted in recesses of a fixed hub, 59, and held normally in the positions shown in Figs. 2 and 3 by springs, 100, the movement of which bell cranks causes the ejectors to reciprocate horizontally in the bottom ends of the type channels, and during each forward movement to push the lowermost type out of a channel on to the revolving type carrying table, and during each rearward movement to clear the channel, so that the types remaining therein may fall.

The bell cranks, 67, are attached by means of cords, 68, to the lower ends of rocking levers, 69, to the upper ends of which latter the key bars, 70, are pivoted. These key bars are provided with tappets, 32, 33, attached to their bodies so as to be above the plates, 23, of a rotating type bar driver, and with a tappet, 34, that is carried by a curved arm, 35, so as to be below the plates, 23, of the same type bar driver.

This type bar driver consists of suitable heads attached to a carrying shaft, 47, and provided with a number of angularly arranged plates, 23, and it is constantly rotated by means of a pulley, 54. The key bars are capable of being moved vertically as well as horizontally, and when carried downward their tappet, 32, will be engaged by one of the revolving plates, 23, which will thus move the depressed key bar forward and carry its tappets, 33 and 34, into their foremost position. When the key bar is thrown so far forward that the plate, 23, which propelled it passes off from the tappet, 23, it will have brought its tappet, 33, into a position to have its rear face engaged by another of the plates, 23, which plate, in moving over the inclined rear face of said tappet, 33, presses the same upward and raises the key bar to which it is attached, thus lifting the tappet, 34, high enough to be engaged by one of the plates, 23, which will then, by means of the arm, 35, carry the type bar back to its rearward position, when it will be held by its sustaining spring in the raised position shown in Fig. 3.

Each of these key bars has its front end guided in a vertical slot in the plate, 41, and the division plate, 42, of the key board frame, and it carries at its front end a small cross stud that will pass through a slot at the front end of the division plate, 42, when the key bar is pressed downward and forms a riding guide bearing against the under side of the division plate, 42, as the key bar is carried inward. At its rear end this division plate has another slot that permits the upward passage of the stud, 43, and consequently allows the key bar to rise at the end of its rearward stroke, so that it may be moved forward with its stud, 43, riding upon the top of said division plate.

Each key bar is surmounted by a key, 36, which keys are held in vertical guide slots in the top plate, 38, of the key board frame, and so as to rest upon the upper surface of the key bars. When a key is depressed, it forces a key bar downward, thus bringing its tappet, 32, into a position to be engaged by one of the plates, 23, the slot in the front end of the division plate causing the stud, 43, not to obstruct such movement. When a key bar, 70, is thus moved downward, a plate, 23, engages its tappet, 32, and forces the bar rearward by a positive movement. The stud, 43, then bears against the under face of the division plate, 42, and with it acting as a guide, holding the key down, the tappet, 32, is in engagement with the said plate. The rearward or inward movement of the key bar moves the lever, 69, and rocks the bell crank, 67, the latter forcing a type ejector, 6, outward, and causing it to expel a type from its type channel. The type thus ejected is received upon the rotating carrying table, 30, and is carried around with its face foremost until it reaches the throat, 3, through which it is propelled on to a type conveying belt, 25, running over pulleys, 26, 27, which is arranged to travel with its edge in the same plane as that of the table, 30. This belt travels at a speed slower than that of the carrying table, and conveys the type to an inclined guiding chute, 28, whence it is conveyed to the line forming mechanism with a momentum that will not cause its face to be injured.

The detailed figure illustrates the type distributing mechanism, which is very simple and has already been sufficiently described.

From the foregoing description the great ingenuity of this machine will be evident. It appears to have been very successfully introduced in the United States, where its capacity for setting and distributing is equal to 12,000 ens per hour. The machine is made by the Thorne Machine Company, Hartford, Conn.

We are indebted to *Engineering* for our engravings and the foregoing particulars.

Fluoride of Nitrogen.

The supposed compound was formed by passing an electric current from seven ferric chloride batteries through a concentrated solution of ammonium fluoride. After the lapse of a short time, several drops, of oily consistence, were observed attached to the negative plate. On becoming connected with the positive, a thin gold wire, these drops exploded with violence. The compound is undoubtedly highly unstable, being at once decomposed in contact with glass, silica, or organic matter, thus rendering the analysis of the same one of considerable risk. Its explosive violence is even greater than the chloride of nitrogen, and it is also prone to spontaneous decomposition.—*Chem. News.*

Gymnastics at School.

The honorary secretary of the National Physical Recreation Society gave some interesting evidence lately before the Royal Commission on Elementary Education, and it had the advantage over much of the other matter collected by that body of being statistical in large measure. Speaking of the work done by the Liverpool Gymnasium for the treatment of spinal curvature, he stated that some 3,000 cases had come under his own observation there, of which 2,500 were cases of children between the ages of eight and fourteen years, 2,000 of these being girls. There can be no doubt, we think, that deficient physical exercise, if not the only or even perhaps chief cause of this very common deformity, is highly calculated to promote it; and, even apart from any specific evil, a well-considered and systematized plan of training for the muscles is undoubtedly a most valuable regimen, and eminently adapted to preserve and benefit the general health. But it is of the highest importance, in following out this object, to avoid pernicious exercises, which may do irreparable mischief to the growing organs and unbraced body of a child. The following instance is very much in point: "The caretaker commanded them all (like children of an elementary school) to keep their knees stiff and touch their toes with their hands, and while he kept them in that position he proceeded to give them an impromptu discourse upon the benefit of physical training. When the children rose up you could tell from the hectic color of their cheeks that they were evidently suffering at that moment from palpitation of the heart caused by leaning down in this extraordinary position." Equally sound appears to us the following comparison between the horizontal and the parallel bars: "In the case of the horizontal bar, or anything pendent, children naturally jump up and get on with their hands together; that is a position of contraction; the chest is contracted and the shoulders brought forward, unless they have a very painstaking instructor, who will make them widen out their hands and change frequently. In the case of the parallel bars, the ordinary position of a child upon it causes expansion of the chest; the very movement of resting upon the parallel bars is one of expansion, without any teaching whatever."—*Lancet.*

Does Labor Produce All the Wealth?

Rev. Dr. G. M. Steele, in *Work and Wages:* "Is it really true that 'labor produces all the wealth of the world'? Of course, by labor here is meant the putting forth of physical energy, otherwise the succeeding sentences have no meaning. Does any one who thinks at all about the subject believe that the great factories, the docks, the vast buildings of stone and brick and iron in our great cities, the railroads, the mighty steamships, the complicated machines and innumerable other structures are the result of manual labor alone? Suppose there is a line of railway fifty miles in length to be built, and five thousand steady, intelligent, and reliable laborers are told to go and build it. Will they be able to build the bridges, to make the deep cuts, to construct the causeways through treacherous swamps, to calculate the grades, and do other equally difficult parts of the work? How many ordinary wage laborers would it take to produce a Corliss engine, the first of its kind? No; there must be much besides muscular effort in order to attain these results. There must be toil of brain, long and protracted, and often exhausting thought, sometimes accompanied by great sacrifices and great hardships. In order to extensive production there are required great mental qualities, some of them of a rare kind. There is needed power to contrive, to invent, to organize, to direct, or little can be achieved. The man who blows the organ might claim that he produces all the music of the instrument. It is true he is generally an essential condition, but not by any means the only or the most essential condition. No more is manual labor the only or the most essential condition of the production of great wealth."

A Long Tramway.

The longest street tramway in the world will be that which is to connect a number of towns near Buenos Ayres, South America, and which will have a total length of 200 miles. The road will also be exceptional in that sleeping cars will be run upon it for the comfort of the passengers. Horses will be employed as a motive power instead of steam, because horses are cheap, fuel is dear, and the people are slow. The price of two tons of coal will buy a horse with its harness. The sleeping cars and all the other equipments of the line are being supplied by a Philadelphia company, and these cars are stated to be curiosities. They are four in number, 18 feet in length, and are furnished with four berths each, which are made to roll up when not in use. The cars are furnished with lavatories, water coolers, linen presses, and other conveniences, and are finished throughout with mahogany. The other rolling stock comprises four double-decked open cars, twenty platform cars, twenty gondola cars, six refrigerator cars, four poultry cars, furnished with coops, eight cattle cars, two derrick cars for lifting heavy material, and two hundred box cars.

Carriers of Contagion.

Flies, aside from being pests, are actual conveyers of contagion. The fly can communicate virus from an open sore, and can carry this from one person or place to another. This may not be credited, but it has been proved by direct experiment to be not only possible, but an actual fact. The common house fly, by lighting on a diseased spot, either in an animal or a man, and thence passing to a healthy subject, has been known to impart the infection to the latter. Whether the poisonous matter be an animal virus or a germ of disease, a bacillus, does not matter; and in this connection it is well to speak of other common methods of possible disease infection. A postage stamp may in various ways convey contagion. One of the simplest and most plausible is that in which a postage stamp, partially attached to a letter to pay return postage, is sent by a person infected with some disease to another person. The disease is transferred, in the first place, to the adhesive stamp through the saliva, and in being attached to the letter by the receiver the poison may be transmitted to him in turn through the saliva.

Another cause may be the infection of the stamp with disease germs. The stamp, having been exposed in a room where a diseased person lies, may become slightly moistened and thus retain the germ. That this is true can be proved very simply by a microscopical examination. It is even possible that an active and tangible poison, as arsenic, may accidentally or intentionally be attached.

We often see a person holding change for a moment in the mouth, probably not knowing that investigation has shown that disease germs can be carried by money. If one could see through what hands the money has passed, they would hesitate before using such a third hand. Silver money is as bad as paper money; but while many would hesitate to hold a dirty bank note in their mouth, they think that a silver piece, because bright, is apparently clean.

Cigars may convey contagion, especially syphilis. We have seen a note in which a physician gave as an excuse for not loaning a light to a friend, that he was afraid of contagion; but if he was so afraid he should have been consistent and refused to smoke the cigar. Cigar wrappers are in the cigar factories, especially in Cuba, moistened with the lips and tongue, and the girls who roll the wrappers are by no means of the highest reputation. Disease can be carried in this way. Tobacco, contrary to the common belief, does not destroy disease germs, and smoking will not confer immunity from contagion.

Any one who uses a towel in common with the public, or a piece of soap, or brush and comb, or any requisite of the toilet, runs the risk of possible infection. The subject of antisepsis, simply another word for cleanliness, has not necessarily brought to light many new facts, but has set people to thinking of old ones. The germ theory of disease is to most people a very vague one. There is a general idea that disease is carried by germs, and that the air is filled with these, and it is a wonder to most people that every one is not so afflicted, the laity conclude that the germ theory is an absurdity and a contradiction. They do not consider the element of a fertile soil. The germ is the same as a seed, and all organic bodies are reproduced by a seed. We must plant seed in a soil suitable for it, and the surroundings—heat and moisture—must be adapted to it if it is to grow. As we descend in the scale of organic life, we find that some of the lower animals can hardly be distinguished from plants, and these are reproduced not by seed, but by a process of division or budding. A part of the animal is divided and separated, and forms a new animal.

As we descend in the scale, we find that instead of seeds we have spores, as in ferns; but these serve the purpose of seeds, and demand a fertile soil before they can grow. Of many million spores, but one or two may serve their purpose; the rest die without giving any result. As we descend still lower, we find that fungi and moulds need not only a fertile soil, but a peculiar soil, and many of them will not grow except in or on another organic body.

In medicine, a common example is the ergot of rye. Another is corn smut. These, in addition to requiring a peculiar soil, undergo an "alternation of generation." For example, corn smut is first reproduced on the barberry leaf as "rust," and this rust in turn produces corn smut. The theory of disease germs is founded on the knowledge of the actions of the lower animals and plants. The bacillus may be an animal or it may be a plant, poisonous in itself or simply a carrier of contagion. It may even be a result of disease, and have nothing to do with its cause except as a foreign body. Still as we find it present, and find it always present, we are necessarily induced to believe that it is an active agent, but in order to reproduce itself it must have a fertile soil. This it finds, as a rule, in a person whose constitution is run down from overwork, lack of rest, poor living, or disease. It may be introduced into the system, directly into the blood, through an open wound, thus inducing septicæmia, a state of poisoned blood, or it may be introduced indirectly into the blood through the alimentary system. In this case it must be inhaled or eaten with food. In either case it is absorbed, or perhaps actively works itself through the mucous membrane. Once in the blood, the bacillus grows, as a rule, by division, and multiplies to an enormous extent. Disease may also be carried by a virus, which may in turn consist of bacilli or of organic putrefactive matter. The common example of this is the virus of cow pox or of a snake, an actual poison.

Either of these factors may be present on a piece of soap or money, or a soiled towel, or a book that has been in constant use, in fact, any article that has been handled by a number of people; and we can perhaps realize how omnipresent disease germs are, when we consider that washing our hands in an antiseptic solution, and wiping them on a perfectly clean antiseptic towel, we shall find they are still, scientifically speaking, unclean. Cleanliness, then, is above all to be inculcated as a preventive of disease. If not next to godliness, it is surely next to health.—*M. T. E., Technics.*

Ball Lightning.

At the recent meeting of the Royal Meteorological Society, June 15, the following papers were read:

"Note on a Display of Globular Lightning, at Ringstead Bay, Dorset, on August 17, 1876," by Mr. H. S. Eaton, M.A. Between 4 and 5 P. M. two ladies who were out on the cliff saw, surrounding them on all sides and extending from a few inches above the surface to two or three feet overhead, numerous globes of light, the size of billiard balls, moving independently and vertically up and down, sometimes within a few inches of the observers, but always eluding the grasp. Now gliding slowly upward two or three feet, and as slowly falling again, resembling in their movements soap bubbles floating in the air. The balls were all aglow, but not dazzling, with a soft superb iridescence, rich and warm of hue, and each of variable tints, their charming colors heightening the extreme beauty of the scene. The subdued magnificence of this fascinating spectacle is described as baffling description. Their numbers were continually fluctuating. At one time thousands of them enveloped the observers, and a few minutes afterward the numbers would dwindle to perhaps as few as twenty, but soon they would be swarming again as numerous as ever. Not the slightest noise accompanied this display.

"Ball Lightning seen during a Thunderstorm on July 11, 1874," by Dr. J. W. Tripe. During this thunder storm the author saw a ball of fire of a pale yellow color rise from behind some houses, at first slowly, apparently about as fast as a cricket ball thrown into the air, then rapidly increasing its rate of motion until it reached an elevation of about 30°, when it started off so rapidly as to form a continuous line of light, proceeding first east, then west, rising all the time. After describing several zigzags, it disappeared in a large black cloud to the west, from which flashes of lightning had come. In about three minutes another ball ascended, and in about five minutes afterward a third, both behaving as the first, and disappearing in the same cloud.

"Appearance of Air Bubbles at Remenham, Berkshire, January, 1871," by Rev. A. Bonney. Between 11 and 12 A. M., a group of air bubbles, of the shape and apparent size of the colored India-rubber balls that are carried about the streets, were seen to rise from the center of a level space of snow within view of the house. The bubbles rose to a considerable height, and then began to move up and down within a limited area, and at equal distances from each other, some ascending, others descending. These lasted about two minutes, at the end of which they were borne away by a current of air toward the east, and disappeared. Another group rose from the same spot, to the same height with precisely the same movements, and disappeared in the same direction, after the same manner.

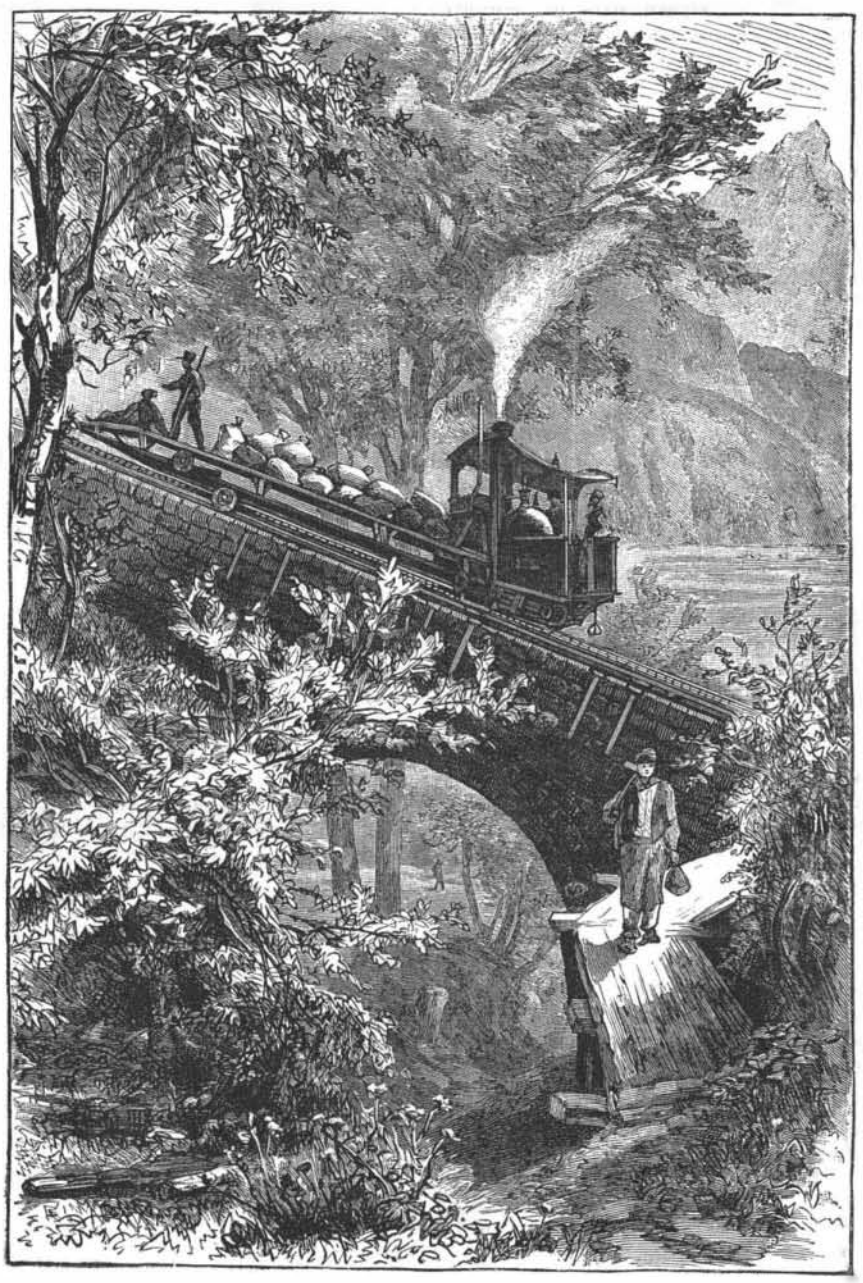
Mr. H. C. Russell, F.R.S., of Sydney, described a fall of red rain which occurred in New South Wales, and exhibited, under the microscope, specimens of the deposit collected in the rain gauges.

Simple Method of Artificial Respiration.

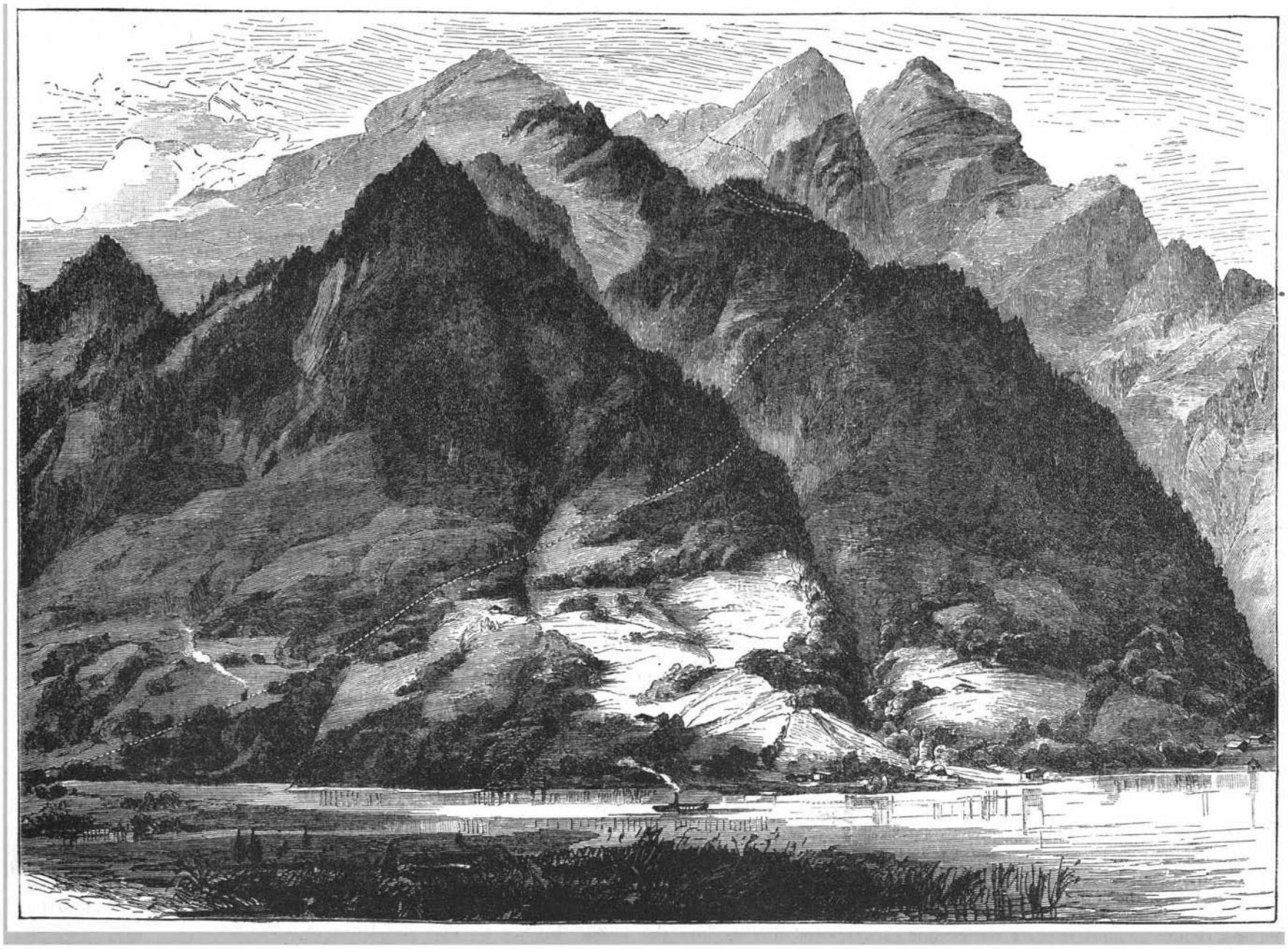
In the *Brit. Med. Jour.* (*London Med. Record*), Mr. J. A. Francis describes a simple method of artificial respiration which, he alleges, combines all the advantages of the Marshall Hall, Sylvester, and Howard methods, without any of their disadvantages. The plan is as follows:

The body of the patient is laid on the back, with clothes loosened, and the mouth and nose wiped. Two bystanders pass their right hands under the body at the level of the waist, and grasp each other's hands, then raise the body until the tips of the fingers and the toes of the subject alone touch the ground; count fifteen rapidly; then lower the body flat to the ground, and press the elbows to the sides hard; count fifteen again; then raise the body again for the same length of time; and so on, alternately raising and lowering. The head, arms, and legs are to be allowed to dangle down quite freely when the body is raised. The author alleges that this method is most successful, and it is so simple that any one can perform it without any teaching.

THE STARTING PLACE.



LOCOMOTIVE AND FREIGHT TRUCK.



GENERAL VIEW OF THE ROUTE OF THE MOUNT PILATUS RAILWAY.
[The dotted lines indicate the track of the railway.]