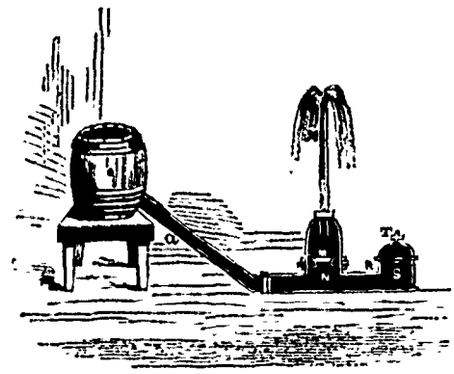
wood work begins to creak, the joints come loose and the entire fabric cries for relief—in other words it is done.

Now for the financial considerations. A good single mower will cost say $90; a single reaper say $120; and a combined machine $140. Here, of course, there is a purchase saving of $70 in favor of the combined machine. But remember it is good only for ten years on the smaller farm—in other words it will cut 500 acres before it is done—whereas the other two together are good for double that amount on 1,000 acres. In short, cutting may thus be done on the smaller farm with the Combined Machine at a cost of 28 cents per acre, and on the larger farm, with the two separate machines, at a cost of 21 cents per acre. Our answer then to the question at first proposed will appear manifest, viz.: If you own a 100 acre farm, by all means get a combined machine, and if you have 200 acres or more, have two separate ones—one for mowing and the other for reaping.

The next point is still more important. It is this. Be sure, whatever machine you purchase, that the knife will cut as much as the machine passes over—that none of your grain is dragged instead of being cleanly cut. This fault is undoubtedly a fact in some machines, and one which cannot be too strongly condemned, because it not only adds unecessarily to the draught, but causes the work to be performed in a most unsatisfactory manner. Straws are left growing here, there and everywhere over the field, with their heads torn off and simply lost.

The fault arises solely from miscalculation on the part of the manufacturer But any farmer can easily discover it for himself where it exists. Of course to one versed in figures, a simple calculation from a few wheel measurements would detect the thing at once; but this knowledge is not absolutely necessary. Let the farmer, before purchasing, mark the spot of ground on which the driving-wheel rests; then let him draw forward the machine until the driving-wheel has made one complete revolution—*and count the number of knife-strokes in that distance*. Next measure the distance passed over by the driving-wheel, and the length of one of the knife sections from its cutting base to its point, and the calculation is made thus.

Suppose the distance for each revolution of the driving-wheel to be eight and a half feet or 102 inches, and that the knife section measures two inches, then the knife must make 51 strokes to cut clean—or the knife-crank must make 25½ revolutions, because at each crank-revolution the knife makes two strokes, an outward and an inward one. Hence the rule; divide the distance passed over by the



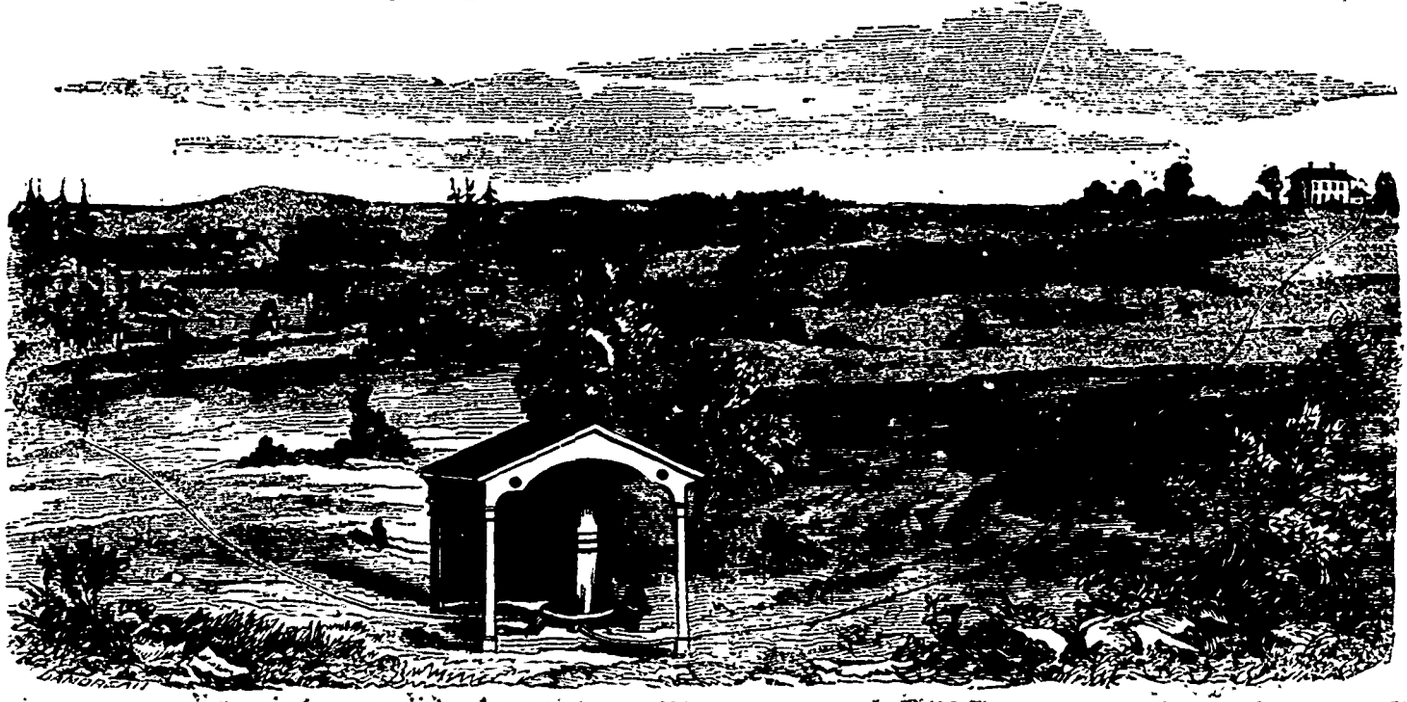
driving-wheel, or the circumference of the driving-wheel, *in inches*, by the *cutting* length of the knife section, and the result will be the number of strokes for each driving-wheel revolution.

If, in the case given, the knife gave 60 strokes instead of 51, there would be an unnecessary waste of material, for 51 are amply sufficient as we have seen to cut clean. If, on the other hand, the number did not equal 51, then clean cutting could not possibly be effected. In selecting your machine then, choose the

exact number when you can, but when you can't, then take the larger in all cases in preference to the smaller.

The Hydraulic Ram—(*Continued.*)

Ten feet for every foot of fall is the usual average now for the improved machine. The following engraving illustrates it. The bartel is supposed to be full. A pipe *a* leads from near the bottom of the barrel (to gain the extra pressure) to the ram and to a valve beyond it, which is kept open by the weight *t*. The water rushing through the pipe and gaining momentum as it flows onwards, strikes against, the under side of the valve *s* and closes it. The course is thus stopped, but the momentum cannot be so easily overcome; that part of the column of water nearest the barrel still endeavors to escape, and as it cannot do so through *r* and *s*, it forces open the valve *n*, and rushes up the centre tube *r*. The momentum ceases and *s* again opens to be immediately closed again, however, by a fresh supply from the barrel, and up rushes another jet through *r*. So rapid does this action become that the valve *s* is kept in incessant vibration and a constant stream of water through *r* is the result. The whole thing is self acting, and will continue to work so long as there is water in the barrel, and nothing goes wrong with the pipes.



The next engraving illustrates the very same principle applied to the purpose of carrying water from a stream, dammed up to form a pond at a distance, to the dwelling house or barns—always remembering that ten feet of a rise are gained for each foot of fall. The volume of water furnished will depend on the size of the ram. The feed pipe must be larger than the delivery pipe, and the latter may be increased in proportion to the former. The nine dollar machine already spoken of will throw a half inch stream, which, constantly running, will supply a large amount of water. The principal expense over and above such a machine is the piping, but this of course depends on the distance The pipes should be made of iron, or lead, lead is best, and they should be laid below the reach of frost. The ram itself will work in any kind of weather unprotected, although for order' sake it might be covered in as in the engraving—still this is not at all necessary.

The third cut illustrates the simplicity and cheapness of an arrangement that will answer any purpose.

Look then to your water sources and streams, however insignificant they may appear. You may discover that with an outlay of a few dollars, and a little trouble and pains, you can render them the source of the greatest utility and ornament about the place.