be soon "played out." Vigorous efforts will undoubtedly be made to put other iron producing centers on a level with Pittsburgh, by improving the communication between coal and iron regions; but the truth will always remain constant, that, however rich iron ore may be, it will not pay to carry it too far.

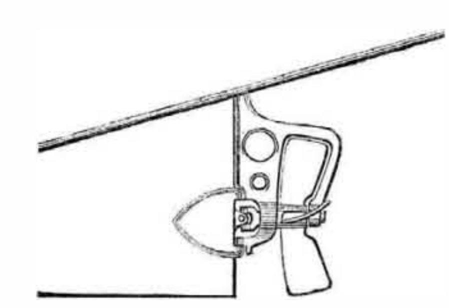
For a long while the American makers had a heavy uphill journey, as, although they were protected by an enormous tariff, and were supplied with a huge home demand, English makers of railway material swept the market. An unprecedented advance in the price of English coal, and consequently of iron, during the last three years, deprived English makers for a while of their advantage, and, despite dear labor, the American ironworks rose last year to a high pitch of prosperity. The delicate conditions of business in the United States failed, however, last autumn to withstand the tension of the financial world, and the American iron and steel trade suffered a paralysis which it communicated in no small degree to the trade of Great Britain. With a keen eye to the wants of the future, the American makers apparently foresaw that the wants of the railway world would be confined to Bessemer steel, and have made great efforts to compete—under the ægis of their duties—with English makers in the production of this important metal. So long as exaggerated prices for fuel and labor prevailed in England, a chance of success remained; but so soon as the period of inflation in England ceased, it at once became evident that steel rails were wanted for America. Barrow-in-Furness is likely to prove for some time a hard nut to crack for all her competitors in Bessemer steel, be the same English or Welsh, Belgian, French, or American. She has the precise kind of ore required under her feet, and in this particular possesses an undoubted advantage over American rivals. That a country may escape ridiculous smallness by being inconveniently large, is proved by the significant fact that Algerian and Bilbao ores cost at the furnace in America $20 per tun, when they may be bought at Barrow or at Cardiff for $6.25. Without "magnificent distances", the superb supplies of iron ore in "the States" would be speedily utilized; but until increased and cheaper railway communication has brought her coal and iron closer together, America will need all her unquestionable energy and ingenuity to compete with England in the world of iron.—*Iron.*

Correspondence.

Universal Joints in Screw Shafts.

To the Editor of the Scientific American:

I have lately noticed in your valuable paper a number of references to the use of Hooke's universal joint in a screw shaft, but I have seen nothing resembling an invention of my own in that direction, and I would like to call your attention to it. The engraving, I think, explains itself, and it



is designed to facilitate the handling of small boats, like launches intended for torpedo work.

The propeller and that portion of the shaft beyond the universal joint is hung in a composition frame, which takes the place of the ordinary rudder. A line passing through the axis of motion of the pintles and gudgeons would also pass through the center of the ball of the universal joint; and by means of the frame, the propeller is thrown to the right and left in steering. My invention has been applied to one of our torpedo launches, and has been in operation for several months. The speed of the boat is exactly the same as it was with the same propeller fitted in the ordinary way; while the rapidity with which she can turn to starboard or port is very much increased, the diameter of her circle being much decreased. The rudder framehead is fitted with an arc which gears into a rack on the side of a cylinder moving athwart the stern of the boat, so that she can be steered by steam or compressed air. An ordinary wheel is, however, fitted, which answers every purpose in a small launch, as it requires very little force to throw the propeller from one side to the other.

I have no patent on my invention; and perhaps, if you print my sketch, some one may get an idea from it.

F. M. BARBER, Lieutenant U. S. N.

Torpedo Station, Newport, R. I.

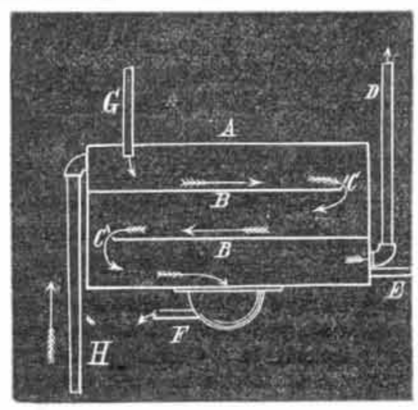
Small Steam Engines.

To the Editor of the Scientific American:

Several of your correspondents having written somewhat upon the performance of small engines, I would like them to see what I am doing.

My engine cylinder is 4 inches by 10 inches stroke, and runs at 120 revolutions per minute; it has a common D valve, and cuts off at ⅝ of the stroke; it has a boiler pressure of 60 or 70 pounds. With this engine I run my machine shop, which has 52 feet of 1⅞ inch shafting, running at 200 revolutions, driving two engine lathes of 8 and 6 feet bed respectively, one planer of 6 feet bed, one upright drill (medium size), one small drilling lathe of 4 feet bed, one drop hammer (hammer weighs 300 pounds), one blower, one grinding machine for grinding rolls, etc., beside a grindstone and an emery wheel. These tools are in my own shop. I run a quarter-turn 4 inch belt into the next building, and drive 32 feet of 1⅞ inches shafting, and one large iron blacksmith's or boiler maker's punch and shears combined, and one medium-sized upright drill. I also take another quarter-turn 4 inch belt from my shaft, and (by three countershafts and pulleys) reach the second story of the second building, and go thence up into the third story of the same, and there drive 54 feet of one inch shafting, and 30 sewing machines running upon heavy cotton goods. I also take from my main line in my shop a rope belt of 1½ inches diameter, and drive (in the third store adjoining me on another side, 56 feet distance between shafts) some coffee-roasting and spice mills.

My boiler is of locomotive style, with a 26 inch shell, 6 feet long, with twenty-nine 2¼ inch flues; the fire box or grate surface is 22 x 28, with a smoke stack 40 feet high and 10 inches in diameter, with a damper. I use no blower; I burn coke and bituminous screenings mixed (about 2 barrels per day). I evaporate about 20 gallons of water per hour, introducing it into the boiler, through a heater of my own construction, at about 206° Fah.



A, heater of sheet iron; B B, two sheet iron pans; C C, points where the pans are turned up a little, and small holes drilled through; D, pipe where steam escapes; E, overflow pipe; F, pipe by which hot water is taken to pump; G, cold water pipe from tank; H, exhaust pipe from engine.

You will see that I introduce the exhaust steam and cold water at a point as near to each other as possible, and that both steam and water travel together over the two pans to their exit, the water falling down upon each pan successively, and through little holes drilled in the ends of the pans for that purpose, in order to expose as much of the surface of the water to the action of the steam as possible, until it reaches a little well in the bottom of the heater, whence I convey it to the pump. I admit only just enough water to this heater to keep my boiler supplied.

If any of your readers are doing more work with less engine, I would like to hear from them. O. B. FENNER.

San Francisco, Cal.

Cribbing in Horses.

To the Editor of the Scientific American:

The letter upon cribbing in horses, from D. Cook, Elmira O., is calculated to do a great deal of harm, without any advantage arising therefrom.

He says that the habit is caused by some foreign substance being pressed between the teeth, or by the front teeth growing too close together, thus causing pain. If this were the case, I ask him: Why a great many horses, during the act of cribbing, always apply the under jaw, instead of the teeth, to the manger? His treatment for the same, which no doubt he offers as an entirely new idea, has been known to horsemen for years, but is seldom practised by them.

Instead of crib-biting or wind-sucking being caused by pain in the teeth, it is due to a derangement of the stomach.

Filing the incisor teeth apart, in the place of relieving pain, very often produces it; and therefore, whenever it is successful in preventing the animals from indulging in the habit—which is but seldom—it is on account of the soreness of the teeth occasioned by the operation.

To enable a horse to swallow wind, it is necessary for the muscles of the neck to contract, and the only object in applying the teeth or jaw to the post or manger is to afford a fulcrum for these muscles to act from. J. C. HIGGINS.

Millstone, N. J.

Forming and Tempering Taps.

To the Editor of the Scientific American:

I find that T. I. B.'s tap, a quarter inch in diameter, which has tapped "over two hundred thousand hot forged nuts," was made according to the instructions given by Mr. Rose in his valuable practical essays. It was forged to as near its finished size as possible, so that it would true up. It was passed through a hardened steel gage. It had three half round grooves, the only clearance being to ease off the tops of the threads. It was heated to a cherry red, "red without being hot enough to scale," then dipped endways, and the shank made the softest and tempered on a piece of iron, as given in "Practical Mechanism" for dies. All these operations are precisely those recommended by Mr. Rose: and it is curious that it broke from being applied to a hole that was too small, giving it, as Mr. Rose puts it, "more duty than it should be required to perform."

As a mechanic, I agree with T. I. B. as to his method of making and of sharpening a taper tap, and thank him for giving to the world, through your columns, the method and result of his practice, which is truly remarkable.

East New York, L. I. MACHINIST.

[The above is only one out of many scores of letters which we receive, constantly testifying to the value of the articles on "Practical Mechanism."—EDS.

A New Friction Brake.

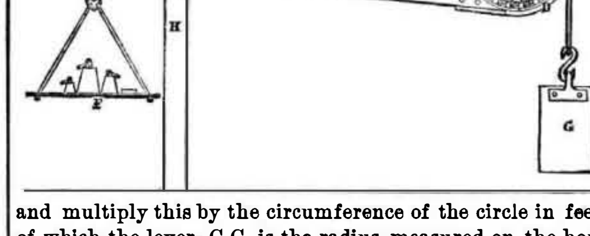
To the Editor of the Scientific American:

In your issue of October 31, 1874, is an illustration and description of a simple friction brake for testing the power of small engines. Having given some attention to the various kinds of dynamometers for such purposes, I submit for your inspection a modification of a brake somewhat similar The difference between this brake and that referred to consists in the weights of my brake being suspended from a center line horizontally through the shaft. It does not require the piston in oil which forms a part of your brake; and instead of two wooden blocks, I use a metal ring in two pieces or sections, each piece being less than the half circle and lined with wood, leaving an opening between the pieces, and turned on a face plate to the exact diameter of the pulley. Each half ring is provided with a flange, to which the arms are bolted, and which meet in a point at a certain distance from the center of the pulley, and form the lever by which the power is measured. There is also a box partly filled with scraps to act as a counterbalance, which, with a common scale and weights, completes the apparatus. As a matter of convenience, in using the brake, a temporary post with two pins is used for securing the lever in an approximately horizontal position, which tends to simplify the operation.

A is the shaft, revolving at seventy revolutions per minute; B, a pulley fastened on the same, the diameter of which is immaterial, but should neither be very small nor very large; C C, two wooden arms which form the lever; D D, two pieces of a metal ring, each piece being less than the half circle: F, a scale whereon weights are placed in making a test; G, a box with scrap which counterbalances the lever C C, and scale, F, when hanging loosely on the pulley; H, a temporary post, with two pins, *a* and *b*, for securing the lever in nearly a horizontal position. The weight of the lever, with rings, scale, and counterbalance, is 300 pounds, when the said lever is perfectly level and loose on the pulley. The length of lever from center of shaft, A, to point, E, is 5 feet.

First find the friction caused by the lever and counterbalance when loose upon the pulley. The coefficient of friction with wood or cast iron, lubricated, is 0·21; 300 × 0·21 = 63 pounds.

Tighten up the brake until the speed of the shaft, A, falls a revolution below its usual speed; slack the brake until the speed comes close up to the full number of revolutions; place weights on the scale, F, adding thereto until the lever, C C, falls down to a perfectly horizontal position. This accomplished, take the number of pounds weight on the scale, F



and multiply this by the circumference of the circle in feet of which the lever, C C, is the radius, measured on the horizontal line, and by the number of revolutions of the shaft, A, per minute; this will give the number of foot pounds (or the number of pounds raised one foot high in one minute), to which product add the friction of the lever as previously found, and divide the whole by the standard horse power, 33,000 lbs. raised one foot per minute, which will give the horse power transmitted by the shaft, A, which shaft may be either that of a small steam engine or a countershaft in a factory or mill.

Example: A lever is 5 feet long; this gives a circumference of a circle described from the center, A, through the point at E, 31·4 feet. Weight in scale when lever is level, 75·05 pounds; speed of shaft, 70 revolutions per minute; 31·4 × 70 = 2,198 feet per minute; 2,198 × 75·05 = 164,959, and 164,959 + 63 = 165,022, and 165,022 ÷ 33,000 = 5 horse power transmitted by the shaft, A.

I consider this apparatus better adapted for the purpose of testing power than the one referred to in your journal. The friction brake in this apparatus is more rigidly secured, and will not cause the end of the lever to vibrate when testing, so that it will come to the desired position more readily than that with the two blocks and long bolts, which latter will cause vibration of the lever. Secondly, the center line is the proper line to hang the weights on. Thirdly, the piston in oil will affect to a certain extent the accuracy of the test.

Toronto, Canada. WILLIAM GILL

Wear of Grindstones.

To the Editor of the Scientific American:

W. Kapp's idea, on page 228 of your current volume, for arranging grindstone spindles to prevent the uneven wear of the stone, is good. But the difficulty is not wholly removed by his plan, as the greatest cause of uneven wear is attributable to the stone being softer on the lower side, caused by the drip or by standing in the water. A good idea is to remove the crank, and this may apply advantageously to his plan. C. C. BLAKEMORE.

Washington C. H., Ohio.