A NOVEL TOOL-GRINDING ATTACHMENT.

Prof. C. V. Boys, of the Royal Society of Great Britain, has designed a novel tool-grinding attachment, the object of which is to provide a means economical, handy and easily understood by a mechanic, of accurately grinding lathe and planing tools. It is not a universal grinder, and it will not grind reamers, milling cutters, and a number of things for which well-known but expensive and elaborate tools are essential. But what it does do it does easily and well, and is especially applicable in small shops where expensive grinding machinery is not required. It is true it only does what the average workman himself thinks he can do sufficiently well, but the better the workman the more he knows that he dare not, especially with cranky and awkward tools, approach so near to the proper relief angle as he should, and the more ready he is likely to be to welcome a simple and handy, but accurate guide.

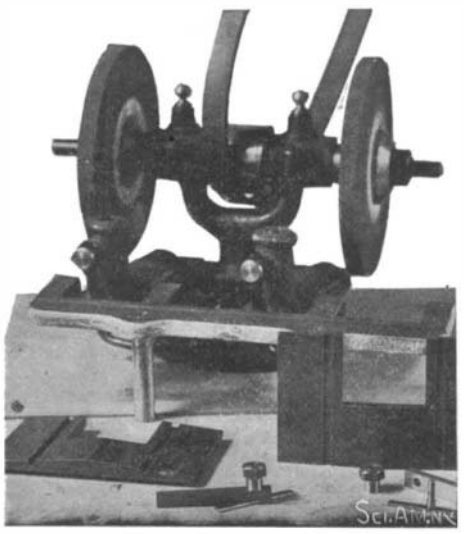


Fig. 1.—TOOL GRINDER WITH REST DETACHED.

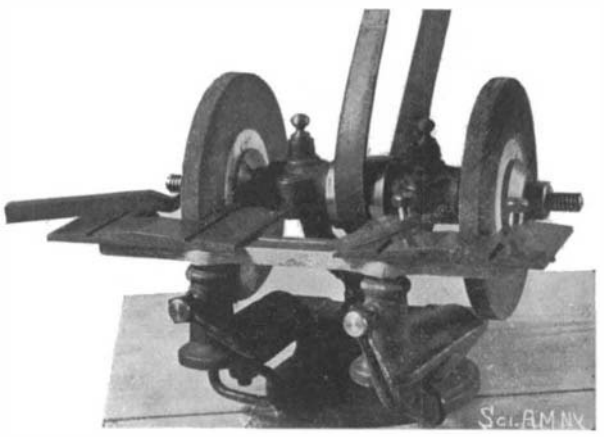


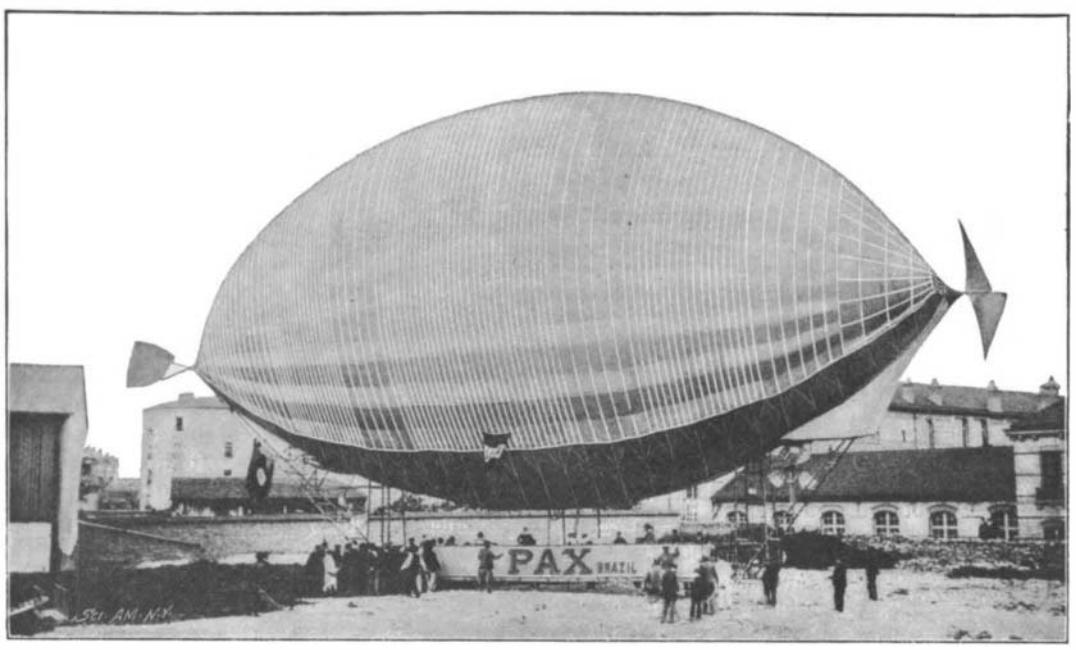
Fig. 2.—GRINDER WITH REST IN PLACE.

It is a simple device, consisting, as will be seen from the illustration, of an ordinary grinding head with a pair of wheels made to carry a platform of double U-form in plan, in which there is a longitudinal groove. In general, the platform is clamped, so that the groove is parallel with the axis of the grinding head. Upon the platform rest two double inclines, the form of which is very clearly seen in Fig. 1, while they are shown in position in Fig. 2. One of these, which is made to embrace the coarser cutting wheel, is sloped on each side to an angle of say 5 degrees, while the other, which embraces the fine cutting and finishing wheel, is sloped on each side one degree less.

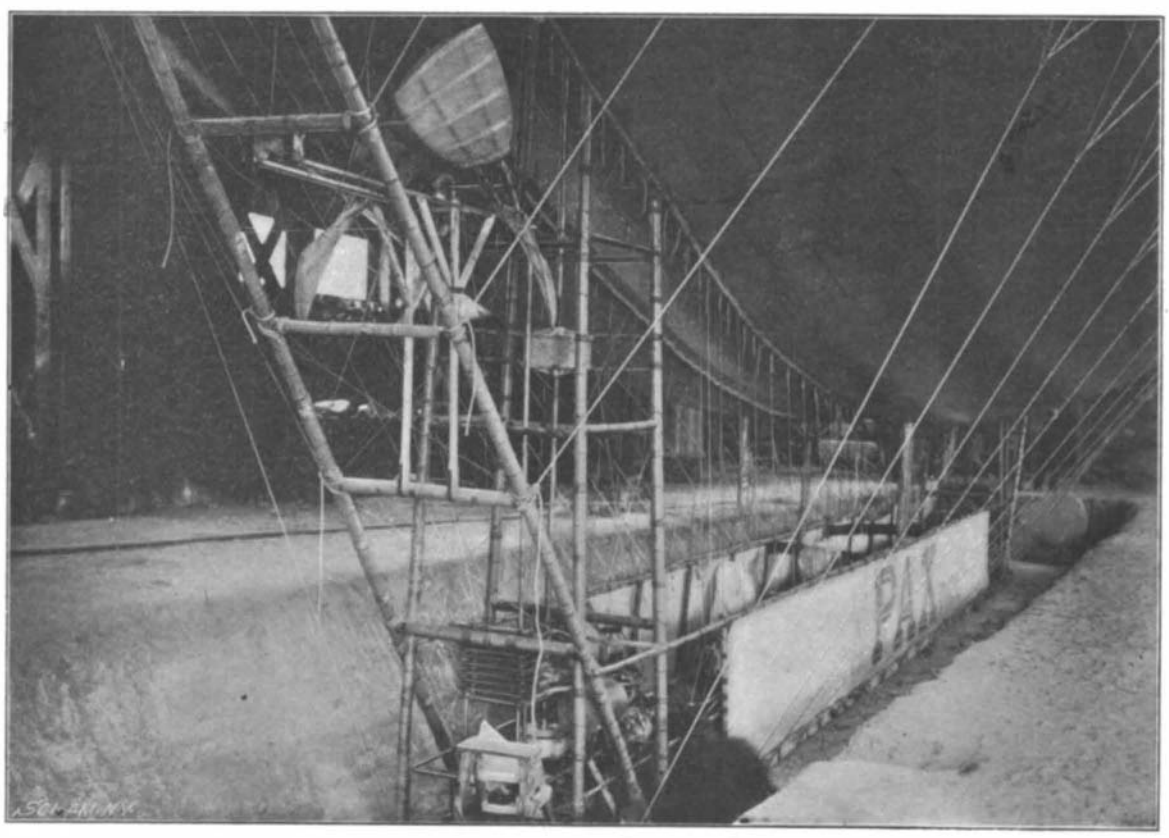
Suppose it is desired to grind a round-nose tool, in which, of course, there is no profile angle, it is laid by its shank upon the steeper double incline, and its round nose is brought to bear lightly against the flat face of the wheel, while the shank is swept over the incline. This is done on each side of the coarser wheel, and a relief angle of 5 degrees is accurately ground. It is then picked up, and with one light sweep on each side of the fine wheel, the edge only is finely ground to one degree less. If the tool is cranked below the shank level, the open mouth of the double incline gives room for the crank as shown at the left of Fig. 2, or if it is a very small tool adapted with a holder, it may be at once supported closely to the wheel. The fine grinding need not extend more than a very little way down below the edge, but with a light and rapid sweep it will reach to the bottom. Should it be arrested before this, the resulting angle of 179 deg. is seen perfectly clean and sharp, thus testifying to the precision in the work done.

Next suppose that a tool is required with definite profile angles. For this purpose the angle guides seen in Fig. 1 are set on a protractor. They are then laid in the grooves of the steeper double incline one on each side, as shown to the right of Fig. 2, and the shank of the tool is brought up against the guide, resting at the same time on the inclined face. The edge is then traversed up and down the face of the wheel, under a light pressure. As the vibration keeps the double incline almost floating, this can readily be accomplished with the greatest delicacy. As soon as the angle grinding is finished, the tool is picked up with its guide, and placed upon the less sloping double incline of the finishing wheel, and a delicate sweep taken across its face. The obtuse angle of 179 deg. will now be far more conspicuous than it was in the case of the round-nose tool. The other edge, or as many as there may be, are then ground in the same way.

A screw-cutting tool ground as exactly as described would suffer from the defect that its nose would not be inclined to the angle of the rake of the thread, and thus would cut more keenly on one side than the other. This difficulty is overcome by the simple device of tilting the whole platform to an extent, determined by a washer, stamped with a number representing the diameter divided by the pitch. The effect of this is to alter automatically all the angles, so that the relief is right on both sides, and the nose of the tool slopes at the same angle as the rake of the thread. It may be mentioned that not only is a tool ground accurately and more quickly by this simple contrivance than by hand, and when ground it need not be tested by an angle gage, but when applied it may be set in the slide rest correctly by its shank, instead of by the short cutting edges and the angle gage, which is necessary when hand grinding is resorted to. Then there is no fear of the two sides of a thread having different angles if they are desired to be alike. There is one feature of this grinder that may not be apparent at first sight, though it is obvious when pointed out. If the protractors are each set to say 30 deg., the edges of the tool will make an angle of 60 deg. with one another, symmetrically situated with respect to the shank as already explained. This will cut a screw thread in which the angle as tested in the axial plane is 60 deg., but the actual angle measured across the thread will be just under 60 deg., namely, such an angle as projected will appear as 60 deg. Now, if the tool had been ground by its edge, tested with a protractor so as to be exactly 60 deg., the form of the thread as seen in an axial section would be just over 60 deg. In most cases the change in the angle due to projection would not be enough to be of any consequence; but where such precision is essential, it is convenient to be able to set the guides to the angle, as shown in an axial section direct without having to make the calculation or allowance for the effect of projection.



First Trial of the "Pax" on May 4, 1902.



The Car, Motors, and Steering Propellers of the "Pax."

AIRSHIP "PAX," IN WHICH SEVERO LOST HIS LIFE.

TOTAL WRECK OF THE SEVERO AIRSHIP.

To the list of enthusiastic aeronauts who have sacrificed their lives in the interests of aerial navigation, the name of Augusto Severo must now be added.

At about 5 o'clock on the morning of May 12, a crowd of spectators was gathered in the airship grounds in the Rue Quintinie to witness the ascent of Severo in his airship "Pax." In the car were Señor Severo and his engineer Sachet. It is said that at starting there seemed to be some difficulty with the steering gear and the propellers. But after several stoppages the airship sailed off steadily enough in the direction of Issy, where the experiments were to be made. As the ship hovered over the Avenue Demaine, she was caught by a puff of wind and blown about in such a fashion that to the onlookers it became immediately apparent that Severo had lost all control. A bright flash of light suddenly enveloped the balloon. A loud report instantly followed. From a height of 1,500 feet the machine fell toward the earth, crashing through branches of trees, finally landing in the Avenue Demaine. Severo was hurled from the balloon as it fell, and struck the ground near the Mont Parnasse station. He was picked up a mangled corpse. He struck the ground feet first, and with such velocity that the bones of his legs were forced through the soles of his boots. Sachet, it seems, was burnt to death.

At this early date it is rather difficult to explain the cause of the accident. The men who built the balloon claim that the accident was due to the explosion of one of the reservoirs. Santos-Dumont holds that Severo's motor was located much too near the gas bag, and that as Severo rapidly arose the gas expanded and was driven out through the valve and sent against the motor. Col. Renard, of the French army's balloon di-

vision, agrees with Santos-Dumont, and also believes that Severo owed his death to his ignorance of aerostatics.

We present two illustrations of the airship, taken soon after its completion. It will be seen that in a general way it resembled the later craft, Number 7, built by Santos-Dumont; though there are points of difference, in some of which it is inferior to and in others an improvement on that machine. It is evident, at a glance, that the car or navigating platform is carried much nearer to the balloon than it was in the Santos-Dumont ship, and the danger of ignition of the escaping gas, which owing to the ascent of the ship would flow downward toward the car, is at once evident.

This placing of the car so close beneath the balloon was evidently done with the object of improving the control by bringing the center of resistance as close to the center of effort of the propellers as possible. For the same reason the propellers were placed on the axis of the balloon. Severo also endeavored to further improve the control by adopting a fuller model for the gas bag, using a ratio of 5 to 2 in the "Pax," as against a ratio of 1 to 6 in Santos' airship.

The larger of our illustrations shows that the gas bag was partially divided by a deep longitudinal depression on the under side. The car was built of bamboo framing trussed with steel wire. A decided novelty was the use of two steering propellers arranged transversely to the axis of the airship—a very doubtful improvement, we should say, over the ordinary rudder of large area.

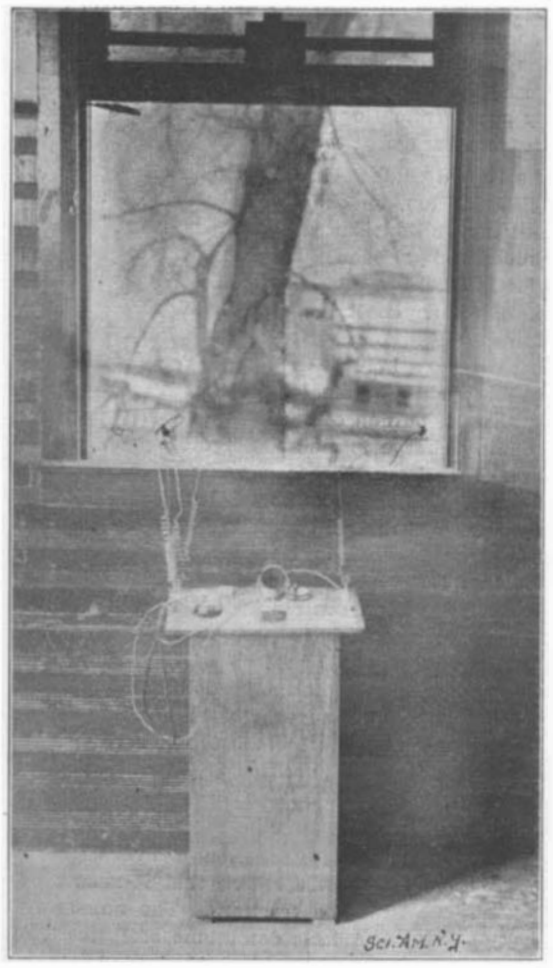
THE LATEST ADVANCE IN WIRELESS TELEPHONY.

BY WALDON FAWCETT.

The latest and one of the most interesting systems of wireless communication with which experiments have recently been conducted is the invention of Nathan Stubblefield, of Murray, Ky., an electrical engineer who is the patentee of a number of devices both in this country and abroad. The Stubblefield system differs from that originated by Marconi in that utilization is made of the electrical currents of the earth instead of the ethereal waves employed by the Italian inventor, and which, by the way, it is now claimed, are less powerful and more susceptible to derangement by electrical disturbances than the currents found in the earth and water. In this new system, however, as in that formulated by Marconi, a series of vibrations is created, and what is known as the Hertzian electrical wave currents are used.

The key to the methods which form the basis of all the systems of wireless telephony recently discovered—the fundamental principles of wireless telephony, as it were—was discovered at Cambridge, Mass., in 1877 by Prof. Alexander Graham Bell, the inventor of the telephone system which bears his name. On the occasion mentioned Prof. Bell was experimenting to ascertain how slight a ground connection could be had with the telephone. Two pokers had been driven into the ground about fifty feet apart, and to these were attached two wires leading to an ordinary telephone receiver. Upon placing his ear to the receiver, Prof. Bell was surprised to hear quite distinctly the ticking of a clock, which after a time he was able to identify, by reason of certain peculiarities in the ticking, as that of the electrical timepiece at Cambridge University, the ground wire of which penetrated the earth at a point more than half a mile distant.

Some five years later Prof. Bell made rather extensive experiments along this same line of investigation at points on the Potomac River near Washington, but these tests were far from satisfactory. It was found on this occasion that musical sounds transmitted by the use of a "buzzer" could be heard distinctly four miles distant, but little success was attained in the matter of communicating the sound of the human voice. Meanwhile Sir William Preece, of England, had undertaken experimental study of the subject of wireless telephony, and during an interval when cable communication between the Isle of Wight and the mainland was suspended, succeeded in transmitting wireless messages to Queen Victoria at Osborne by means of the earth and water electrical currents.



STUBBLEFIELD APPARATUS.

Mr. Stubblefield's experiments with wireless telephony dated from his invention of an earth cell several years ago. This cell derived sufficient electrical energy from the ground in the vicinity of the spot where it was buried to run a small motor continuously for two months and six days without any attention whatever. Indeed, the electrical current was powerful enough to run a clock and several small pieces of machinery and to ring a large gong. Mr. Stubblefield's first crude experiments looking to actual wireless transmission of the sound of the human voice were made without ground wires. Nevertheless, by means of a cumbersome and incomplete machine, without an equipment of wires of any description, messages were transmitted through a brick wall and several walls of lath and plaster. As the development of the system progressed, the present method of grounding the wires was adopted, in order to insure greater power in transmission.

The apparatus which has been used in the most recent demonstrations of the Stubblefield system, and which will be installed by the Gordon Telephone Company, of Charleston, S. C., for the establishment of telephonic communication between the city of Charleston and the sea islands lying off the coast of South Carolina, consists primarily of an ordinary receiver and transmitter and a pair of steel rods with bell-shaped attachments which are driven into the ground to a depth of several feet at any desired point, and which are connected by twenty or thirty feet of wire to the electrical apparatus proper. This latter consists of dry cells, a generator and an induction coil, and the apparatus used in most of the experiments thus far made has been incased in a box twelve inches in length, eight inches wide and eighteen inches in height. This apparatus has demonstrated the capability of sending out a gong signal as well as transmitting voice messages, and this is, of course, of great importance in facilitating the opening of communication.

The most interesting tests of the Stubblefield system have been made on the Potomac River near Washington. During the land tests complete sentences, figures, and music were heard at a distance of several hundred yards, and conversation was as distinct as by the ordinary wire telephone. Persons, each carrying a receiver and transmitter with two steel rods, walking about at some distance from the stationary station were enabled to instantly open communication by thrusting the rods into the ground at any point. An even more remarkable test resulted in the maintenance of communication between a station on shore and a steamer anchored several hundred feet from shore. Communication between the steamer and shore was opened by dropping the wires from the apparatus on board the vessel into the water at the stern of the boat. The sounds of a harmonica played on shore were distinctly heard in the three receivers attached to the apparatus on the steamer, and singing, the sound of the human voice counting numerals, and ordinary conversation were audible. In the first tests it was found that conversation was not always distinct, but this defect was remedied by the introduction of more powerful batteries. A very interesting feature brought out during the tests mentioned was found in the capability of this form of apparatus to send simultaneous messages from a central distributing station over a very wide territory.

Extensive experiments in wireless telephony have also been made by Prof. A. Frederick Collins, an electrical engineer of Philadelphia, whose system differs only in minor details from that introduced by Mr. Stubblefield. In the Collins system, instead of utilizing steel rods, small zinc-wire screens are buried in the earth, one at the sending and another at the receiving station. A single wire connects the screen with the transmitting and receiving apparatus, mounted on a tripod immediately over the shallow hole in which the screen is stationed. With the Collins system communication has been maintained between various parts of a large modern office building, and messages have been transmitted without wires across the Delaware River at Philadelphia, a distance of over a mile.

Subsidence of the Texas Oil Wells.

Oil has now ceased to flow spontaneously from the wells of Beaumont, but the refiners are not thereby in any way disturbed. There is plenty of oil left in the fields, but it will now be necessary to force it from the ground. The startling flow of oil which greeted the man who made the first strike was due primarily to the enormous pressure of the gas confined in the same subterranean chamber with the oil. Since the chamber was penetrated the gas began to escape and the flow of oil to subside. Instead of natural gas pressure it will now be necessary to use artificial air pressure.

Scientific American Paris Exposition Award.

The exhibit made by the SCIENTIFIC AMERICAN at the Paris Exposition in Group 3, Class 13 of American journals and periodical publications, has received a Grand Prix diploma.

PASSENGER ON VESSEL COMMUNICATING WITH LAND.

RECEIVING A MESSAGE.