THE ACME AUTOMATIC SAFETY ENGINE.

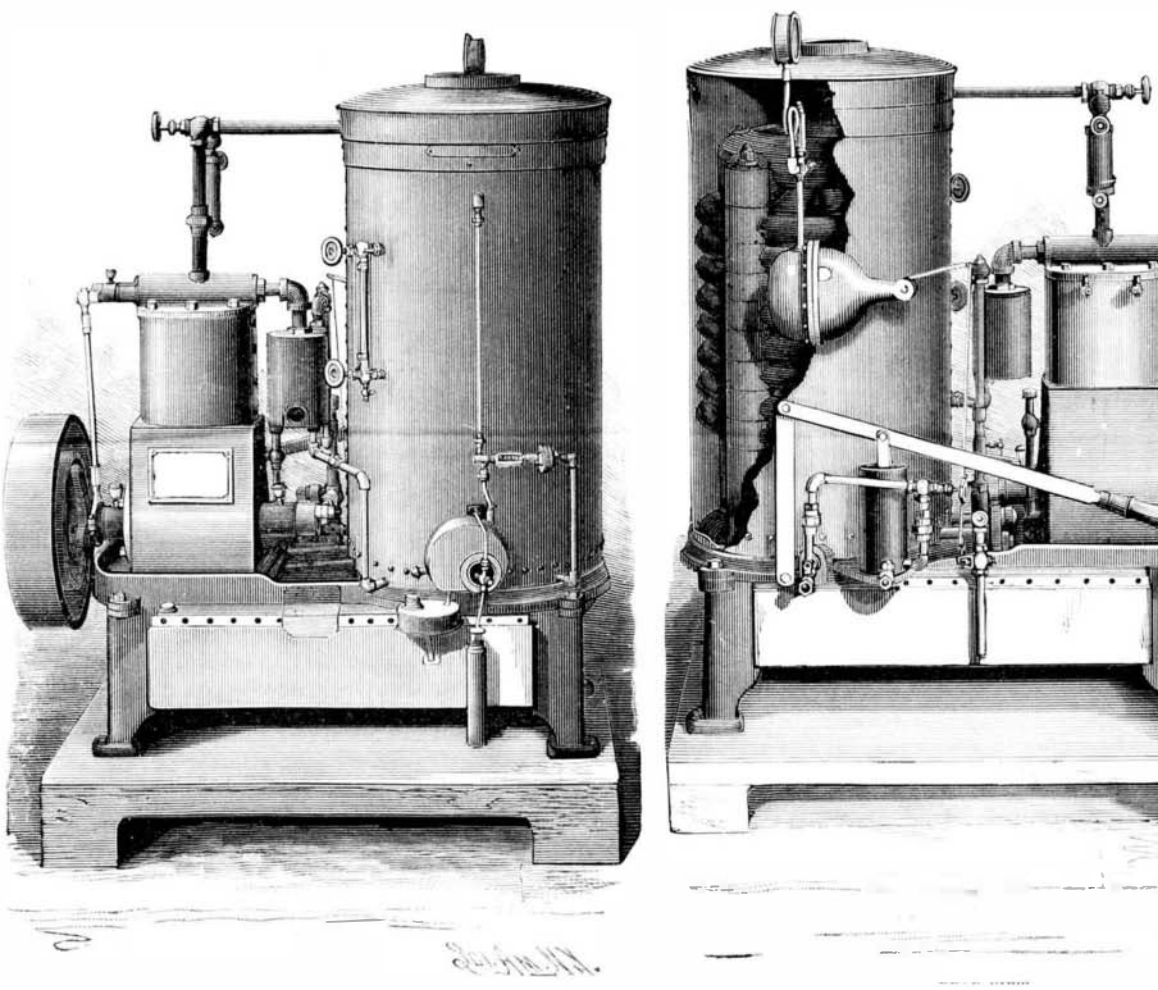
The engine herewith illustrated is adapted to all purposes where a small power is required, is noiseless in operation, easy to manage, and safe. The parts are so designed and arranged as to insure economy, efficiency, and durability.

There are two single-acting cylinders, the pistons in which, being one and one-half times the stroke in length, form their own guides. The cylinders are directly over the center of the shaft, so that the engine may be run either way as may be required. The steel cranks are placed 180° to each other, and are of large size, both in diameter and length. The valve is of the balanced rocking type, has extra large and long bearing surfaces, and is placed on top of the cylinder, the valve case forming the cylinder head; this allows long ports, that give quick admission and release, and make the action of the cut-off governor sensitive to the slightest change in speed or load. Within the periphery of the flywheel is the automatic governor, which regulates the admission of steam to suit the varying loads by changing the throw of the eccentric.

The eccentric rod strap and bearing, and the outer bearing of the valve stem, are the only bearings not constantly flooded with oil while the engine is running. This important characteristic is accomplished by carrying in the crank case a mixture of oil and water, into which the cranks dip at every revolution, thereby not only flooding themselves, but throwing the oil to every part of the inside of the case, the wrist pins and lower part of the cylinders getting a plentiful supply at each stroke. As this oil cannot escape, it is used over and over, and the oil furnished to the main bearings is all caught and returned to the crank case at last.

The boiler is a quick and economical steam generator, and has a very rapid circulation—increased in its rapidity by the intensity of the fire; and all sediment is deposited in the water space below the fire, where it can be readily removed or blown out. The construction of the boiler will be understood from the accompanying engraving. The water is carried in a series of rings connected by inclined tubes that break joints, so that the fire is compelled to reach every part in its passage through them. On top of the boiler is a ring or dome for insuring an ample supply of well dried steam. A double jacket prevents loss of heat by radiation. A pump, worked directly from the main shaft, forces the water through a coil heater, where it is subjected to the effect of the exhaust steam before entering the water leg of the boiler; by this means the water is heated to near or above the boiling point before being introduced into the boiler, without in the least choking the exhaust. The supply of water is regulated by a ball float, attached to the boiler, which by means of levers controls the amount delivered at each revolution of the engine, and may be adjusted to maintain the desired water level under all conditions.

The fuel is kerosene oil, which is atomized by a steam jet and controlled by an automatic fire regulator that reduces or cuts off entirely the supply of fuel when the steam pressure reaches the limit at which the regulator is adjusted. This fire gives a most intense heat, is easily controlled, and makes an even and constant supply of steam. No dust or smoke is produced when the fire is properly adjusted, and this fuel is cheaper than coal.



THE ACME AUTOMATIC SAFETY ENGINE, WITH BRYANT'S PATENT BOILER.

At the present time, two sizes of these engines—for which great success in incandescent electric lighting is claimed—are manufactured by the Rochester Machine Tool Works (Limited), of Rochester, N. Y. The one horse power has cylinders 2⅛ in. bore by 2½ in. stroke, makes 500 revolutions per minute, and the boiler is tested to 500 pounds hydraulic pressure and the regulator is set to carry 110 to 120 pounds steam. The second size is two horse power, having cylinders 3 in. bore by 3½ in. stroke and making 400 revolutions per minute. The engines are capable of a higher power than their rated duty, as the nominal power is computed on a basis of 70 pounds steam pressure.

A NEW LONG DISTANCE TELEPHONE SYSTEM.

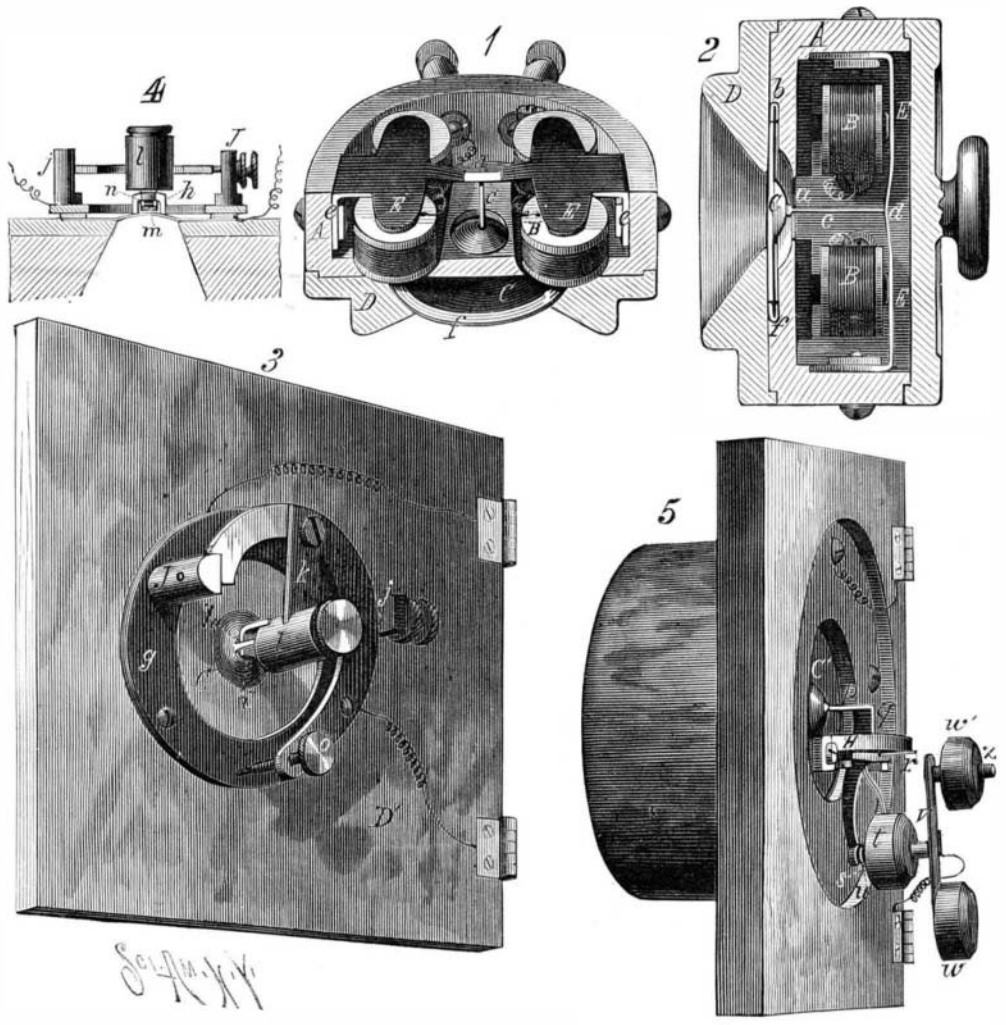
The transmission of articulate speech by means of broken electric currents has been considered impossible by telephone experts, and, as is well known, it has been disclaimed by Bell in his patent.

The transmission of articulate speech by means of interrupted or pulsatory electric currents has been a matter of great difficulty, so great, indeed, that it is supposed by many electricians to be impossible to secure any practical results by means of such currents; but, on the other hand, it is admitted that the nearer the transmitter can approach to interrupting the current, the more distinct will be the articulation, and the greater the volume of sound.

Proceeding on the supposition that a properly manipulated interrupted current would prove far more efficient in the transmission of speech than an undulatory current, Messrs. Dann & Lapp, of Honeoye Falls, N. Y., have devised a telephone system consisting of a transmitter and a receiver, which they claim is a refinement of the Reis system, and in which the intermittent currents are produced and used successfully in the transmission of articulate speech.

Fig. 1 is a perspective, sectional view of the receiving instrument; Fig. 2 is a diametrical section of the receiving instrument; Fig. 3 is a rear view of one form of the transmitter; Fig. 4 is a transverse section; and Fig. 5 is a perspective view of another form of the transmitter.

These various members of the telephone system are detached from their supports, and arranged to show their working parts as clearly as possible.



DANN & LAPP'S LONG DISTANCE TELEPHONE.

The telephone receiver shown in Figs. 1 and 2 is provided with a casing, A, which incloses two electro-magnets, B, arranged parallel with each other on opposite sides of the center of the casing, and with their yokes secured in front of the casing. In the front of the casing there is an opening, *a*, also a recess, *b*, for receiving the diaphragm, C. The diaphragm is clamped in place by a mouth piece, D, of the usual form. The central portion of the diaphragm, C, is made inwardly convex, and connected by a wire, *c*, and elastic cross piece, *d*, with the spring armatures, E. Each armature is provided with an arm, *e*, which is bent at right angles and bolted to the side of the casing, A. It will thus be seen that the poles of the electro-magnets, B, are not in proximity to the diaphragm, as in other forms of receiver, the diaphragm being arranged to receive its motion through the wire, *c*, from the spring armatures, E. By making the central portion of the diaphragm convex, it is rendered rigid, so that the vibrations transmitted by the wire, *c*, are distributed over a greater surface, thus insuring superior results. To render the action of the diaphragm free, its edges are inclosed in an elastic band, *f*. The receiver is connected with the line, so that the current passes through the two magnets in series.

The transmitters shown in Figs. 3, 4, and 5 are substantially alike in principle, but different in form. That shown in Figs. 3 and 4 is provided with a diaphragm, C', which is made and mounted

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in substantially the same way as the diaphragm of the receiver, being held in place by a ring, *g*, which clamps the diaphragm to the mouth piece, D′. To the center of the diaphragm is secured a U-shaped bar, *h*, carrying on the side next to the diaphragm a contact point, *i*. To the ring, *g*, are secured posts, *j j′*, between which is pivoted the segment, G, of a ring which carries a spring, *k*, to the end of which is secured a weight, *l*. This weight carries a right angled finger, *m*, which is provided with a contact point, *n*, supported opposite the contact point, *i*. A screw, *o*, serves to adjust the electrodes by tilting the ring, G. The ring, G, and the weight, *l*, supported thereby are insulated from the diaphragm, and the current employed in the transmitter is taken through the diaphragm through the contact points, *i*, *m*, through the rings, G, *g*, and the instrument is connected up in the local circuit in the usual way. The action of this transmitter is such as to cause the contact point carried by the diaphragm to separate from the contact point carried by the pendulous weight, when the diaphragm is pushed backward by the impact of a sound wave.

The instrument shown in Fig. 5 is provided with a diaphragm, C′, having a concavo-convex center, as in the other cases, and is connected by a wire, *p*, with the short arm of the lever, *q*, which is connected by a spring, *r*, with a bridge, H, extending over the diaphragm. The lever, *q*, carries at the end of its longer arm the contact point, *s*. The spring, *r*, which supports the lever, *q*, is bent at an approximately right angle, and prolonged downward and attached to a weight, *t*, carrying at its center a contact point, *u*, directly opposite the contact point, *s*.

On a stud projecting from the back of the weight, *t*, is mounted a cross arm, *v*, carrying at its lower end a fixed weight, *w*, and provided at its upper end with a screw-threaded stud, *x*, on which is adjustably mounted the weight, *w′*. By turning the weight, *w′*, on the stud, *x*, the relation of the weights will be changed, so as to vary the pressure of the contact point, *u*, on the contact point, *s*. In this form of transmitter the motion of the diaphragm, C′, due to the impact of a sound wave, causes the contact point, *s*, to retreat from the contact point, *u*, and the contact point, *u*, by virtue of the inertia of the weights, *t*, *w*, *w′*, is unable to follow the contact point, *s*, consequently the current is interrupted. On the return movement of the diaphragm, C′, the circuit is again established, and so with every complete vibration of the diaphragm the current is interrupted at the contact points.

It is claimed that by means of this system, articulate speech can be transmitted over a five hundred mile line distinctly and clearly, that the articulation is perfect with a battery of one cell Leclanche, and farther if more battery is used.

On an experimental line the transmitted speech may be heard ten feet from the receiving instrument. It is claimed that, owing to the make and break of the current, the sound from the receiving instrument, when speech is being transmitted, is as great in volume as the noise made by the receiver, when the current is made and broken, by similar electrodes, as rapidly in any other manner.

With these instruments the circuit is not only broken, but the current also. If a spark should cross the gap made by the parting of the electrodes, the transmission is very much injured thereby.

Messrs. Dann & Lapp have an electrode which takes the place of carbon; in this electrode it is claimed that the molecular action of iron is used to effect a separation of the electrodes. It is equally as efficient in an undulatory current transmitter as in a make and break. To protect the iron from corrosion, it is plated with platinum. It is said to be as good as carbon, if not better. We are informed that, while speech is being transmitted, the electrodes vibrate and separate, and the noise made by this motion can be heard several feet.

Causes that Produce Unrest and Strange Nocturnal Visions.

Wundt regards most dream representations as really representations, since they emanate from sensorial impressions, which, though weak, continue during sleep. An inconvenient position during sleep causes the representation of painful work, perilous ascent of a mountain, etc.

A slight intercostal pain becomes the point of an enemy's dagger or the bite of an enraged dog.

Difficulty in respiration is fearful agony caused by nightmare, the nightmare seeming to be a weight rolled upon the chest or a horrible monster which threatens to stifle the sleeper.

An involuntary extension of the foot is a fall from the dizzy height of a tower.

Flying is suggested by the rhythmic movements of respiration.

Further, "those subjective visual and auditory sensations which are represented in a waking state as a luminous chaos of an obscure visual field, by humming and roaring in the ears, and especially subjective retinal sensations, have an essential role," according to Wundt. "There are shown to us innumerable birds, butterflies, fish, multicolored pears, flowers, etc. But if there be some cutaneous irritation, these visions are usually changed into caterpillars or beetles, crawling over the skin of the sleeper."

The sleeper sometimes dreams of his appearing on the street or in society only half dressed; the innocent cause is found in some of the bedclothes having fallen off.

An inconvenient position of the sleeper, a slight hinderance to respiration, or interference with the action of the heart may be the cause of dreams where one seeks an object without being able to find it, or has forgotten something in starting on a journey. The movements of respiration may suggest to the sleeper, as previously mentioned, flying, but this flight may be objective, and instead of himself flying he sees an angel descending from the heavens or a luminous chaos where birds are swiftly moving.

The representation of dreams having sensorial origin may have mingled with them those which arise solely from the reproduction of past memories. Parents and friends cut off in the flower of life ordinarily appear in dreams, because of the profound impression which their death or burial has made, "hence the general opinion that the dead continue during the night their intercourse with the living."

The Atlantic and Pacific Ship Railway.

The following able statement is by Mr. E. L. Corthell, chief engineer, presented to remove any misapprehensions that may exist in reference to the ship railway proposed between the Gulf of Mexico and the Pacific for the transportation of ocean vessels:

1. The commercial and political history of the world, for 3,000 years, exhibits the importance of Pacific markets. The history of the last 300 years records the efforts to reach them by crossing the American isthmus.

2. The following statesmen, among many, have urgently advocated the encouragement and protection by the United States government of an isthmian transitway: Clay, Jackson, Buchanan, Webster, Fillmore, Cass, Seward, Hayes, Windom, Blaine, Arthur, Edmunds, Bayard, Cleveland.

3. The commerce, industry, and general welfare of our country imperatively demand the construction of the isthmian ship railway, that we may thus unite our Atlantic and Pacific coasts by a maritime route, open to our Atlantic ports the important markets of the Pacific countries, and bring the markets of Europe 8,000 miles nearer to our western coast.

4. The Tehuantepec isthmus, in Mexico, has great advantages over Panama and Nicaragua, being 1,200 miles nearer to the United States than the former and 800 miles nearer than the latter.

The climate is healthy.

The winds and ocean currents are favorable.

The harbors are deep and capacious, and their approaches can be easily defended by a navy, and the railroads can promptly transport an army to the isthmus.

Mexico and the United States can hold this isthmus against the world, and control it as an American route.

5. The ship railway is entirely feasible, and is so asserted by a large number of practical experts of national and international reputation—naval constructors, navigators, civil engineers, and railway managers.

6. Economy in construction, maintenance, and operation, speed and safety in transportation, are its distinguishing features, and it surpasses, in these respects, a canal at Panama or Nicaragua. The entire cost of the ship railway will be less than $100,000,000—that of the Panama Canal at least $500,000,000, and the Nicaragua Canal $260,000,000, if adequate channels are provided.

7. If the ship railway is completed in 1890, a traffic of 5,000,000 tons is estimated to await its opening.

8. The concession from Mexico, granting the right to build and operate the railway, is very liberal.

It grants to the company 2,700,000 acres of public lands—an area half as large as the State of New Jersey—in addition to a right of way half a mile wide.

Exemption, for ninety-nine years, from all taxes, State and Federal, and from all duties on imports.

The right to establish coaling stations at each terminus.

A guarantee of $1,250,000 per annum for fifteen years, as one-third of the net revenue.

The defense of the railway by the army and navy of Mexico.

9. What is asked of the United States government? A national charter by a company of American citizens.

A guarantee that, when the railway is completed, solely at the expense of the company, and tested to the satisfaction of the government, by transporting over it vessels weighing, with their cargoes, 6,000 tons, two-thirds of the net revenue, during the first five years, shall amount annually to $3,500,000; the government to be liable for the payment of $2,500,000 the first year, $1,500,000 the second and third years, and $1,000,000 the fourth and fifth years, or a total possible liability of $7,500,000.

This liability of the government is conditional upon the railway being kept in order for transporting ship weighing 6,000 tons the first year, and 7,000 tons the remaining four years.

10. What is offered to the United States government?

Repayment, within ten years, of the amounts loaned.

Security for repayment in the bonded obligations of the company and the receipts of the railway.

The bonds, with 10 per cent interest added thereto, if not paid within ten years, may be used in payment of tolls on American vessels.

The right, with Mexico, of a representation of four-ninths in the board of directors.

The power to reduce the tolls whenever the net revenue (one-half of the gross receipts) exceeds ten per cent on $100,000,000—the limited capital of the company.

A rebate of 25 per cent on all coastwise commerce of the United States and on American vessels bound for foreign ports loaded with American products, and on American vessels returning with cargoes for consumption in the United States. This rebate is to continue fifteen years; estimated total amount of rebates, $35,000,000.

Transportation, during ten years, of government vessels, property, and mails and the transmission of telegraphic messages for 75 per cent of the rate charged to other governments, except Mexico.

The right to enforce its claims against the company in the United States and in Mexican courts.

Unnoticed Dangers.

Mr. Le Roy F. Griffin, in the *Chicago Current*, comments very sensibly on household dangers as follows:

"Far too many houses, both in city and country, are positively dangerous. Many city houses stand on made land, or at least that which was formerly swampy. The foundation walls, when there any—for houses often stand on posts alone—are built of solid masonry, but with no cement either outside or in. Such walls are porous, and soak up water nearly as rapidly as a sponge. Then it slowly trickles down the inside, emitting malaria, forming a finesoil in which all manner of fungoid growths flourish. The rooms over such places are first-class disease breeders, and every home should be frequently examined to see that this source of danger does not exist.

"Then, drain pipes often leak in the cellar and basement. This adds to the danger to the rooms above. The two fiends, stagnant water from the sewers and the water filtering slowly in through the walls, work in concert to sap the life of the little ones, and to fit them to yield to the first disease.

"The walls of the rooms themselves, in far too many houses, are disease breeders. A neat and tasty paper upon the wall makes a room inviting and adds to the home comfort. But, unfortunately, even when the paper is made free from poison—and good paper can be so made—the paste with which it is attached is just the home for the minute organisms which produce certain diseases. This is bad enough where there is only a single layer of paper; but when, as is often the case, several layers of paper and paste are spread upon the same wall, outside of one another, the danger is multiplied many times. Such walls are really masses of festering filth. The best wall is, undoubtedly, the plain plastered wall.

"All cases like these demand caution. Those who are responsible for the homes cannot be too careful. The health, often the life, of loved ones, children particularly, depends upon rigid exclusion of all these lurking places of disease and breeders of death. Beauty should be, and is, consistent with perfect safety in the home."

Railroading in Mexico.

The expenses of railroading in this hot climate are great. Wooden ties have but a short life, cracking in the dry season, and rotting during the rainy months; bridge timbers and piles also wear out rapidly. Freight cars must be painted frequently to prevent drying and cracking, and even the substantial Pullman cars shrivel under this exposure. Fuel constitutes a large item of outlay. Mesquit roots are burned on the Central road; pine cut along its route is used on the Interoceanic; and the Vera Cruz Company feed their engines coal blocks that are brought from Wales as ballast. The decay of ties will in time necessitate a serious outlay on the Central road, for wooden sleepers cost here $1 each. It is evident that iron ties are a necessity in Mexico, and they are just coming into use. The climate tends to preserve the rails and iron bridges—provided the latter escape the torrents of the rainy season. Engineers command better wages here than they do in the United States, for only that inducement brings them here. The general staffs of the roads are also well paid, but the section hands, who are peons, work for small wages. The natural and proper tendency on all the roads is to employ Mexicans when the right men can be obtained. This policy helps to protect the property of outside corporations doing business here.—*Springfield (Mass) Republican.*

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