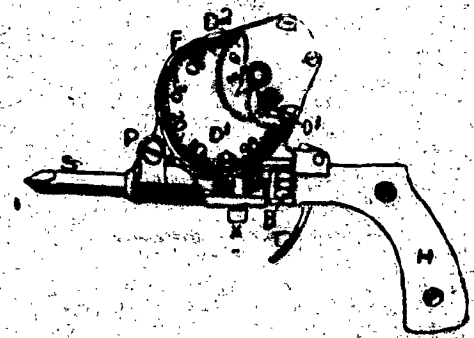


## FIELDS OF SCIENCE.

### LATE DISCOVERIES IN PROGRESS' INTEREST.

**The Paragon Speed Indicator and What It Will Do.**—Mechanical Arithmetic—Electricity and Copper—Chemical and Other Wonders.

**The "Paragon" Speed Indicator.**  
A very convenient and handy speed indicator is shown in the accompanying illustration. The device is made in the form of a pistol, which it closely resembles in appearance. The handle is grasped firmly in the hand of the operator, the point being pressed against the end of the shaft and the indicating mechanism is set in operation



by simply pulling the trigger. This simple contrivance enables the operator to time the indicator with the hands of a watch with considerable nicety, while the form in which it is manufactured is convenient and the parts are simple in construction.

In the illustration, a portion of the tubular bearing in which the spindle revolves is cut away, to show the worm gear connections and the ball bearing at the inner end of the spindle which sustains the ends of the shaft when the device is in use. The handle, H, is of pistol grip form, the spindle, S, being angularly pointed with the inner ball bearing, B. The frame, F, in which the dial wheels, D1, D2, D3, are mounted, is pivoted at P, so that it can be moved downward against the force of a spring to cause the teeth of the dial wheel D1 to engage with one of the worm gears on the spindle, S, the first wheel indicating units and tens, the second hundreds and the third thousands of revolutions.

By means of a thumb nut at the back of the dial frame, the dials are quickly and easily reset to zero, the star on each wheel being then opposite its pointer. A shift slide, X, has two worms, one right hand and the other left hand, and this shift may be moved to the right or left, as indicated by the letters R, L, according to the direction in which the shaft is running, whereby the revolutions may be counted by one set of figures, no matter in what direction the shaft may be running. The dial wheels are instantly brought into operation by pulling the trigger lever, T, the releasing of the trigger instantaneously disengaging the registering mechanism, even though the spindle continues to revolve. An accurate registration may thus be obtained without even looking at the instrument from the time it is applied until after its removal. This device is strong and well made throughout.

#### Electricity and Copper.

According to the opinion of so good an authority as the Engineering News, the recent discovery made relative to the electro-deposition of copper and other metals promises to be of great importance; for, while heretofore such processes have been carried on by immersing the metal intended to receive the deposit in an aqueous solution of a salt of the metal to be deposited, the new method makes effective use of insoluble salts of the various metals, these being simply reduced to a fine powder and mechanically mixed with water; the mixture is applied to the surface of the metals by means of a brush, to a handle of which is attached the electric conducting wire, so that the depositing operation resembles the ordinary application of a coat of paint. Not only pure metals, but all sorts of alloys, it is represented, are affixed as coatings to other metals, with the utmost facility, by this means; thus, the hull of an iron ship, for example, may be spread over with a tough, adherent, and impervious surface of metallic copper of any desired thickness, and experiments have been made which indicate that this plan may be successfully carried out in the plating of aluminum with silver and gold—a desideratum which has long been sought for, but in vain.

#### A Curious Phenomenon.

A most curious phenomenon—the action of solids held in suspension in moving water—may be practically demonstrated, says M. Gallois, by taking a bottle of white glass, about three inches in diameter and with a flat bottom, putting into it to the depth of about one-fifth inch some fine and very clean silicious sand, such as will not interfere with the transparency of the water, filling the bottle with this and corking it so as to exclude all air. On giving the bottle a rapid movement of rotation around its own axis, either by placing it on a turn table or by suspending it from a previously well twisted cord, all the sand will be projected upon the cylindrical sides of the bottle by centrifugal force. This rotation movement of the bottle will gradually communicate itself to the water, progressing from the sides to the axis, the rotation lasting as long as the sand adheres to the cylinder. As soon as the water turns with the same velocity as the bottle containing it the sand will, on the bottle being suddenly stopped, at once quit the sides and precipitate itself toward the center of the bottle in the form of a cone, having the same axis as the bottle, and being higher as the velocity of rotation is greater. Finally the

cone flattens as the velocity of rotation grows less until the slope of the conical surface is the slope of equilibrium of grains of sand in still water.

#### New Building Material.

The new kind of building material, some time since announced as a substitute for ordinary stone or brick, is now receiving special endorsement on account of its freedom, under various and repeated tests, from the usual liability to crack or fracture. To insure this property, with the other essential adaptations, siliceous acid is used, powdered and cleansed from all impurities; 5 to 10 per cent of this is mixed in warm river or rain water, and this is applied to slacked or well-burnt lime, or added to hydraulic lime, the resulting product being mixed with sand and small portions of fluorspar. This mixture is cast into moulds, in various shapes as may be desired, and, after removal, the castings are left to dry from twelve to twenty-four hours, which brings them to a condition as dry as atmospheric air; in this state they are brought into a steam boiler and steam blown through so as to drive out all air, after which the boiler is hermetically sealed up and steam let in under a pressure of less atmosphere. In this high-pressure steam bath the stones remain for forty-eight to seventy-two hours, afterward being submitted to a bath of boiling and saturated solution of calcium for six to twelve hours, also, under a pressure of twelve atmospheres in the same boiler, and the condensed water may be used for the bath. The stones are allowed to dry in the open air, or, more quickly, by circulating steam inside the boiler after the chloride of calcium has been withdrawn and prior to taking out the stones.

#### Pyroxylin.

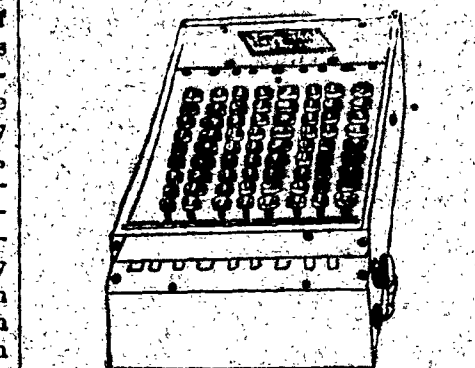
It appears that the pyroxylin, used in pharmacy and the arts, dissolved in alcohol and usually regarded as non-explosive, may, under certain conditions, become highly dangerous. An account is given of the preparation of some of this article in the usual manner, the operator adding a small quantity of ammonia to the water used for washing, so as to effect complete removal of the acids, more rapidly. A copper oven heated to seventy degrees, C., used for drying about one ounce of the pyroxylin thus treated, was, after some three hours' use, torn to pieces by the force of an explosion, the fragments of copper being hurled all over the apartment. From all that is known in respect to the different degrees of temperature under which ignition takes place in this class of substances it is believed that such an explosion must be attributable to the use of ammonia in the washing process. A little nitrate of ammonia, probably, was formed and dried upon the nitrocellulose in a state of fine subdivision, and any trace of acid would then suffice to cause the salt to act as a fuse.

#### Mechanical Arithmetic.

"Mechanical arithmetic" is not all arithmetical mechanical. At least every arithmetical computation consists of enumerating numbers or quantities of units whose dimensions are determined by some mechanical means, and it is said that our system of enumeration, by tens, is the outgrowth of the mode of counting and expressing on his fingers such simple numbers as the early half-savage man could comprehend, and to-day the great government and insurance agencies all over the world use mechanical appliances of various kinds to perform their arithmetical calculations.

In the accompanying cut will be found a computing machine of my own invention, known as the comptometer, which is operated by keys like the better class of typewriters. A large number of them are now in use, not only in this country, but in Europe, India, South America and Mexico. This machine is peculiar to itself, and is wholly unlike any other calculating machine in the world, both in mechanism and manner of operation.

In using it the operation is wholly mechanical, one only having to touch



#### FELT'S COMPTOMETER.

keys corresponding to the number of the example and the machine does the rest, the carrying being done automatically by the machine and requiring no attention from the operator.

In addition the operator only has one key for each figure, the same as an operator on a typewriter, and sixty words is not an extra speed for typewriter operators, which, figuring five letters to the word, is 300 keys. I have seen that speed reached on the comptometer; hence it is fair to say that a properly designed adding machine is more than twice as rapid as mental adding. No mental adder can begin to keep up with it when skillfully operated for ten minutes, or even for one minute, while for a stretch of several hours there is no comparison between a mental adder and it.

All the columns are added at once. The figures of each respective column on the paper are struck in the corresponding column of the machine. The standard size has a capacity of eight columns (99,000,000), though larger sizes are made. As shown in the cut, there is a series of keys for each column of numbers, and the first on the right stands for units, the next for tens, the next for hundreds, etc., just the same as they are ordinarily written on paper.



"THE COMMANDER."

Civil soldiers reassembled by the river of your (land).  
Ye who have the virgin city bathed in Wash-  
ton's clear name!  
Which of all your past commanders doth this Scott, McDowell, Burnside, Hooker, McClellan, Halleck, Grant?

There is one too little mentioned, when your proud remembrance comes,  
And the thought of love of country dies upon the sounding drum.  
Let me call him in your muster! Let me wake him to your grief!  
Captain of the revolution, Abraham Lincoln was your chief!

Ever nearest to his person, ye were his devotees and able!  
The sole supreme commander died upon the battle field of war.  
All your generals were his children, leading on him faithful will.  
And then all were dead! Monarchs round the muddy tomb to wail.

Tender as the bark of David his soft answers now become.  
When amid the care of kingdoms rose and fell, and he would tell his memory like a light  
Of the sunken sun that lingers on the icy mountain.

Like the Greek who sped the sunrise first of As it faded white marble on a steep slope, so the sunken sun of Lincoln shone the dawn of glory came.  
On his pen emanation glittered like an altar flame.

For him the doomed deserter, feeling for the drafted man,  
For him the Southern heart, the Southern home, the Southern name, the Southern name.  
Mercy kept him from the gallows, all the future And eternal peace to garner for the millions yet to be.

Not a soldier of the cause, he could see through a clear prevision,  
Master of the greatest science, military command, and strategy.  
As he watched your marches, camps, battles, further, wayward years,  
On his map of the world, you followed you can trace them by his tears.

In the rear the people clamored, in the front the generals misdeed:  
In his inner council harbored critic and an-  
But he ruled them by an instinct like the queen among the bees.  
With a wealth of soul that honeyed publicans and the world.

Faint with faith, we looked behind us for a child of higher time,  
While the voice that drowned the trumpet had the plangency of our own.  
Every word of old companions!—Gauls has us by the hand,  
Walking on the tempest with us, every crisis to command.

Like the eagle flown at evening by some homestead son of art,  
Lincoln's eagle, quiver in the universal heart.  
Not an echo left of malice, scarce of triumph,  
In the summer thunder murmurs in patriotic showers of rain.

Years forever consecrated, here he lived where duties be,  
Never failing on the climate or the toll a momentary.  
Here his resting body was buried, and the night like him in the garden, when the stars shone bright.

How his call for men went ringing round the world, a mighty bell,  
And the faces of creation came the proud re-  
Sounding in the last reaction on the rock of human rights,  
Words of his grew his features in the dash of battle lights.

Once, like Moses from the mountain, looked he on the people in his own,  
When the slaves in burning Richmond knelt and thought him Washington,  
Then the voice of his own people followed him from the theater of things  
To become a saint of nature in the pantheon of time.

Faded are the golden chorons, vanished is the light of his own,  
Mild to heaven his moral glory lingers like the morning star,  
And the voice of his own people followed him from the theater of things  
To become a saint of nature in the pantheon of time.

All around him spelt of greedy women vain and honor spent,  
Still his voice was heard in the mature life without discouragement.  
For his country, which could raise him, bare could mock her or his mother, though her name she could not write.

Deep the wells of humble childhood, cool the springs beauteous the hut,  
Mildness beauteous the hut, Lincoln's sea the door he has not shut.  
Not till wealth has made its canker every Shall the great republic wither or the intellect subdue.

Stand around your great commander! Lay aside your little fears!  
Every Lincoln carries freedom's car along a shout and goes on, and the nation follows along the golden belt.  
Look to see a mighty column rise and march, proud and true!

—George Alfred Townsend, "Gath."

#### How Guerrillas Fought.

This is the way Major E. N. Edwards describes the Centralia, Missouri, massacre in September, 1864, when Anderson's guerrillas slew hundreds of Federal troops and citizens:

"A few shots from the guerrillas at close range cleared the platforms and windows. All on the train were formed in line and then the work of winnowing began. It was a ghastly line which at last separated the citizens from the soldiers. Twenty-four of the latter and one citizen who wore a soldier's blouse fell upon that side of the line where death, yet invincible, waited grimly in ambush for its prey. In twenty minutes more all were killed. The train was next set on fire, and the engine, with a full head of steam, dashed away like the wind toward Sturgeon. Then the depot and a gravel train were destroyed. After, indeed, killing everything in and about the town that looked like a Federal soldier, Anderson led his men back to Singleton's pasture, and reported to George Todd the nature of the morning's work. It was then decided to put Todd in command and await further developments. These, bloody beyond all precedent, were not long in coming.

"At Paris, Monroe county, there had been a Federal garrison under command of a Major Johnson, and strong

These soldiers had been scouting for Anderson and had come down as near Centralia as Sturgeon. After Anderson had done all the devilment his hands could find to do in Centralia, Major Johnson came into the pillaged town swearing all sorts of frightful and fearful oaths. At the head of his column a black flag was carried. So also, there was one at the head of Todd's column. In Johnson's ranks the stars and stripes for this day had been forbidden; in the ranks of the guerrillas the stars and bars flew fair and free.

"As Johnson rode toward the ridge, ten men anticipated him by coming up fair to view in skirmishing order. The guerrillas numbered 302, in command of George Todd. As the ten men went forward to skirmish with the advancing enemy Todd came out of the timber and formed a line of battle. Johnson moved right on and some shots were fired at long range. From a column of four Johnson's men galloped into a line of battle. The ten guerrillas opened a brisk fire and fell back to the main column. As this movement was being executed Johnson's men raised a shout and dashed forward altogether—formation of ranks all gone. Up to the hill crest a column of men suddenly rode into view—halted, dismounted and seemed to be busy or confused about something. It meant that the men were tightening their saddle girths and putting fresh caps on their revolvers and preparing for a charge that would have about it the fury of a whirlwind.

Johnson halted his men and rode along their front. The guerrillas gathered themselves and took the bridle reins between their teeth. In the hands of each man there was a deadly revolver. They dashed from a walk into a run. The attack was a hurricane. Johnson's command fired one volley and not a gun thereafter. Some broke ranks as soon as they had fired and fled. Others were attempting to load their muskets when the guerrillas, firing right and left, hurled themselves upon them. Johnson fell among the first. There was no quarter. The wild rout broke away toward Sturgeon. Death did its work in twos and threes in squads. Beyond the first volley not a guerrilla was hurt. That volley killed three and wounded three. Johnson's loss was 250, or out of 302 only eighteen escaped.

"Johnson's overthrow was probably a decree of fate. He did not know how to command, and his men did not know how to fight. He had by the sheer force of circumstances been brought face to face with 302 of the most terrible revolver fighters of the American war."

#### What Soldier's Home.

I think I am not in error when I say that the first soldier's home was built in Boston, Mass., in 1864.

The Rev. Phineas Stowe of the Mariners' church in Boston, had for a number of years been known as the stranger's friend, and when spoken of by anybody was called Father Stowe. Mr. Stowe was a very warm-hearted man. He had established a headquarters for strangers in Commercial street in Boston, which was called the Mariners' exchange. In the latter part of 1862 many soldiers and sailors returned from the war, wounded or disabled in some way, many of whom were foreigners, or others far away from home.

Mr. Stowe became anxious that they should be cared for. He went to see Mr. John M. S. Williams, who, like Mr. Stowe, had a large heart, and with plenty of money and influence these two united in the idea of raising money enough to provide a home for the friendless soldiers and sailors. The idea was a good one, and was crowned with success on every hand. The first soldier's home was built in the South End, in the city of Boston, in 1862-63. At that time it was only a Boston soldier's home, though open to all.

Thus we had in Boston, in the year 1864, a home for the soldier, an exchange and headquarters for the soldier; and next, Mr. Stowe formed what is known as the "Little Wanderers' home." Mr. Stowe died in 1864.—National Tribune.

#### Too Brave a Man to Die.

One of the earliest acts in the great drama of the rebellion was the capture of the United States arsenal at Apalachicola, at the mouth of the Chattahoochee river, by the troops of the state of Florida. In consequence of the weakness of the command, an entrance was gained. Mr. Powell, who had been in the service of the United States some twenty years, and had command of the place, acted in a gallant manner. After the troops had entered, he faced the line and thus addressed them:

"Officers and Soldiers: Five minutes ago I was the commander of this arsenal; but, in consequence of the weakness of my command, I am obliged to surrender—an act which I have hitherto never had to do during my whole military career. If I had had a force equal to, or even half the strength of your own, I'll be—If you would have entered that gate until you walked over my dead body. You see that I have but three men. These are laborers and cannot contend against you. I now consider myself a prisoner of war. Take my sword, Captain Jones!"

Captain Jones received Commander Powell's sword, and then returned it to him, addressing him as follows:

"My dear sir! take your sword! You are too brave a man to disarm!"

The whole command then gave three cheers for the gallant Powell.—American Tribune.

Twenty years ago there were but two or three manufacturers of horse hide leather in this country. The consumption of this leather is large and rapidly increasing.

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