

The Teleradiophone.

M. Mercadier, the eminent French electrician, has ingeniously adapted the photophone of Professor Bell to telegraphy. In the photophone a ray of light is reflected by a mirror, so as to fall upon the sensitive surface of a "selenium cell" joined up in the circuit of a voltaic battery and a speaking telephone. When the light strikes the cell its electric resistance is diminished, and a wave or pulse of current flows through the telephone, causing it to sound. By eclipsing the ray of light a great many times per second, this sound can be exalted into a continuous hum, like that of a tuning fork, and by again occulting the intermittent ray for long and short intervals corresponding to the flashes of a signaling lantern, this hum or drone can be broken up into audible signals. Thus, if the Morse telegraphic code is used, a short occultation, producing a short pause in the note of the telephone, will stand for a "dot," and a long occultation, producing a long pause, will stand for a "dash."

This photo-electric telegraph is realized by M. Mercadier with the help of a gas flame forming the source of light, a mirror, and lenses to direct its rays upon the selenium cell in circuit with a battery and the line wire. The beam is regularly eclipsed by means of a rapidly rotating disk, perforated with a circle of holes, and the telegraphic occultations of the intermittent beam are effected by means of a signaling key, which interposes a dead screen in the track of the light whenever the key is pressed. These apparatus form the transmitter; and the receiver at the other end of the line is, of course, the telephone, which is fitted with a resonator to re-enforce the sound. There is no gain in such an arrangement over the ordinary telegraph now in use; but it has the merit of lending itself to multiple telegraphy. Thus by multiplying the number of transmitters at one end of the line and the number of telephones at the other, several different messages can be sent along the same wire at once. In order to do this it is only necessary to rotate the eclipsing wheels at different speeds, so as to produce notes of different pitch in the receiving telephones, and to fit each resonator so as to enhance a particular note. Then, although the complex current flows through all the telephones in turn, each telephone will only render to the ear of the clerk the particular note for which he listens, and the makes and breaks of that note will be interpreted as the message. Not only can several messages be sent in one direction along the same wire together, but from opposite ends simultaneously without confusion, and M. Mercadier reckons that with 10 transmitters and 10 receivers at each end of a line he can send 200 dispatches of 30 words each per hour, or 100 words per minute, in either direction. The effects of induction, so troublesome in speaking by telephone, are not experienced in this process, owing to the employment of musical notes and resonators.

ADER'S MAGNIFYING TELEPHONE.

M. Ader showed, at the Electrical Exhibition in Paris, an instrument that possesses the power to magnify transmitted sounds. If a song is hummed in front of the microphones attached to the instrument, the song will be reproduced as a full quartet.

This instrument is formed of four trumpets whose mouthpieces are attached to a vibratory diaphragm (see illustration), but its interior arrangement has been kept secret by the inventor, as it is the only known instrument that is able to increase sounds transmitted through the air.

It is rightly named a microphone, as it does for the ear what the microscope does for the eye.

At present it is only able to reproduce musical sounds, but M. Ader hopes soon to magnify and reproduce articulate speech of the human voice, so that a person whose hearing is defective can hear without placing the instrument to his ear. He may possibly do this, for all telephones commenced by transmitting musical sounds only.

If M. Ader succeeds, instead of the present style of telephone, there may be telephonic offices and rooms where one can sit and talk comfortably to any distance without moving from his chair.—*La Lumière Electrique.*

More Money in Firearms and Dirks than in Farming Implements.

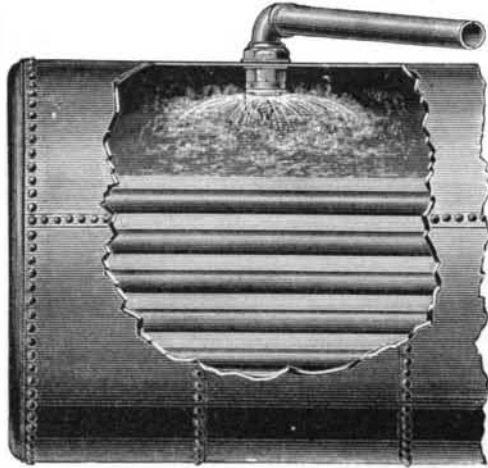
The Montgomery *Advertiser* publishes a partial list of subjects of taxation in Alabama, and makes, in the main, a fine showing; but three items in the schedule strike us as being at least queer. These items are: 1st, mechanical tools, \$238,509; 2d, farming implements, \$77,100, making a total value of farming implements and mechanical tools of \$305,600; 3d, guns, pistols, and dirks, \$354,250! Or about \$49,000 more invested in guns, pistols, and dirks than in farming implements and mechanical tools combined. No county in the State reports less than \$1,000 worth of guns, pistols, and dirks, and the average of all the counties is over \$5,000, while some of the counties have only \$20 worth of mechanical tools, and only twenty-nine counties return over \$1,000 worth of farming implements, and fourteen counties less than \$100 worth,

and some of them as little as \$25. The only fair explanation of these figures must be the fact that only a very small fraction of the mechanical tools and farming implements are listed by the receivers of tax returns, for there is no year when the people of Alabama do not buy five times the amount named of farming implements.

Guns and pistols being surplus assets, they are more fully returned. We all know they are infinitely less used.—*Columbus (Ga.) Times.*

SUPPLYING STEAM BOILERS WITH WATER.

It has long been the common practice of steam engineers to supply boilers with water below the "water line," it being the general impression that to obtain the best result, the temperature of the water should be gradually raised to the boiling point. As a consequence, it is found that most

**HALL & SONS' SPRAY FEED-WATER HEATER.**

boilers receive the feed water at the coolest part, generally near, if not quite, at the bottom of them. As an economy so far as relates to non-condensing engines, it is usual to heat the feed water by exhaust steam to probably 180° Fah. before it enters the boiler, whenever practicable.

If all water was free from impurities, either in solution or suspension, as lime, sulphur, acids, mud, and other matter, and a uniform temperature always maintained, it would probably be a satisfactory method in most instances, but such existing examples are rare exceptions. Almost all waters throughout our land contain impurities, which are separated during the process of boiling, but as the water is admitted in volume, the temperature is raised so slowly the particles of matter unite and adhere to the exposed surfaces, forming a coating called scale. When this coating is formed, on account of its non-conducting nature, which compared with iron is as 1 to 37.5, it involves a loss of fuel in direct ratio with its thickness. When it is considered

Within the last few years, however, there has been some progress made in feeding steam boilers, in quite an opposite manner from the old custom, and the result seems to be satisfactory and combining several advantages. Instead of feeding in the coolest part of the boiler in volume, it is the later practice to feed in the steam space above the "water line" in the form of spray or in a finely divided state, and by contact of the water in this form with the high heat caused by the steam pressure, the water is heated (as it descends through the steam towards the water line) fully to the boiling point, thus practically distilling it and separating the impurities contained in the water, which assume a finely granulated form usually, and which, settling, can be readily disposed of at the mud valve.

Owing to the fact that in the use of the best devices for this purpose no water comes in contact with the shell or tubes of a boiler, until it is heated as hot as that at the water line, it follows there is less unequal expansion, the danger from cold currents is overcome, and "shell cracks" are avoided, thereby effecting a saving in boiler repairs, and increasing the factor of safety. This system has been adopted in many sections where almost every other means failed to be of benefit.

At Syracuse, N. Y., it has been used successfully upon the hardest lime water which heretofore baffled every means employed. Upon the muddy waters of our Western rivers it has been well tested and has given entire satisfaction, as also on mineral and mine waters of almost every known variety it has proven superior to the old way in all cases, effectually preventing scale formation and reducing boiler repairs and fuel expenses to a minimum. Supplying water to boilers in the steam space cannot be considered a late idea, but the early efforts in this direction were crude, the devices used were imperfect and could not be depended upon, being designed generally by parties that had not given the subject the study it deserved. It is unnecessary for us to recall the numerous failures, but each was a step forward and in the right direction, until now the system has been perfected, and from its adoption has received due appreciation from thoughtful, practical steam users. Among the devices which are rapidly growing in favor and receiving general approval is the patent "spray" feed-water purifiers, shown in the engraving, and manufactured solely by Hall & Sons, Buffalo, N. Y., who may be addressed for further information.

MECHANICAL INVENTIONS.

An improved regulator for spinning-mules has been patented by Mr. Lazarus B. Sanford, of Greenville, S. C. This invention has reference more particularly to improvements in mechanism for regulating the rising movement of the quadrant-nut, the object being to provide improved means for automatically regulating the tension of the yarn while the cop is being wound.

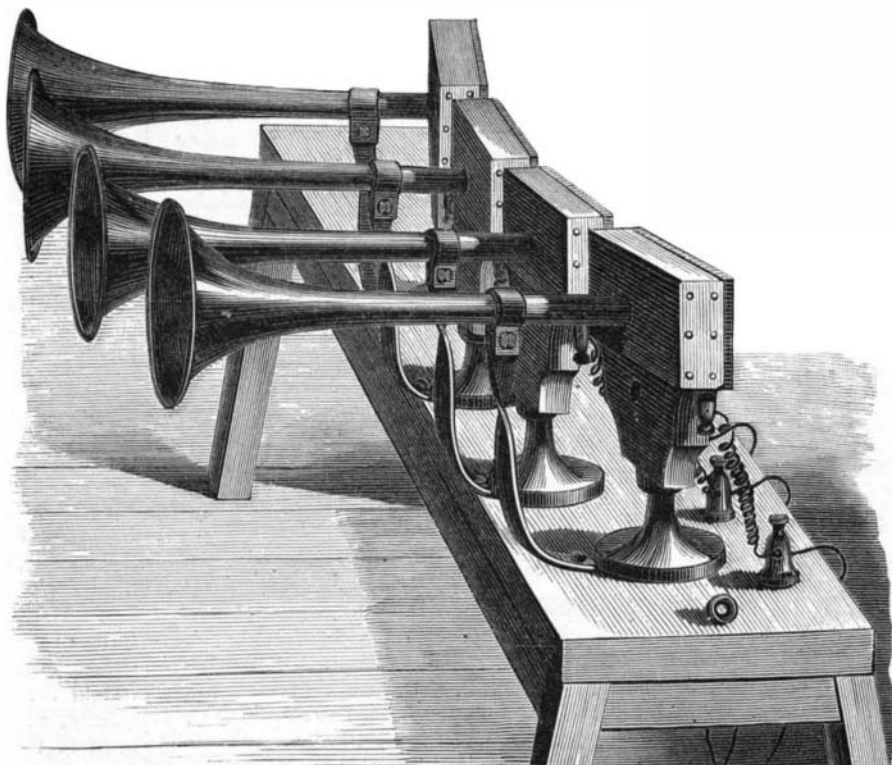
An improved device for tightening belts, especially elevator bucket belts, and giving them the required tension, has been patented by Mr. John F. Wilson, of Camden, N. Y. The invention consists of two frames, which have screws mounted in their ends for drawing these frames together or separating them, on which frames serrated or ribbed segmental interchangeable belt clamping blocks, with handles for operating them, are pivoted, which pivots can be withdrawn to remove the clamping blocks from the frame.

Mr. Albert D. Canfield, of Arlington, Vt., has patented an improvement in that class of car wheels which have steel treads with a filling of less expensive material. The invention consists in the arrangement of the segmental sections and the wedge-shaped sections, and of the manner of securing them to each other and to the hub.

An improvement in tricycles has been patented by Mr. Samuel N. Silver, of Auburn, Me. The object of this invention is to provide a new and improved tricycle, or self-propelling vehicle, which is so constructed that it can be propelled, steered, and controlled very easily by the occupant.

The tricycle is provided with two pivoted foot levers connected with arms loosely mounted on the axle, and provided at the outer ends with pivoted pawls engaging in notches in disks loosely mounted on the axle, and provided with friction clutch-dogs catching on the inner surface of the circumferential flange of a disk rigidly mounted on the axle, so that when the foot levers are depressed springs on the axle connected with the loose disks, and other springs also connected with these disks, will be brought in tension, and when the pawls are released from the disks the springs revolve the loose disks which catch on the rigid disk, thereby rotating the axle and propelling the vehicle forward.

A combined tablet and easel has been patented by Messrs. Andrew B. Banghart and Charles H. Treat, of Frankford, Del. The object of this invention is to produce tablets to be painted or ornamented, and to combine therewith easels for supporting the tablets in such a manner that they can be readily taken apart and packed in small space for storage and transportation.

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that scale one-eighth inch thick requires 28 per cent more fuel to produce the same effective heat than when the boiler would be a clean one, it of course becomes a subject for consideration and of interest to every steam user, though it must be confessed that many manufacturers do not give their boilers the attention required for economy and safety.

It is not our purpose to enumerate the attempts that have been made to effectually overcome the scourge called scale, as there have been so many inventions, mechanical cleaners, lime catchers, etc., not to mention compounds, oils, and chemical preparation, which, in most instances, fail to be of any benefit, it merely showing the urgent need of some system which will effectually meet the requirement in all cases.