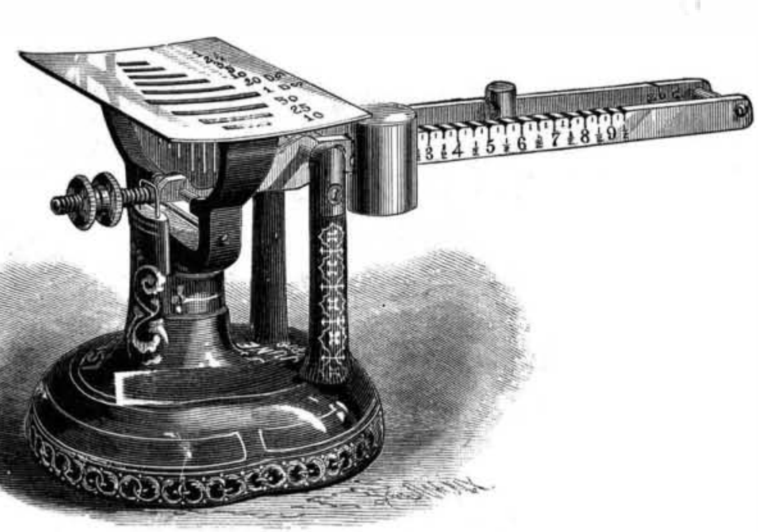
NEW POSTAL COIN SCALE.

This ingenious scale, recently patented, is so fully shown in the accompanying cut that a description is hardly necessary. A letter scale is a necessity to every business man, and the coin attachment adds but a trifle to the cost, and is of equal advantage to all who handle coin, especially as it gives the three tests that the counterfeiter finds it impossible to overcome—weight, diameter, and thickness.

Full information may be obtained of the special agents, Messrs. Geo. F. June & Co., 267 Broadway, New York, who have an advertisement in this issue, to which attention is directed.



NEW POSTAL COIN SCALE.

American Steamboats Sweep the World.

There is apparently a large and extended market for American flat river steamers on the shallow navigable rivers of Europe and Asia. In China they have already effected almost a revolution in the water carrying trade of that empire, and we hear that there is a brisk demand for them already on the Volga. The plan adopted in that case by the American builders is to take out the machinery with them, and to build the steamers of timber on the spot. This plan produces a steamer much cheaper than the iron river steamers exported from England, which have been in use there for some time. Not only is their success due to that cause, but more especially owing to the fact that the American built boats only require a draught of four feet, while most of the English steamers require nine. Even a draught of five feet bars the navigation through a great portion of the river, and the speed of the wooden American boats is said to be better than that of any of their iron competitors. The light draught of the American boats has opened up a navigable length of some 2,000 to 2,300 miles on the Volga, which will probably induce considerable further orders for the other large rivers of Russia. There should be an equally good market for such steamers on the rivers of the Argentine Republic, which are very wide, but for the most part shallow. We understand, however, that there is a strong prejudice against them, owing to their liability to catch fire—the first two which were run on the Plate having been destroyed by fire. We do not see why America should have a monopoly of such flat bottomed river steamers, and we recommend this to the attention of English ship builders, though as a nation we are said to be the last to suit our goods to customers' requirements.—*Marine Engineer.*

A NEW AND INTERESTING ELECTRICAL MACHINE.

We find in a recent number of *Engineering* the following description and illustration of a new electrical machine designed by Mr. James Wimshurst, of the Board of Trade, and which possesses several points of superiority over the Holz machine, while at the same time it can be constructed for but a fraction of the cost.

This new machine consists of two circular disks of ordinary window glass, 14½ inches in diameter, mounted upon a fixed horizontal spindle in such a way as to be rotated in opposite directions at a distance apart of not more than one-eighth of an inch. Each disk is attached to the end of a hollow boss of wood, or of ebonite, upon which is turned a small pulley. This is driven by a cord or belt from a larger pulley, of which there are two attached to a spindle below the machine, and which is rotated by a winch handle, the difference in the direction of rotation being obtained by the crossing of one of the belts.

Both disks are well varnished, and attached by cement to the outer surface of each are twelve radial sector shaped plates of thin brass disposed around the disks at equal angular distances apart.

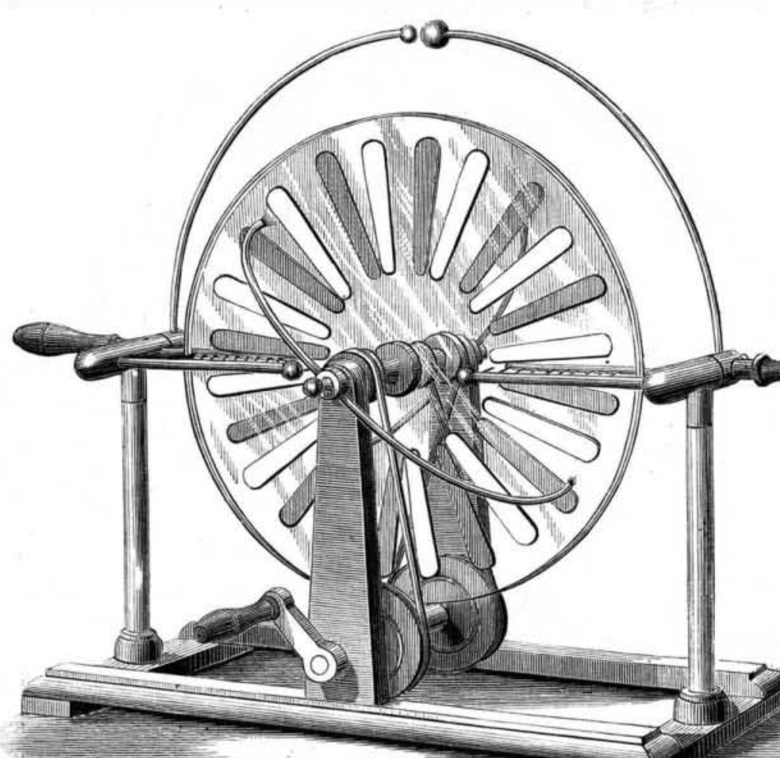
The two sectors, situated on the same diameter of each disk, are twice in each revolution momentarily placed in metallic connection with one another by a pair of fine wire brushes attached to the ends of a curved rod, supported at the middle of its length by one of the projecting ends of the fixed spindle upon which the disks rotate, the brass sector-shaped plates just grazing the tips of the brushes as they pass them.

The position of the two pairs of brushes with respect to the fixed collecting combs, and to one another, is variable, as each pair is capable of being rotated on the spindle through a certain angular distance; and there is, as in the case of the collecting commutator brushes of dynamo electric apparatus, one position of maximum efficiency. This position in the machine we are now describing appears to be when the brushes touch the disks on diameters situated about 45 deg. from the collecting combs, and 90 deg. from one another. To make this clear, let us suppose the twelve sector shaped plates to be numbered round like the hours of a clock, from I. to XII., then opposite plates, such as XII. and VI., X. and IV., VIII. and II., if on the front disk, would be momentarily connected together when passing the diameter, joining a point midway between X. and XI., and IV. and V., on a clock face; and, if on the back disk, they would be connected when passing between I. and II., and VII. and VIII.

The fixed conductors consist of two forks furnished with collecting combs directed toward one another and toward the two disks which rotate between them, the position of the two forks, which are supported on ebonite pillars, being along the horizontal diameter of the disks. To these collecting combs are attached the terminal electrodes, whose distance apart can be varied by the two projecting ebonite handles shown in the illustration.

The presence of these collecting combs appears to play no part in the action of the apparatus except to convey the electric charge to what may be termed the external circuit; for the inductive action of the machine is quite as rapid and as powerful when both collectors are removed, and nothing is left but the two rotating disks and their respective contact or neutralizing brushes, the whole apparatus bristling with electricity, and if viewed in the dark presents a most beautiful appearance, being literally bathed with luminous brush discharges.

It is one peculiarity of this interesting machine that it is only with the greatest difficulty that the polarity of its electrodes can be reversed, and in this respect it has a very decided advantage over most of the induction machines. It is difficult to account satisfactorily for the exceptionally high efficiency of the apparatus.



WIMSHURST'S NEW ELECTRICAL MACHINE.

With a machine of the size we have described, and which is shown in the illustration, there is produced under ordinary atmospheric conditions a powerful spark discharge between the electrodes when they are separated by a distance of 4¼ inches, a pint size Leyden jar being in connection with each electrode; and these 4¼ inch discharges take place in regular succession at every two and a half turns of the handle. This remarkable efficiency may be partly due to the duplex action of the apparatus, both plates being active and contributing electricity to the collecting combs, the sector-shaped plates of brass acting as *inductors* when in their position of lowest efficiency as *carriers*, and as *carriers* when in the positions at which their inductive effect is at a minimum, and *vice versa;* and as it follows from the construction of the instrument that the inductors of the one disk are at the position of highest efficiency, when those of the other are at their lowest, and *vice versa*, and as this applies with equal force to the sectors when considered as carriers, it also follows that the charging of the electrodes, and, therefore, the discharge between them, is by mutual compensation maintained constant. The machine is, moreover, perfectly self-exciting, requiring neither friction nor the spark from any outside electric exciter to start it, and this is one of the most remarkable features of the apparatus, for under ordinary conditions the machine is working at its full power after the second or the third revolution of the handle.

We are inclined to think that this initial charge is obtained not so much, as in Sir William Thomson's replenisher, from a minute difference of electrical potential between two parts of the apparatus—for the insulation is hardly perfect enough to allow so minute a difference to be so enormously increased in so short a time—but rather from the frictional influence of the air, and that chiefly between the plates—that is to say, on the surfaces opposite to those to which the sectors are attached. Within this narrow space the air friction must be far greater than on the outside surface, on account of the two disks rotating in opposite directions. Whether, however, the initial charge be derived from air friction or not, its generation is a point of very great interest, and this is especially conspicuous in the remarkable experiment to which we have referred, in which both conductors are removed, and the most brilliant electrical effects are produced when the apparatus consists simply of two disks rotating in opposite directions, with no fixed conductors except the light conducting brushes.

From the above description and illustration it will be apparent that the apparatus can be constructed for a few shillings, and thus a very useful and highly instructive generator of static electricity is, by Mr. Wimshurst's latest invention, placed within the reach of all. Having constructed several machines himself, Mr. Wimshurst is of the opinion that manufacturers could construct and sell them with a reasonable profit for something not much more than seventeen shillings apiece. If such a result can be obtained, Mr. Wimshurst will, besides having won the gratitude of the scientific world for having made a valuable contribution to the science of electricity, deserve the thanks of teachers and students for placing in their hands a much-needed instrument for the induction and production of electricity.

Why Men Cannot Fly.

The New York *Sun* wisely concludes that this century is likely to be forever memorable for its mechanical and engineering triumphs. It is distinguished from all the centuries which have preceded it as the age of steam and electricity, of rapid transportation for human beings and their products, and for bringing all the world in instant communication, one part with another.

Other eras may have surpassed us in literature and art. Some of our metaphysical science may not be so wonderful to the future as it seems to us; but our mechanical and engineering development has been so far beyond anything of the same sort in the past, even taking many centuries together, that this century is separated from the eighteenth by the broadest gulf in the history of human progress from era to era.

Yet, with all our mechanical triumphs and our engineering achievements, the *Sun* thinks that we are no further advanced in one respect than men were one hundred years ago, or a thousand years ago, except to some slight extent for military purposes. Ballooning has made no progress, and is still nothing more than an amusement of no practical value. We do not seem to be any nearer flying than men were at the beginning of the Christian era.

Our modern engineers have not yet constructed a practicable flying machine; nay, they have not yet so much as taken the first step in that direction.

The London *Engineer*, which has lately discussed flying machines in a scientific way, comes to the conclusion that there is no combination of wings or arrangements of any kind which will enable a man to fly with his own strength. He lacks muscular power to practice the accomplishment in which the birds are so proficient. And even if machines are devised to compensate for that lack of power and endurance, they will not be successful unless they shall be so constructed that each pound of the machine will develop as much energy as each pound of a bird. "Not till then," says this engineering critic, can flight for man be achieved.

Because birds fly, that is no reason why man should do the same thing, even if he is able to fit to himself wings as well adapted to his body as the wings of the bird are to its physical construction. Already "the wings of many model flying machines act just as do those of the rook and other birds" whose movements are slow enough for us to observe just how they fly. For there is a great difference among birds as to the rapidity of their flight, and not only that, but also as to the grace with which they do it. They have various styles of moving through the air, some graceful and others comparatively clumsy, just as the walk of a courtly woman differs from that of a Sioux squaw. "We have no doubt," says our London contemporary, "that if men could once fly, we should soon have as many styles developed as there are men."

We have said that the reason men do not fly is not merely because they lack wings, but also because they are not strong enough. There is no bird of flight which weighs as much as even a very light man, but there are many birds which are far stronger than men. The limit of weight beyond which the air cannot be utilized for bird flight is somewhere about thirty pounds. Nature does not produce heavier birds, and doubtless for the reason that the air is not the proper home for animals weighing more. "The conditions under which species are developed," says the *Engineer*, "are such that everything goes as far as it can go in size and speed." The roc of Eastern story it pronounces a "mechanically impossible creature."

The albatross is the largest bird in existence, and one of the heaviest. There are heavier birds with limited powers of flying, but the maximum weight of any natural flying machine which can fly well does not exceed 30 pounds, according to the *Engineer*; and the weight of the albatross seldom, if ever, exceed 28 pounds, or one-sixth that of a powerful man. But the albatross can keep its wings, 13 feet long from tip to tip, in motion for a whole day, while the strongest man would be exhausted, if he had to keep beating the air with them, in half an hour. And to fly he would need far heavier wings to be kept in motion.

After a mathematical calculation, the *Engineer* comes to the conclusion that the albatross possesses as much muscular energy as a man, and far more endurance, with which to propel the 28 pounds of its body. "We have in the bird," it adds, "a machine burning concentrated fuel in a large grate at a tremendous rate, and developing a very large power in a small space. There is no engine in existence, certainly no steam engine and boiler combined, which, weight for weight, gives out anything like the mechanical power exhibited by the albatross."

The conclusion arrived at by both of our contemporaries is that man will have to give up the hope of competing with the birds in flying.

Expiration of Artificial Alizarine Patents.

Scarcely fifteen years have elapsed since Graebe and Liebermann discovered the constitution of alizarine and then made it synthetically. In that short space of time German energy and genius have succeeded not merely in putting on the market an artificial product that would compete with the natural article, they have done far more; the natural product has been driven to the rear, and for a long time has completely disappeared, we may say, from the market. The importance of this revolution as an example of national and political economy is far reaching. On the one hand a large extent of land that has been devoted to the cultivation of madder, is now available for better uses, while on the other hand a material hitherto useless has suddenly attained a high value and become the source of a profitable and flourishing industry. What advantages Germany, in particular, has derived from this change are too well known to need any detailed description.

Being protected by patents, its manufacture was retained in the hands of a limited number, but these few exhibited unusual industry and great skill in overcoming the technical difficulties which made it questionable whether artificial alizarine would ever conquer its way into trade. Their restless and genial activity has secured for them a lasting and honorable name in the history of the great chemical industries. Now, as the expiration of the patent is approaching, it is probable that those already engaged in its manufacture will seek for means of combating the fresh competition, so as to be able to consign it to its grave before it is fairly born. They have had a conference in Frankfort-on-the-Main, the result of which was a close compact, an agreement upon a common price, and the issuing of a circular to be mentioned later.

In England alizarine is of the greatest importance; half of all the alizarine produced is consumed there; part of it in Glasgow, the center of the Turkey red dyeing, part of it in Manchester, the head center of calico printing. It is natural that the large manufacturing chemists of England are watching most attentively the expiration of the patent on alizarine, and that they will strive with all the power and tenacity which characterize an Englishman to manufacture for themselves an article, the raw material for which is sent over to Germany, in order that it may be returned, in great part, in the shape of a dye stuff.

This threatening competition and the danger that it involves to German industries did not escape the united alizarine manufacturers, who decided, as the best means of meeting it, to send out the above mentioned circular to all the calico printers and dyers in England. It contained the following proposition: The consumers agree to take all the alizarine used by the mup to the end of 1884 from these manufacturers, at present prices. The manufacturers offer a rebate of 5 per cent for 1883, and one of 10 per cent for 1884, to be paid at the end of the contract. The final clause states that in case the manufacturers lower their prices between the beginning and end of the contract, the buyer shall receive the benefit of this reduction. The buyer also pledges himself to buy only for his own use, and not to sell or transfer it, and indirectly it is understood that the producers will not sell to any that do not enter into this agreement.

The combination made a great blunder when they put forth this proposition, and the English manufacturers were not slow to profit by this mistake. The newspapers immediately pointed out what a restraint would be laid on the consumer by entering into such a contract, that it would be equivalent to lengthening the patent, and also how greatly the buyer would injure himself by thus closing the market, as he could not take advantage of the freedom of competition. In addition to all this, statistics were published to show how much alizarine was used, and how much Germany had made out of its manufacture, and that England, which furnished the anthracene and consumed the alizarine, was permitting immense sums of money to flow into the pockets of foreigners.

The Turkey red dyers held a series of meetings and resolved not to accept the proposition of the manufacturers, but rather to limit their own production than to place themselves under this restraint; and in fact a part of them, it is said, did stop work for a short time. The agitation promises to bear the desired fruit. An English stock company has been formed with a capital of £200,000, for making alizarine on a large scale, and the works of Burt, Boulton & Hagewood, in London, have been purchased for that purpose.

In the mean time the circular of the German combination has been withdrawn, and their two great precautions have accomplished nothing beyond hastening a catastrophe that might not otherwise have occurred for several years.—*Chemiker Zeitung.*

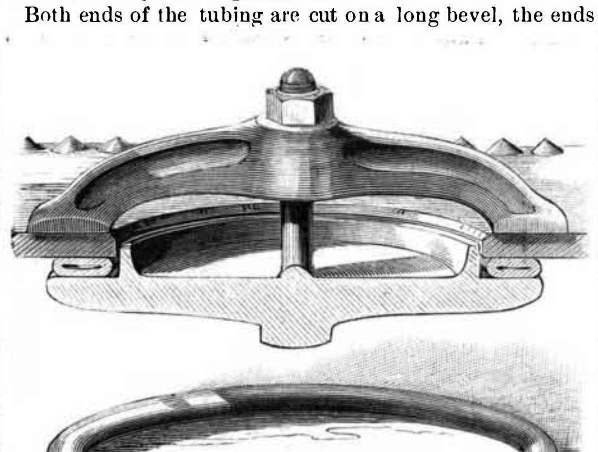
When will capitalists ever venture on the manufacture of alizarine in America?

Manhole Packing.

To the Editor of the Scientific American:

It may be of interest to parties having charge of steam boilers, some who, no doubt at one time or another have been troubled with leaky manholes, to know that the very best packing for the same is a piece of ordinary rubber tubing of an internal diameter of about three-eighths of an inch, cut and joined together.

Both ends of the tubing are cut on a long bevel, the ends



being held together by simply putting into them a roll of common draughting paper, the spring of the paper being sufficient to keep the adjustment until it is in place. Leaky manheads are common, blowouts often occur, and that means delay and pecuniary loss. The roughest surfaced manhead will be made tight by this method, and the cost does not exceed that of plaiting a gasket. To protect the iron from the effect of sulphur contained in the rubber, coat the tube with "black lead."

A. D. TYTLER.

San Antonio, Texas.

How to Dry Plants.

Mr. Leo H. Grindon, whose name is well known in scientific circles, gives the following practical hints on this subject in a recent article in the *Field Naturalist:*

"The very ancient adage, that if a thing be worth doing at all it is worth doing well, applies to the preservation of plants for the herbarium as much as to any great and important work or business. Specimens that are no better than fragments of brown stick, or that seem effigies of plants cut out of thin brown paper, the flowers shriveled and shrunk so as to be no longer intelligible, the leaves crumpled and doubled up, everything confused and mashed together, such as one may see sometimes in collections, are altogether undeserving of the name. Nothing that is not dried in the best manner possible, its colors and configuration preserved as perfectly as the nature of the plant will admit, ought never to be allowed a permanent place in the herbarium; the bad may be tolerated a while, in default of better, but the further a specimen is from vivid and pleasing resemblance to the living thing, the speedier should be the endeavor to supersede it. Specimens from abroad that cannot be superseded of course we do not speak of. In the plants within reach, none but admirable representatives of their best features while alive should be considered worthy of a place. Plants dry very variously. Some require not a moment's trouble; others demand patience. Now and then the case is hopeless, and we are constrained to fall back upon the pencil, and prefer drawings, colored ones if possible. Grasses and their allies, most kinds of ferns, plants that resemble heather, everlastings, the mature leaves of shrubs and trees, call for only the minimum. Those which try the patience, and can be managed only after considerable experience with easy ones, are such as may be illustrated by citation of the hyacinth. To secure the best results, obtain a half a dozen pieces of stout millboard cut to about 18 inches by 12 inches. Then gather together a hundred old newspapers, and fold them neat and square to about the dimensions of the mill boards. Four or five yards of common white cotton wadding, a score of sheets of tissue paper and as many of blotting paper, all cut to the same size, complete the apparatus. One of the boards serves for the foundation; on this only a newspaper, then a piece of wadding, and upon this place the specimen intended to be dried. The cotton being soft and retentive, every portion can be laid in a proper and natural way, including the petals of the flowers. A newspaper above, two or three if the specimens have thick stems, and so on, till all shall be deposited in the way of the first. If the specimens are sticky, or hairy, or of a kind that the wadding seems likely to adhere to, then, before depositing them on it, introduce a half sheet of the tissue paper. A heavy weight must be put on the top of all, sufficient to embed the specimens in the wadding; then leave the whole to rest for twenty-four hours. All the papers must then be changed, dry ones being put in their place; and if the plant seems to throw off a very considerable amount of moisture, such as will render the wadding quite damp, change the wadding also. A second and even a third change is desirable at the end of two or three days or a week; and when this is made introduce the blotting paper, pressing again till everything is perfectly flat, and the specimens are absolutely dry.

"Such is the simple process by which the writer of these lines has succeeded in the art of preserving the colors and forms, not only of robust and tractable plants, but of the most delicate and very many of the obdurate. Every petal, every leaflet, retains the form it had in life, and nine specimens out of ten keep their colors excellently. To insure the keeping of color, it is well, if time can be spared, to change the blotting paper many times, and to dry it thoroughly before the fire, but this need not be done until after the third day from the beginning."

English Locomotives.

The express passenger engine, having 18 inch cylinders and four coupled 7 foot driving wheels, with four wheeled bogie in front under the smoke box, designed by Mr. S. W. Johnson for the traffic of the Midland Railway, is supported on a wheel base of 21½ feet in length. The engine weighs about 42 tons in working order, and with tender, including coal and water, about 68 tons. The average load taken by engines of this class is fourteen carriages, at the time bill speed of fifty miles an hour, over gradients of from 1 in 120 to 1 in 130, with a consumption of 28 pounds of Derbyshire coal per mile run. The engine can take, as a maximum load, seventeen carriages between Manchester and Derby, either way, over ruling gradients of 1 in 90 and 1 in 100 for ten miles, at a speed, up the banks, of thirty-five miles per hour; and on a level, or on falling gradients, at fifty miles per hour. The curves on the Manchester line are very frequent, and vary from eleven chains to forty chains of radius. The carriages weigh, with passengers, 11 tons each, making a train of the gross weight of 187 tons. The express passenger engines on the Great Northern Railway, designed by Mr. Patrick Stirling, having 18 inch cylinders, and 8 foot single driving wheels, weigh, in working order, about 38 tons, of which about 16 or 17 tons weight is upon the driving wheels. They work the express trains between King's Cross and York. Engines of this class take trains of from sixteen to twenty-two carriages. On one occasion a length of fifteen miles was run in twelve minutes with sixteen carriages of from 10 to 12 tons each. These engines can take a gross load, including the engine and tender, of about 350 tons, on a level, at a speed of forty-five miles per hour, with a steam pressure in the boiler of 140 pounds per square inch.

In his recent inaugural address as president of the Institution of Engineers and Shipbuilders in Scotland, Mr. J. Reid gave some interesting notes on locomotives. The first engines of the old Garnkirk and Glasgow Railway, which was opened about the year 1829, weighed from 8 to 9 tons. They had 11 inch cylinders, and wheels of cast iron 4 feet in diameter, with a working pressure in the boiler of 50 pounds per square inch. The Garnkirk engine used to take a train of three carriages, weighing 7 tons gross, at an average speed of sixteen miles per hour, between Glasgow and Gartsherrie. When the old line, eight miles in length, merged in the Caledonian Railway, now comprising a system of about 870 miles, the power of the engines was greatly increased, and at this day there are express passenger engines working over the same ground having 17 inch and 18 inch cylinders, and wheels of 7 feet and 8 feet in diameter, and weighing, in working order, from 35 to 45 tons. These engines take a gross load of 90 tons at a speed of from forty to fifty miles per hour, burning about 23 pounds of coal per mile run.