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CHANGEABLE SPEEDS.

It is beyond question that our present method of changes of speed of lathes, drills, milling machines, planers, and other tools where changes of speeds are required is a crude one, and unworthy of present mechanical capability. At the best, our changes are made by moving the belt from a large driving pulley to a smaller driven pulley, or from a small driving pulley to a larger driven pulley. But each of these changes involves a positive and unalterable degree of change of speed. It must be "Hobbs or nothing." A graded pulley may range thus in diameters: 6 inches, 8 inches, 10 inches, 12 inches. Suppose the spindle speed is 200 revolutions per minute, the small delivering pulley would give 300 feet per minute, the next 400 feet, the next 500 feet, and the last 600 feet. Between these changes of 100 feet per minute there are no intermediate speeds. It must be a change of 100 feet per minute. This is a favorable estimate of the changes of graded pulleys; it is seldom the grades are so near or that they range in the proportion stated—6 inches to 12 inches. Generally the total range of change of speed is much below these two proportionate extremes.

Now there is no theoretical reason, and no mechanical impediment, or hinderance, to such an arrangement of changeable speeds, for at least some of our machine tools, as shall greatly increase their usefulness. But our machine tool builders appear to run in ruts—shop ruts—and are slow to adopt a new thing and slow to adapt an old thing. Some of our light lathes and our light upright drills, which are fed by hand so as to be properly called "sensitive," would have their usefulness greatly increased if the speed could be as exactly and designedly governed and regulated as the feed can be.

There is in use for the potter's wheel, and also for the sewing machine, a mechanical device that will give a long range of speeds without any sudden and abrupt changes.

It is a simple device—a rotating disk twenty-four, thirty-six inches or larger in diameter, and across it from center to periphery extends a shaft feathered (with fixed key) the entire length. On this shaft traverses a sliding roll or small pulley controlled by a forked guide attached to a lever moved by hand or foot. The roll has a bearing by spring on the turned face of the disk, which revolves at a constant speed. If the roll is near the hub of the disk, its speed may not be fast; but if it is guided too near the rim of the disk, its speed is correspondingly increased.

Suppose the disk to be 36 inches in diameter, and allow four inches for a hub. The driven wheel at the nearest point to the hub—say six inches—will have a speed (at the initial speed of 200 revolutions per minute) of 300 feet per minute. If the driven wheel comes away from the hub, or the six inches around it, to 16 inches beyond, it will have a speed of 800 feet per minute. But better than these extreme changes is the fact that *any* speed, from the initial 300 feet to the extreme 800 feet, can be had and be maintained. This is not possible with exact graded pulleys. And more than this, there need be no stoppage of a machine or shifting of belt to effect all these changes; a movement of the foot on a treadle or the hand on a lever will do the business. The lever that guides the friction wheel across the face of the disk can be made to be secured or latched at any point to make a constant velocity, and the degree of velocity between the slowest and the fastest may be controlled exactly. The position of the driving disk and its shaft is immaterial. I have seen it on a horizontal shaft driving an upright shaft, and on a vertical shaft driving a horizontal shaft. The friction roll may be made of disks of raw hide or of leather, or be of hard rubber—the latter not to be used in oil, but is unaffected by water. There is no question of the utility of this device as already used, and there seems to be no insuperable obstacle to its adaptation to small upright drills and other small machine tools.

AUTOMATIC TORPEDOES.

During a war, where it is waged partly on navigable waters, fixed torpedoes have proved, in some cases, effectual in preventing or at least delaying the approach of an enemy's ships. But the torpedo branch of naval service has long ago extended to the offensive, and there is no machinery in existence that has more certainly and abundantly proved the resources of the machinist than that which is employed in the working of the offensive automatic torpedo. As an illustration take the Lay-Haight torpedo. This is a cigar-shaped vessel thirty feet long and perhaps thirty inches diameter in its central and largest portion. It carries a charge of an explosive in its forward end sufficient to blow the largest and strongest ironclad that ever floated to "kingdom come." In the after compartment and all amidship are the generator, the engine, the steering apparatus, and the propeller shaft, and at the outer end the propeller. Adjustable rudders determine its depth under the water and direct its course. All the machinery is of the very best construction; no expense is spared for exact and perfect workmanship. From the shore, or from an anchored ship, one of these destroyers can be sent a mile, one and a half miles, or even two miles, being guided in its course by the operator at the fixed starting point, by means of wires and electricity. The torpedo can be sent at a speed that absolutely prevents preparations to defend against it, even if any ordinary defense was possible.

At the works of the Pratt & Whitney Company, Hartford, Conn., there is now being built, under the direction of Mr. George E. Haight, one of his torpedoes that is to be submitted to a foreign government for approval before the award of a contract for a number of these naval weapons. This one is being made of sheet copper instead of sheet steel, the material of which most of the Lay-Haight torpedoes has heretofore been made. The engines which are to drive the propeller are six in number, or rather the engine is a group of six cylinders working synchronously with a speed that will develop about 1,000 revolutions of the screw propeller per minute. It is calculated and confidently believed that the speed of this torpedo will be almost if not quite at the rate of twenty miles per hour at a depth below the surface or from thirty inches to forty-eight inches. A distance of two miles will be traversed in six minutes, giving little opportunity for the crew of a hostile vessel to take defensive measures, even if they could detect its starting and determine its approach. The motive power of the engines is carbonic acid gas.

BALDNESS.—ITS PREVENTION AND CURE.

The mode of formation and growth of the hair is now so well known that there can be no question as to the cause of baldness. It is produced by a failure of normal nutrition in the papillæ at the base of each hair follicle. Imperfect work being done in the capillaries, which are here richly distributed, the cells which constitute a hair shaft are not formed in their due proportion, the old shaft thus feebly sustained becomes loose and drops away, leaving nothing in its place. This failure of nutrition may have a sudden cause, of which the effect will be but temporary. For instance, an attack of typhoid fever often leaves the papillæ of the scalp so much enfeebled that rapid baldness ensues. The papillæ, however, still retain their vitality, and as the system regains its strength they quickly recover their potentiality, and the hair comes again, perhaps thicker than before.

In the same manner certain cutaneous affections may cause the hair to fall by an action on the papillæ which is but temporary; in such cases recovery, perhaps with assistance, perhaps without it, is possible. In the great majority of instances, however, where the head is bald the failure of nutrition of each papilla has come on so gradually, and has continued so long, that the papilla no longer exists; it has passed away by atrophy; its capillaries have become obliterated, and even the follicle itself no longer constitutes a depression in the cutis, and the scalp has the smooth and shining appearance which we so well recognize.

It is easy, therefore, to see that in such a condition as this no renewed growth of the hair is to be expected, for the anatomical structure which caused its development and continued it has ceased to exist, and the countless remedies which are so freely advertised as being able to rejuvenate bald heads are utterly of no avail. They serve only to illustrate the greed and the impudence of the inventors, as well as the credulity of the purchasers. But such is the desire to escape the appearance of "growing old" that no doubt they will hold their ground for all time to come.

But now arises the question, Cannot the application of the various agents to the scalp, at the time when the hair is *beginning* to lose its hold, be of service in stimulating the follicles and papillæ into renewed and permanent vigor? To this question it is not possible, on theoretical grounds, to say no, absolutely; but in practical fact that is the only true answer to give in the vast majority of cases. The cause of the falling of the hair has been already stated, and safe reasoning tells us that our only hope can be in that which can restore the failing vitality, and we well know that we should not expect to secure this on any other part of the skin by filthy oils and washes. Proper cleansing of the scalp is as important as it is of all other parts; nothing else should be applied to it but common sense.

There can be little question that the continued close covering of the head with hats and caps is one very constant cause of baldness. Women, in our own communities, seldom lose their hair, except from sudden causes; and among those nations where the head is habitually left bare or but slightly covered, baldness is practically unknown. At the same time the beard, which is of the same class of hair as that of the scalp, but which is always uncovered, does not fail with age. A reform in our style of head gear is very desirable, but it is not at all likely to be accomplished.

The suggestion was some time ago made in our columns that bald heads might perhaps be covered anew with hair by "skin grafting," *i. e.*, applying bits taken from other scalps and causing them to take root and spread. No doubt such bits might be attached, but the whole matter is merely a wild fancy without practical value. We can make "skin grafts" take hold, but it is only where the skin is destroyed and the surface raw and exposed, commonly rendered so by disease. Assuming that some person (though it is difficult to believe that such a person could be found) would consent to have his scalp peeled away in preparation for the operation, and then assuming that some other person could be found who would consent to appropriate his own scalp to cutting out the proper bits for the work, yet then the very best possible success (even theoretically) must be extremely imperfect. The denuded surface would heal so rapidly between the "grafts" that no extension on their part could take place, and a head with small specks of hair here and there would be the only attainable result. "Crazy patchwork" is fashionable, but perhaps not many would care to wear it in that way.

The result of all seems to be that when baldness has come slowly and naturally, it has come to stay, and our only wisdom is to be content.