

Ironman Articles

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The Final Breakthrough

“Why not restrain the thighs?” he said; and with those five words, Dan Howard solved the last remaining problem of any real importance.

More than that, he provided the answer for the problem that had stopped me in my tracks for months, and he also provided an answer to a problem that I had always considered impossible to solve. Every weight trainee in the world should take off his hat to Dan Howard of the University of Tulsa; in no small part, weight training results of the future will be made possible because of his contribution to our research.

Are you worried about danger to your knees from heavy squats? If so, forget such worries; that danger (if such ever really existed) has been removed.

Do squats bother your lower back? They never will again. That, too, has been taken care of.

Does the weight of the bar across your shoulders exert too much compression upon your spine? Such pressure has been entirely removed; not reduced, REMOVED – never again need you expose your spinal column to even an ounce of compression force while performing squats.

Are you forced to do full squats with a light weight for full-range results, and additional sets of practical squats with a much heavier weight for building great strength and muscle mass? If you have not been training in such a manner, you have been training wrong; but you need never to do so in the future; that limitation has also been overcome.

Do you consider squats almost brutally hard? That problem HAS NOT BEEN SOLVED – and it never will be. On the contrary, Dan’s contribution has not resulted in an easier form of squatting; it has, instead, resulted in a form of squatting that is at least three times as hard as any previously possible method of squatting. And primarily for that reason, it is at least three times as productive as any other method of squatting; and, insofar as the production of results in comparison to the expenditure of energy is concerned, this new method of squatting will certainly prove to be at least ten times as productive as any earlier method.

The title of this article is “The Final Breakthrough.” Many readers may feel that is a gross overstatement; “... after all,” they may ask, “how can he possibly predict the discoveries of the future?”

Obviously I cannot predict the discoveries of the future, and I certainly don’t pretend to be able to, but in this instance, just as obviously, I don’t have to predict the future. All – and I mean ALL – of the important problems connected in the field of weight training have now been solved. Only a matter of a few months before you read this article, all but one of the important problems in this field had already been solved, and then Dan Howard solved the final problem.

A very similar problem had been encountered, and solved, previously; but in this case it did not appear to be practical to approach the problem in a similar manner. Such a solution was POSSIBLE, but it certainly was not PRACTICAL; an exercise machine based on those principles would cost at least as much as a small airplane – and would be approximately the same size.

Full-range movement of biceps muscle of the upper arm involves two separate planes. Building a machine that was capable of supplying the required compound resistance was certainly not easy – but it was both possible and practical. The resulting “Compound Curling Machine” is a rather large, far from inexpensive, very complex machine; but it will build maximum possible strength and muscular size in a tiny fraction of the time previously required.

Squatting is also a compound movement; it, too, involves rotational movement around two different axis points. But in this case, a solution such as that used in the Compound Curling Machine did not appear to be practical. So, at that point in our research, we were struck; until Dan pointed out a possible solution that had not previously occurred to us.

Squats and leg presses are very similar; their primary differences being “range of movement” and “point of restraint.” In squats, the lower legs (the calves) are restrained, while the torso and the thighs are moved. Properly performed, full range squats are a full-range movement.

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Leg presses are different in that the torso is restrained while the thighs and calves are moved; and since the thighs are not brought into line with the torso in leg presses, the range of movement is reduced. Leg presses are easier on the spine.

So much for the light differences between squats and leg presses; their similarities are more numerous. Neither exercise offers any direct exercise; neither movement is based upon rotational resistance; neither offers the required variation of resistance during the movement; both work the involved muscular structures heavily in their weakest positions, while affording almost no worthwhile resistance in the strongest position.

But, until quite recently, and in spite of those limitations, squats and leg presses were among the most productive exercises known.

In effect, a squat (or a leg press) is a double movement, a combination of a thigh extension and a glute extension; and in the case of squats, the exercise may reasonably be considered a triple movement; the third part being a lower back extension.

While there may be very little actual movement (bending) of the lower back during the performance of squats, the fact remains that the lower back muscles will be forced to work quite hard in order to prevent such bending of the back; so in either case, with or without bending of the back, the back muscles will be worked either isometrically or isotonicly.

A close scrutiny of the actual forces of the squat will clearly indicate at least one probably very surprising disclosure; the force being exerted is NOT being directed upwards, along the line of the spine – in fact, it is being exerted out of phase with an upwards direction, toward the rear.

This being true, and it is true, then why support the weight on the shoulders, when in fact the force being expended is not going in that direction? Probably because there was simply no other way to do it, except by performing leg presses, which limited the range of movement and thus reduced the production of results, while doing little or nothing for the lower back muscles.

But if the thighs were restrained, then the upper body could rotate in one direction while the lower legs rotated in the opposite direction; the resistance could be removed from the shoulders (or from the feet, as in the case of leg presses), and could then be spread out over the entire surface of the back and the front of the lower legs, as it should be, since the forces are being expended in those directions.

Having provided direct, rotational resistance in this fashion, then the resistance could be varied in exact proportion to the strength curves of the involved muscle structures by use of a Nautilus pulley rotating at the knee axis and another Nautilus pulley rotating in the opposite direction at the hip axis.

Since it is extremely important for the rotational axis of each of the two Nautilus pulleys to remain exactly in line with the body axis for which it is designed and since the distance between the axis points of the knees and hips of a short man will be several inches less than would be the case if a taller man was using the machine, it becomes obvious that one of the Nautilus pulleys and its related machinery must be movable; but since such movement would be in a horizontal plane, this presents no great problem; it simply means that part of the machine must be mounted on a track that would permit the required movement.

Quite simple, once you think of it, perfectly obvious, once it is explained to you. But so is the wheel, yet millions of people struggled for thousands of years before anyone thought of anything as simple as a wheel. And since that moment, every single improvement in the field of transportation, apart from riding animals or sailing boats, has been based upon, or dependent upon, the principle of the wheel; and if you think otherwise, then just try building a practical square rocket. You may be able to build a square rocket that will be strong enough to withstand the required forces, but if so, it will be far too heavy to get off the ground. For maximum strength with minimum weight, any structure must be round.

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So, just as the wheel was the real breakthrough in the field of transportation, this latest development in the field of weight training is the final breakthrough in this field; the other requirements have already been provided previously; we had already discovered rotational movement, direct exercise methods, variable resistance requirements, full-range, omni-directional, balanced, compound resistance, and we had learned how to provide the requirements in every case but one.

Now even that has been solved. Thanks, in very large part, to Dan Howard.

But some people will ask, "...just how can you be so sure it really is such an enormous improvement in method?"

Simply because nothing else is even possible; although many people continue to try to do so, you cannot adjust the laws of physics to suit yourself; definite efforts will invariably produce definite results. Since, for the first time in the history of exercise, this new method of squatting will provide the involved muscular structures with direct, omni-directional, balanced, variable, full-range resistance, resistance that involve working almost a full 100% of the individual muscle fibers in that section of the body, then it must produce much greater and far faster results – no other result is even possible.

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Above I gave a brief outline of the required characteristics of an exercise machine designed to replace the squat; a machine that would provide all of the benefits of the squat – while markedly improving the possible degree of results producible – and with none of the disadvantages of the squat, the discomfort and possible danger.

And while it should be obvious to any literate person momentarily familiar with the weight-training scene that some of my past comments have created a storm of controversy, I think the reactions of large numbers of people to the article on a "squat machine" provided an interesting commentary on human character traits; because, without single exception up to this point, the reactions have been highly favorable – thus, apparently, while a few people may be somewhat hesitant about admitting the full value of some of our other types of machines, it seems that everybody (all those I have heard from, at least) afforded the new squat machine instant and full acceptance.

Why? Why doubt in some areas but immediate acceptance in this case? Could it be that people want to believe in the squat machine – simply because they hate doing squats so much, while being clearly aware of the value of the squat as an exercise?

If that proves to be the case – and I think it will- then this is yet another example of wishful thinking on the part of large numbers of people, the kind of thinking that has done so much damage in the weight-training field in the past; I do not want our ideas – nor products – accepted simply because people "believe in them." From the moment of the first public announcement of our work, one of my goals has been the establishment of a trend towards logical thinking in a field where it has been all too rare in the past – and if people believe something only because they almost desperately "want it to be true" then my efforts are not producing the desired results.

And it now appears that this is happening; apparently people hate doing squats almost with outright passion – and such an emotional attitude thus leads them into an acceptance of the new machine that is based on emotion rather than logic. It is my firm opinion that emotion and logic are mutually-exclusive; that they exist in inverse ratio – total emotionality equates insanity, and pure logic presupposes complete elimination of emotion. And while I am certainly not suggesting even an attempt to remove emotion, I do think that everybody would be well advised to try to at least be aware of the distinction between emotion and logic.

My eldest daughter once accused me of being extremely "cold blooded" – of almost being without emotion; she asked me, "do you actually consider simple survival the ultimate achievement?"

And I told her, "... no, but it is certainly a prerequisite for anything else."

In that light, then, let us logically attempt to examine the concepts of the new squat machine; if it is logical – and thus "right" – let us accept it, and if not, then we should reject it.

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To begin with, as I clearly stated in the first half of this article, the new machine does not provide an “easier” form of exercise; which should not be surprising, since it was not our intention to provide easier exercises – on the contrary, since it is my firm opinion that exercise produces results almost in direct ratio to the intensity of effort of the exercise, we were trying to provide the hardest-possible form of exercise.

In the squat, you are primarily working three separate muscular masses – the frontal muscles of the thighs, the muscles of the buttocks, and the muscles of the lower back; and while squatting is certainly not an “easy” form of exercise, it is nevertheless true that squats involve only a small percentage of the total number of fibers contained in the muscles being worked, and that none of the muscles are worked in a direct manner – in either sense of the word “direct” as I have used it in previous articles.

That is to say, the resistance provided in squats is not “directly opposed to the possible-direction of force application” – the resistance is being provided in one direction, straight down, and the force is primarily being exerted in another direction, in a direction almost 90 degrees out of phase with a direction opposite to the direction of resistance application. As a consequence, a very large part of the force being produced is wasted – is doing nothing in the way of moving the resistance. And secondly, in some important areas of the exercise movement – and as it happens these are the most important areas – the direction of resistance application is fully 90 degrees out of phase with the direction of force application; and thus, obviously in such a situation there is literally NO resistance in those positions – not, at least, insofar as the muscles you are trying to work are concerned – and without resistance there is no possibility of benefit from the exercise in those positions, in the very positions where greatest benefit is both possible and desirable, in the only position where it is even possible to involve ALL of the muscles in the exercise.

And while the above paragraph should take care of one meaning of the word “direct,” it still remains necessary to explain the same word in another sense – a sense that is of equal importance in this instance. To be direct in this sense, exercise must be applied directly to the muscles being worked – rather than indirectly; the exercise must not involve, be dependent upon, nor be limited by, other, weaker muscles – not, at least, if you are trying to build the greatest possible degree of strength and/or size. Because a chain is only as strong as its weakest link – and you will fail in any exercise at the point where the weakest involved muscular structure runs out of steam; and when such a muscle is much smaller and weaker than another muscle being used in the same exercise, then the larger and stronger muscle will not be – literally cannot be – worked anywhere near the point that is required for inducing maximum possible muscle growth stimulation.

In the case of the squat, this usually happens when the lower back muscles reach a point of exhaustion – or cannot handle the load involved in a heavy single attempt; although, in single-attempt squats carried to the proper low point, the lower back is usually not the limiting factor – since, in that position, the thighs are in the most disadvantageous position possible in this exercise, for three reasons. First, the moment-arm of the resistance is at or near its maximum point, and thus effective resistance is at its highest level (or very near it) – second, the moment arm “within” the muscular mass itself, the moment arm of the angle of insertion of the muscular attachments, is in its worst possible position, in the position where anything near full utilization of existing strength is literally impossible – third, the muscle is then in an extended position, and it is literally impossible to involve more than a fairly low percentage of the total number of muscular fibers in the exercise, since the centrally located fibers cannot become involved in the “worst possible” position for the angle of insertion moment-arm factor is the fully erect position – but by that point in a normal squat, you don’t need any strength, since there is no resistance in that position.

So where does that leave us? Well, that simply means that your lower-back muscles are too weak to enable you to do squats hard enough for the production of best possible results.

And how do you get around that – while using conventional equipment; quite simply – if perhaps not “easily.” But remember, we are not looking for easy exercises.

First, you do a set of leg presses carried to the point of muscular failure – performing at least twenty full repetitions against the most resistance that you can handle, and then as many partial repetitions as you can squeeze out, stopping only when it is utterly impossible to move the weight at all in any position. Then – IMMEDIATELY, without even two seconds of rest – you perform a set of thigh extensions; again doing at least twenty full repetitions, and again continu-

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ing with partial movements until a point of utter exhaustion is reached. Then – again IMMEDIATELY, without even one second of rest this time – start your squats, with a weight that you think you can do at least ten full repetitions with, and again carry them to the point of utter failure, so that the weight must be removed from your shoulders in the low position. Then – and yet again IMMEDIATELY – step under a much heavier squat bar and do partial-range movements near the top of the squatting position – going as low as possible while still managing to come erect again, trying to make each repetition as hard as possible.

How many cycles? Are you kidding? Even one such cycle done in that fashion without careful break-in training might well kill you – and it will certainly put you on the floor for quite a while, probably in a dead faint, certainly very near a state of shock; and if you think not, just try it – exactly as outlined above.

Eventually – after careful break-in training – you can work up to two such cycles; but at first, one cycle will be more than enough for anybody – King Kong not excluded.

How often? Probably not more than twice a week – with three days between workouts once each week, and four days between workouts during the other weekly “off period.” That is to say, train Monday and Thursday – or Tuesday and Friday. But under no circumstances more than three such workouts in any given week – and probably not more than six weeks of such training in a row, with a full week of rest afterwards before any training is done again.

After the above outlined leg workout – after you finally get into such condition that you can do “anything” afterwards except lie on the floor and curse me – then add two sets of heavy stiff-legged deadlifts to the routine; because the above routine does little or nothing for the lower back – it is designed to remove the weak link of the involvement of the lower back, in order to make it possible to exercise the frontal thigh muscles as strongly as it is possible to do with conventional equipment. But if you make the mistake of overdeveloping the muscles of the thighs in relation to the muscles of the lower back, then you have created a literally dangerous situation – a condition that could easily result in very serious injury, up to and not excluding the possibility of breaking your back.

If you are willing to make proper utilization of the above outlined routine, then you probably don’t even need a squat machine; because, while the schedule above will not produce anything close to the degree of development producible with the squat machine – or, at the very least, not in anything close to the same elapsed training time – it certainly will build your thighs far larger and stronger than any other possible routine involving conventional equipment. And after all, how big do you want your thighs, anyway?

But, if you simply won’t be satisfied with halfway measures – if you just must have the best – there is only one remaining logical choice; but, of course, my “saying” that it is the only logical choice doesn’t make it a fact – so let us logically look at the squat machine in its present state of development, which, quite frankly, I think is very close to its ultimate state of development, insofar as function is concerned at least.

Thus we must ask, “...what are the advantages, and the disadvantages?”

The only realistic disadvantage is cost – the machine is not quite as inexpensive as a barbell, to put it mildly; and a possible disadvantage is size – if you live in a phone booth, then you will be a bit crowded if you add a squat machine.

But the advantages are a bit harder to explain – since a clear explanation will necessarily involve more than simple statements if this is really to even approach a logical examination. But I will do the best I can in that direction – poorly as that may be in fact.

To begin with, the resistance is not provided in line with the spine – and this provides improvements in both comfort and safety, simply enormous improvements; since it totally eliminates – not reduces, ELIMINATES – the compression of the spine. The resistance is provided in two separate areas of contact – against the front of the calves, in a manner somewhat similar to that used in thigh-extension machines, and against the entire surface of the back.

And since this not only totally removes the compression forces from the spine, thus greatly reducing the danger of injury, but increases the “area of contact” by a ratio of at least 100 to 1, it also provides almost ultimate “totality of comfort.” Instead of having several hundred pounds of force concentrated on an area of a few square inches, you have a force spread out over an area of literally hundreds of square inches, almost the entire surface of the back – as well as

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a good part of the surface of the fronts of the calves. This reduces the pressure in any one area something in the vicinity of 99% – any significant additional reduction of pressure would involve total elimination of resistance, which is, of course, impossible while still providing “exercise.”

So – any danger previously resulting from compression of the spine has been removed, and comfort has been provided almost to the ultimate degree.

Secondly, the resistance is provided “directly” – in both senses of the word; it is directed against the possible directions-of-movement – and it does not reach the major muscular structures involved only after being filtered through the previously-existing chain of related muscles.

This requirement (actually these requirements) was met by providing rotary form of compound omni-directional resistance – apparently the only possible way that this problem could be approached logically.

In effect, rotational resistance is provided in two opposite directions at the same time – the lower legs, powered by the frontal thigh muscles, rotate forward around the axis of the knees – and the entire torso, powered by the buttock muscles and the muscles of the lower back, simultaneously rotates towards the rear around the axis of the hips.

But since such movement of resistance (a common source of resistance, as it must be in this case) is powered by both oppositely-rotating body-part movements, and since we are again dealing with the characteristics and requirements of spinal pulleys that are the only practical method of providing the requirement for automatically variable resistance, and since the inherent characteristics of spinal pulleys are “interesting,” to say the least, we are brought face to face with some rather highly technical situations.

It would have made the situation a great deal easier if the “hip axis to knee axis length” was exactly the same in all people – or, if we were dealing with round pulleys, it would have been a simple matter even without standardized people. But since people come in a great variety of sizes, and since we were dealing with spiral pulleys, we had our work cut out for us. Arrogant as this must unavoidably sound, it is nevertheless perfectly true that it is at least highly “unlikely” that any possible reader of this article will have any slightest idea of, or appreciation for, the scope of the problems introduced by the use of spiral pulleys in this instance – nor will I do much in the direction of trying to make such an appreciation possible; for any readers who are sincerely interested, I will point out that doing computer-type problems in your head is easy by comparison to an attempt to understand all of the possibilities inherent in spiral pulley applications. While a spiral pulley – in effect, a form of cam – is one of the most simple-appearing shapes in existence, it may well be the most complex shape to work with – and if not, be good enough not to tell me about whatever is, since I have enough problems already.

But it wasn't an impossible problem – even if, as happened to be the case, it certainly appeared to be for a while; but it did lead to the conclusion – apparently the only possible conclusion – that a “straight rise” form of resistance was a distinct requirement in this application, and that it must also be a common source of resistance.

So we ended up with a machine – apparently the only possible practical form for such a machine – which restrained the thighs, while permitting full range, rotary form, automatically variable, double balanced, compound resistance application. In effect, the muscles are worked against constant, direct, automatically varying resistance over their full possible ranges of movement – so that all of the involved muscles are meeting maximum-possible degrees of resistance throughout the movement – from a starting position of full extension to a finishing position of full contraction.

An additional safety factor is introduced by the fact that it is impossible to go too low in this machine – thus any possible dangers to the knee attachments is greatly reduced, if perhaps not entirely removed; since some people can apparently manage to hurt themselves with anything – a friend of mine recently strained his back while brushing his teeth.

Thus – insofar as I am aware – this machine provides literally ALL of the requirements for inducing increases in muscular size and/or strength; while removing most of the previously-existing danger factors, and greatly reducing all of them, and while increasing the comfort factor to a degree that literally must be experienced to be believed.

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If this machine “fails” to meet any requirement – or even fails to provide for any “desirable feature” – then I am simply unaware of any such shortcoming. It is, I think, as close to being perfect as a machine intended for this purpose can ever be – or certainly, ever will be.

But please don’t believe in this machine simply because you want to – probably because you hate regular squats so much; instead, try to understand it – it is absolutely worthy of full understanding, and it will certainly become one of the most important contributions to physical training within this century, and perhaps literally for all time.

And if you think otherwise – then attack it with all due vigor; but I clearly warn you in advance, any such efforts would be better directed towards an attempt to tear down the pyramids with your bare hands. In some other instance involving the application of these same principles, we are still a long way from final solutions – but in this case, we are “there,” this is literally the ultimate development, the final breakthrough.

And when will such machines at least be available in most large gyms? Well – now THAT is a problem that we haven’t solved yet; but we are working on it – negotiations are already under way with a major industrial firm for the large-scale manufacture of this machine. Just when this will bear fruit is still an undecided point – soon, I hope; but the eventual result is inevitable, within a couple of years, these machines will be freely available as an “off the shelf” item – and not long afterwards, they will be in use in every major gym, almost every school, and in many private homes.

And while some few (actually only one that I can remember) people have been outraged by my announcements of developments “before they were immediately available for widespread use,” I think that such prior notice is the only honest course; after all, it should now be obvious that investing your savings in stock in a used-squat-rack business would hardly be wise.